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ORIGINAL ARTICLES

Photos top to bottom: (1) Chest injury radiograph (2) Glucose test in urine (3) Newborn care

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ORIGINAL ARTICLE

Prevalence of Heavy Menstrual Bleeding and Its Associated Factors Among Women Attending Kilimanjaro Christian Medical Centre In Northern Eastern, Tanzania: A Cross-Sectional Study

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ABSTRACT

Background: Women of reproductive age experience a lower quality of life and considerable morbidity as a result of heavy menstrual bleeding. This issue needs to be addressed to achieve gender equality and permit women and girls to engage in a range of economic activities. In this study, we aimed to determine the prevalence and the most common factors associated with heavy menstrual bleeding.

Methodology: Cross-sectional study was conducted at a zonal referral hospital in Northern Eastern, Tanzania. Data was extracted from women files who attended the hospital obstetrics and gynaecology clinic retrospectively. Data were analysed using Statistical Package for Social Sciences (SPSS) version 20.0. Descriptive statistics were used to summarize the data. A univariate logistic regression model was fitted to assess the strength of the association between heavy menstrual bleeding and exposure variables.

Results: A total of 162 women aged 15-54 years were enrolled. The prevalence of heavy menstrual bleeding was found to be 24.1%. The following factors were found to be significantly associated with heavy menstrual bleeding; age range of 20-44 years (OR: 0.16;95% CI: 0.02-1.01), hormonal contraceptives (OR: 3.16; 95% CI: 1.15-8.69), having no clots on menstrual blood (OR: 0.19; 95% CI: 0.58-0.651), low haemoglobin level (OR: 5.61; 95% CI: 1.44-21.90), and uterine fibroid (OR: 0.35; 95% CI: 0.17-0.73).

Conclusion: Despite the extreme measurements of Heavy Menstrual Bleeding (HMB) in this study, its prevalence remained high. To spread awareness of HMB and its consequences, we recommend screening the general public and offering health education initiatives.

BACKGROUND

Menstruation in a woman is a normal physiological process. It is a monthly process when the woman is passing blood through the vagina from the reproductive tract, taking 3-8 days.[1] Menstruation is a physiological process associated with several disorders in which heavy menstrual bleeding is among.[2] Heavy menstrual bleeding can be defined as menstrual blood loss in a month of greater than 80mls.[3] However, it can not only be measured objectively but also subjectively. The current and most common definition of heavy menstrual bleeding is menstrual blood loss that is so excessive it interferes woman's physical, social, emotional, or quality of life (QoL).[4] It can also be considered when a woman passes large blood clots, need for double sanitary protection, needs for frequent changes of tampons and towels (meaning changes every 2 hours or less, or 12 sanitary items per period) and flooding through to clothes or bedding.[5] Other objective measures of heavy menstrual bleeding involve the use of pictograms in estimating the volume of blood lost.[6]

The global prevalence of heavy menstrual bleeding has been demonstrated to differ. This prevalence also varies according to how HMB was measured. In America, the prevalence of heavy menstrual bleeding was 38.9 %.[7] HMB prevalence was reported to be 27.2% in five European countries.[5] Moreover, in developing countries, the prevalence of heavy menstrual bleeding is ranging from 8%-27%. There is a scarcity of data concerning the prevalence of heavy menstrual bleeding in African Countries.[8] Heavy menstrual bleeding accounted for 57.4 % of all menstrual disorders assessed among adolescents in Nigeria.[9] Heavy menstrual bleeding is associated with several factors and these don't necessarily imply causality but increase the risk of a woman experiencing heavy menstrual bleeding. These include age, parity, haemostatic defects, hormonal contraception, clots on menstrual blood, anaemia, and uterine fibroids.[9–12] It has been documented that HMB affects the quality of life of many women of reproductive age as it interferes with their daily activities in terms of reducing the number of working hours, school attendance, and sexuality.[6]

Although heavy menstrual bleeding has never been documented to produce significant mortality, it causes significant morbidity due to anaemia.[4] There is little knowledge and awareness among women and healthcare providers about the importance of reducing menstrual flow among women who are anaemic.[8]

To achieve gender equality and enable women and girls to participate in a variety of activities such as education, health care, a decent job, and representation in political and economic decision-making processes, this matter has to be addressed with an effective treatment plan. Considering the importance of this matter and the fact that data are scarce concerning the prevalence of heavy menstrual bleeding in East Africa simply because perhaps little attention has been given to this unmet area of reproductive health care for women, there is important to conduct this study. In this study, we aimed to determine, the prevalence of heavy menstrual bleeding and identify the most common factors associated with heavy menstrual bleeding among women attending Kilimanjaro Christian Medical Centre (KCMC), a tertiary referral hospital in North Eastern, Tanzania. This study will benefit other researchers by shedding light and creating a baseline for those who will be conducting studies on this subject.

METHODOLOGY

Study Design, Setting, and Population

We conducted this study from March to July 2016 at KCMC which is one of the referral zonal hospitals in Tanzania, serving mostly referral patient cases in the North-Eastern part of Tanzania. The minimum sample size was estimated using a formula expressed as sample size $=Z^2$ (p)(1-p)/e2, where, Z = value (1.96 for 95 % confidence level).[13] An average prevalence (P) of 7% for heavy menstrual bleeding reported from developing countries was used,[8] and a minimal tolerable error at the 95% confidence level used was 0.05. The minimum estimated sample size was 110 non-pregnant patients who attended at obstetrics and gynaecology outpatient clinic of KCMC.

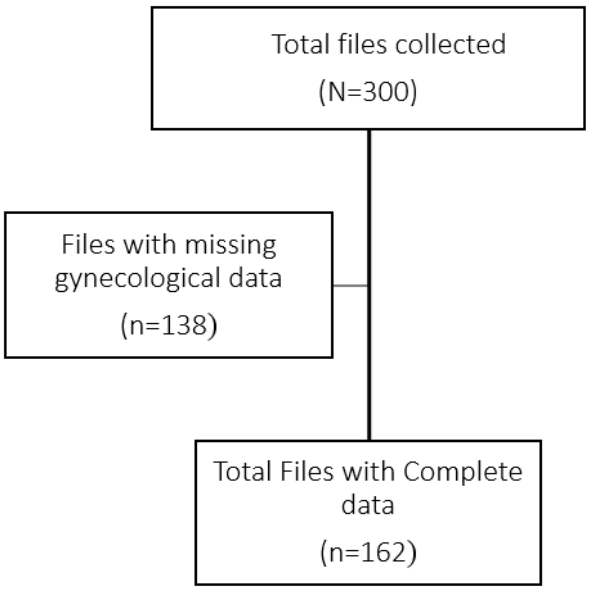
Data Source and Collection Methods

Data were extracted retrospectively from registered patient files of the women who attended the obstetrics and gynaecology clinic of KCMC in the year 2015 and filled in the data collection form. Only files involving non-gravid women with complete data were included. Additionally, a pre-testing of the data collection form was conducted before data collection. It involved selecting randomly 10 patient files to make sure the data needed for the study is available and not ambiguous. Also, pretesting was done for the validity and reliability of the data collection form. Non- probability sampling was employed in this study in which convenience sampling was done to select the files. The files with missing gynaecological or ineligible data were excluded. See flow chart figure 1 below.

Study Variables

In this study, the outcome variable, heavy menstrual bleeding, was recognized when a woman self-reported using more than 5 fully soaked (wet) sanitary pads per day on any day of her menstrual period. Our operational definition was adopted with stringent measures to reduce research subjectivity and improve the study's clarity and reproducibility. Exposure variables included socio-demographic characteristics (age, residence/address, and occupation), reproductive and clinical characteristics (hormonal contraceptive use, Clots on menstruation, haemoglobin level, Platelet level, and Uterine fibroid).

FIGURE 1: Flow Chart Showing Number of Screened and Selected Patients' Files



Statistical Analysis

Data were entered, cleaned, checked for completeness, and analysed using Statistical Package for Social Sciences (SPSS) software version 20. Descriptive statistics were used to summarise the data. Percentages and proportions were used to summarize categorical data while continuous data were summarized using the mean with their respective dispersion measure (standard deviation). The logistic regression model was used to determine the magnitude of the association. A univariate logistic regression model was fitted to obtain the crude estimates and a variable with a *P* value of <0.05 was considered statistically significant. The odds ratio with their 95% confidence interval was used to assess the strength of the association between heavy menstrual bleeding and exposure variables.

Ethical Approval

The study received ethical approval from the ethics Committee of Kilimanjaro Christian Medical University College (KCMUCo). Permission was obtained from both the head of the gynaecology and obstetrics department and the medical record department to collect data.

RESULTS

Socio-demographic Characteristics among the Study Population

Participant ages ranged from 15-59 years with a mean age of 37.6 years (SD+ 9.98), 52.5% of participants were peasants while 53.7% resided in urban areas(Table 1).

Reproductive Health and Clinical Characteristics of the Study Population

Among the 162 women, 73.5% (n=119) had ever had a child, 72.8% do not use hormonal contraceptives, 32.7% of women had a diagnosis of uterine fibroid, and 85.8% used sanitary pads as means of protection during their menstrual period. The mean and standard deviation result for the haemoglobin level of the women was 10.2g/dL and 2.9g/dL respectively. 53.7% of women were found to have a haemoglobin level of less than 11.9g/dL. Other characteristics of the participants are shown in Table 2.

Prevalence of Heavy Menstrual Bleeding

The prevalence of heavy menstrual bleeding was found to be 24.1% among women attending the obstetrics and gynaecological clinic of the KCMC hospital in North-Eastern Tanzania.

Association of Participants' Socio-demographic Characteristics with Heavy Menstrual Bleeding

Age was found to be associated with heavy menstrual bleeding as a result of self-reported use of more than 5 sanitary pads per day. Women with ages ranging from 20-44 were having 84% fewer odds of having heavy menstrual bleeding compared to women aged 15-19 years. Other socio-demographic factors were assessed but found to be not significantly associated with heavy menstrual bleeding (Table 3).

Association of Participants' Reproductive and Clinical Characteristics with Heavy Menstrual Bleeding

Significant factors that appear to be associated with heavy menstrual bleeding as a result of self-reported use of more than 5 fully soaked sanitary pads per day included the use of hormonal contraceptives, low haemoglobin level, presence of clots in menstrual blood and presence of uterine fibroid (Table 4).

TABLE 1: Socio-demographic Characteristics of Study Population (N=162)

variable	Number	%
Age		
Less than 19	8	4.9
20-44	106	65.4
Greater than 45	48	29.6
Occupation		
Peasant	85	52.5
Teacher	17	10.5
Student	18	11.1
Others	42	25.9
Residence		
Urban	87	53.7
Rural	75	46.3

TABLE 2: Reproductive Health and Clinical Characteristics of Study population (N=162)

variables	Number	%
Use of hormonal contraceptives		
Yes	44	27.2
No	118	72.8
Parity		
Never had a child	43	26.5
Ever had a child	119	73.5
Menstrual protection		
Sanitary pads	139	85.8
Cloth	22	13.6
Tampons	1	0.6
Hemoglobin level		
<8 g/dl	25	15.4
8g/dl- 10.9 g/dl	53	32.7
11g/dl-11.9 g/dl	9	5.6
>11.9 g/dl	75	46.3
Platelet level*		
Less than 150,000/Ul	3	12.5
More than 150,000/Ul	21	87.5

Platelet level * = out of 162 files, 138 patient files missed data about platelet level

TABLE 3: Association Between Socio-demographic Factors and Heavy Menstrual Bleeding (N=162)

variable	Number	n (%)	OR(95% CI)	P value
Age				
Less than 19 years	8	5(12.82)	1	
20-44 years	106	21(53.85)	0.16(0.02-1.01)	0.02
> Than 45 years	48	13(33.33)	0.26(0.34-1.92)	
Occupation				
Peasant	85	14(35.90)	0.38(0.16-0.92)	
Teacher	17	4(10.26)	0.57(0.15-2.14)	
Students	18	7(17.94)	0.69(0.15-3.08)	0.08
Others	42	14(35.90)	1	
Residence				
Urban	87	23(58.97)	1	
Rural	75	16(41.03)	0.76(0.37-1.57)	0.47

TABLE 4: Association Between Reproductive and Clinical Characteristics of Study Population and Heavy Menstrual Bleeding (N=162)

Variable	Total	n (%)	OR(95% CI)	p-value
Use of hormonal contraceptive				
Yes	44	5 (12.82)	1	
No	118	34(87.18)	3.157(1.147-8.691)	0.023
Parity				
Never had a child	43	15(38.46)	0.472(0.218-1.019)	
Ever had a child	119	24(61.54)	1	0.063
Menstrual protection				
Cloth	22	8(20.51)	1	
Sanitary pads	139	31(79.49)	(0.738(0.182-2.989)	0.305
Tampons	1	0(0)	0	
Clots on menstruation				
Yes	12	7(17.95)	0.194(0.58-0.651)	
No	150	32(82.05)	1	0.009
Hb level				
>11.9g/dl	75	11(28.21)	1	
11-11.9 g/dl	9	0(0)	2.28(0.224-23.210)	
8-10.9 g/dl	53	17(43.59)	1.806(0.461-7.082)	
<8g/dl	25	11(28.20)	5.401(1.375-21.207)	0.016
Platelet level*				
<150,000/ul	3	3(27.27)	1	
>150,000/ul	21	8(72.73)	1.375(0.958-1.975)	0.82
Uterine fibroid				
Yes	53	20(51.28)	1	
No	109	19(48.72)	0.348(0.166-0.733)	0.006

*n=24

DISCUSSION

The prevalence of heavy menstrual bleeding (HMB) was found to be high when a woman self-reported using more than 5 fully soaked sanitary pads per day. Women who do not use hormonal contraceptives, have no clots on menstrual blood, have severe anemia, or have uterine fibroids are more likely to self-report having heavy menstrual bleeding.

Depending on how it is assessed, HMB prevalence varies. Our prevalence values were remarkably within the self-reported prevalence rates for heavy menstrual bleeding in developing countries, which ranged from 8% to 27%.[8] However, the prevalence we discovered was considerably higher than that of the Gambia study (4%).[14]

Moreover, this study's findings demonstrate that the prevalence is relatively lower than that of studies conducted in Europe and America, where the prevalence of heavy menstrual bleeding was 27.2% and 38.9% respectively.[5,7] This result still supports the difference in prevalence that exists between developing and developed countries. This mismatch may be caused by the fact that menstruation subject is taboo in the African and Asian cultures.[15] Because few women are aware of what constitutes a regular or atypical menstrual cycle, many of the affected women would opt for traditional remedies before eventually having medical attention.[15] We can thus hypothesize that the prevalence of heavy menstrual bleeding could be higher in the general population of North Eastern, Tanzania.

In addition, a significant association between having a lower level of hemoglobin and heavy menstrual bleeding is similar to several studies done in East Africa, America, and Europe.[11,16] Women in the current decade are more likely to experience more menstrual cycles due to advancements in fertility control that result in fewer cases of postpartum amenorrhea.[17] Thus, there is a higher likelihood of getting anemia from an increasing number of menstrual periods in a woman's lifetime. Hence, women with HMB will more likely experience severe anemia. Anemia will thus affect women's physical well-being, which will lead to decreased engagement in social and economic activities.

Furthermore, the result of this study showed increased odds of having heavy menstrual bleeding in women who are not using hormonal contraceptives. Studies showing that hormonal contraceptives have an impact on lowering menstrual flow, menorrhagia, and the number of bleeding days can substantiate this.[18–20] Hormonal imbalance secondary to multiple factors can cause HMB, thus hormonal contraception is one of the recommended first-line treatments to manage HMB.[21,22] However, in this study, we couldn't differentiate the use of these medications as treatment for heavy menstrual bleeding or rather as a woman's choice of contraception.

Women presenting with clots in menstrual blood have fewer odds of having heavy menstrual bleeding compared to women who have no clots in menstrual blood. These findings were relatively similar to a European study which revealed that the presence of clots in menstrual blood does not contribute to the volume of blood loss. [23] In contrast to one of the American studies which indicate the positive association between the presence of clots in menstrual blood and heavy menstrual bleeding.[11] In India, the decrease in clots in menstrual was associated with a decrease in heavy menstrual bleeding in women.[24] The differences in results could be attributed due to the method used to assess HMB and study design. There are contrasting findings that need further research.

CONCLUSION AND RECOMMENDATIONS

The present study yielded essential pieces of clinical reference information. Despite the stringent assessments of HMB in this study, there is a high prevalence of heavy menstrual bleeding in our region, 24.1%. Haemoglobin level less than 8g/dL, uterine fibroid, no clots on menstrual blood and use of hormonal contraceptives were associated with heavy menstrual bleeding. Moreover, Hormonal contraception continues to be protective against heavy menstrual bleeding. Lastly, reducing heavy menstrual bleeding will reduce the risk of anaemia and hence reduce the rate of morbidity among women. Thus from this Study's findings, we do recommend that health education programs should be established that help raise awareness of the consequences of heavy menstrual bleeding such as iron deficiency and anaemia, encourage women to seek assistance and thus improve their quality of life. Also, further studies are needed to explore more heavy menstrual bleeding in society so as to increase knowledge to help women improve their quality of life.

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ORIGINAL ARTICLE

Assessment of Safe Motherhood Health Service Coverage, Birth Defects Detection and Child Disability Prevention Using Lot Quality Assurance Sampling in Central Uganda

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ABSTRACT

Introduction: It is crucial to have satisfactory coverage of safe motherhood services in order to prevent birth defects and child disabilities. Mildmay Uganda Institute of Health Sciences (MIHS) implemented a safe motherhood project aimed at preventing birth defects and child disabilities.

Methods: Three years after the project's implementation, a rapid cross-sectional health facility survey was conducted in 4 districts of central Uganda to assess the coverage of key safe motherhood and early childhood services. The Lot Quality Assurance Sampling approach was used to assess coverage of 16 indicators in the areas of ANC, skilled birth attendance, early childhood care, postnatal care, and knowledge about child disability prevention. A Decision Rule was set at 80% upper threshold to classify the performance of health facilities at the district level.

Results: The survey found that there was variation in performance across indicators and districts. All districts achieved the 80% coverage target in ANC first visit, mothers who received at least two doses of Fansidar for intermittent preventive treatment of malaria in pregnancy, and mothers with knowledge of the action to take in case they suspect childhood disability. Folic acid supplementation during pregnancy and screening for birth defects using the Appearance, Pulse, Grimace, Activity, and Respiration (APGAR) score had overall coverage above the target, but one district each had coverage below target in each of these 2 indicators. The coverage target was not reached in the rest of the survey indicators in each of the districts.

Conclusion: Well-performing districts, especially in indicators with inconsistent performance, offer valuable insights for learning and adapting interventions in districts that do not meet the desired coverage of those particular indicators. Considering the disparities in performance among different indicators and districts, project planners should adopt, modify and implement successful strategies in districts and indicators that perform well. By doing so, they can enhance the performance of under performing districts or indicators.

BACKGROUND

For over 3 decades now, the World Health Organization (WHO) has been emphasising the importance of providing effective safe-motherhood care to ensure positive pregnancy outcomes.[1] The components of safe motherhood including; timely attendance at antenatal care, skilled birth attendance, early detection and management of pregnancy complications and effective postnatal care for all mothers. All these are essential components of safe motherhood crucial in preventing birth defects and child disabilities.[2–4] Maternal and child health services, including reproductive health are typically incorporated into primary healthcare services in most countries, thus making the prevention of birth defects an integral part of these services at all levels of primary healthcare.[3] During antenatal care, mothers receive health education on what to do and what not to do to prevent birth defects. They also receive supplements such as Folic Acid, examinations and investigations for the presence of any infections and treatment.[5] Mothers attending Antenatal Care (ANC) are also educated about the avoidance of behaviours and practices that could result in birth defects such as; use of alcohol, smoking, illicit drugs, drugs not prescribed by a healthcare professional and exposure to harmful substances.[3,6] Supplements such as Folic Acid help prevent brain and spinal defects such as neural tube defects.[7,8] Iron supplementation in the first and second trimesters of pregnancy can also help mothers maintain adequate iron levels, prevent the development of psychomotor challenges, and prevent the impairment of cognitive development.[7] ANC care also includes screening for diseases such as syphilis

and rubella that could contribute to birth defects, and treatment is provided where necessary.[9]

Although safe motherhood programs have numerous benefits, the correlation between safe motherhood and birth defects and disability prevention has often been overlooked. To address this issue, the Mildmay Institute of Health Sciences (MIHS) implemented the Child Disability Management and Rehabilitation (CDR) project in 4 districts in Central Uganda (Mityana, Mubende, Luwero, and Kassanda). The goal was to increase the coverage of safe motherhood services in order to prevent birth defects and child disability. The project worked through existing district health systems to strengthen the capacity of health facilities, health care providers and community resource persons to provide quality child disability prevention, detection and rehabilitation services. The project also trained village health teams and community resource persons to detect birth defects in children and link them to appropriate services.

Additionally, the project provided advocacy for child disability services, created and supported community-based rehabilitation services, and economically empowered families with children with disabilities to access maternal and child health services without financial hardship. The project was implemented in 61 health facilities and their catchment areas across the 4 districts.

As part of the project's learning process, the primary objective of this study was to assess the coverage of safe motherhood indicators at the end of the 3-year project period. The specific objective was to determine the extent to which health facilities in their respective catchment areas provided safe motherhood services to mothers and to record health workers' and caregivers' explanations about the status of coverage for specific safe motherhood and child disability prevention indicators.

By studying the effectiveness of this safe motherhood and child disability implementation project and interventions, it helped in identifying successful strategies and areas that required modification. This information is vital in enhancing future project implementation and improving health outcomes for mothers and children. Additionally, comprehending the obstacles to effective implementation can guide policy and program decisions, facilitating the resolution of systemic issues and the enhancement of district health systems. Ultimately, the aim is to offer mothers and children high-quality healthcare services that prevent birth defects and manage disabilities, resulting in improved health outcomes and better quality of life for all.

MATERIALS AND METHODS

Study Setting

The study was conducted in 4 districts; Mityana, Mubende, Luwero, and Kassanda where the Mildmay Institute of Health Sciences had implemented interventions for safe motherhood to prevent birth defects and child disability. The interventions started in Mubende district in July of 2014/2015 financial year and were expanded to Mityana in the 2015/2016 financial year. Luwero was added in the 2016/2017 financial year, and Kassanda was included in 2017/2018 after it was carved out of Mubende district. The interventions ended in June 2021.

These interventions included among others, training midwives to improve their knowledge and skills in providing safe motherhood care, improving public health education about safe motherhood to mothers who present for ANC at the Primary Healthcare Centres (PHCs) as well as health education within the communities using community towers and radios. Health education also aimed at improving skilled birth attendance and increasing the number of mothers attending postnatal care with their children. The project also provided tools to the Healthcare Facilities aimed at increasing access to and provision of antenatal services during pregnancy and during childbirth. The use of the ultrasound scan was emphasised from 20 to 24 weeks of pregnancy in order to detect birth defects. In the event that birth defects were detected during pregnancy, the providers were supposed to refer such a mother for professional and specialised handling for the remaining period of pregnancy and during birth.

Study Design

The study utilised the Rapid Health Facility Assessment (r-HFA) Lot Quality Assurance Survey (LQAS) approach. This methodology has been widely applied in various studies to evaluate the outcomes related to maternal and child health.[10,11] This approach is utilised to evaluate the standard and extent of services provided in primary healthcare centres.[11] This study used an evaluation approach to measure the coverage of safe motherhood services and early childhood services, which are important for preventing birth defects and child disabilities. The approach involved selecting a sample of health facilities and determining the extent to which they provided safe motherhood services to mothers in their catchment areas, based on established coverage standards using the binomial LQAS method. Additionally, qualitative interviews were conducted with midwives to gain insights into the factors that influenced the delivery of the services being assessed.

Sampling Frame and Sample Size

The study involved a sampling frame of 61 health facilities; 24 in Mityana, 10 in Mubende, and 13 in each of Luwero and Kassanda. The health facilities were a mix of government and private not-for-profit organisations, including 12 Health Centre IIs, 38 Health Centre IIIs, 8 Health Centre IVs, 2 general hospitals, and 1 Regional Referral Hospital (RRH). Sample sizes of health facilities in each district were calculated using the Hypergeometric LQAS principles.[12] These were used because of the finite population of health facilities in each of the district. The study estimated the sample size (n) and decision rule (DR) for each district using the algorithm for hypergeometric LQAS by following the steps below;

i. For a district with N population of health facilities, we started with n=1, DR=0.

ii. Calculated the rounded upper threshold number, H = round(pU*N), and the rounded lower threshold number, L = round(pL*N)

iii. The alpha (α), was calculated as the Cumulative Distribution Function (CDF) of the hypergeometric distribution, whereby; alpha=CDF(DR, N, H, n) and beta

(β) of 1 – CDF(DR, N, L, n)

iv. If α<= α_threshold and β<= β_threshold, then the solution is (n, DR), otherwise we continued as in step (v)

v. Where DR=n then we increased n by 1 and set DR at 0. Otherwise increased DR by 1 and returned to step (ii)

In order to ensure an optimum sample size (n) for a given district where the estimated n ≤7, n was rounded upwards to 8 and DR estimated at n=8, all the other parameters described below kept constant.

The study divided the program area into 4 districts and each district formed a Supervision Area (SA). The SA was the smallest division used to assess the health facility's performance in delivering Safe Motherhood (SMH) services, and a Decision Rule (DR) was used to determine if the district was performing well or not. The DR is the cut-off point for the optimal performance of Healthcare Facilities (HFs) for each indicator for the calculated sample size (n) in each district. To identify poor performance, the hypergeometric LQAS sampling technique required an upper threshold (pU) and lower threshold (pL) set at 80% and 50%, respectively. The study allowed an acceptable α (α_threshold) and β (β_threshold) error rates of 0.1 each. The α error is the probability of misclassifying a district Supervision Area (SA) as having performed well when it has poor performance in reality.[13] In this study, the term "β error" refers to the probability of wrongly classifying a district's performance as poor on a specific indicator, when in reality it is actually performing well.[11] (Table 1)

The total sample size for the study was 41 Healthcare Facilities (HFs); 13 in Mityana, 8 in Mubende, 10 in Luwero and 10 in Kassanda districts. The HFs in each district were sampled using simple random sampling without replacement.

To evaluate the performance of each healthcare facility (HF) regarding a particular indicator, the researchers used the binomial LQAS model and selected 6 data points from each HF or its catchment area. This resulted in a sample size of 246 data points for the 41 HFs. If at least 5 out of the 6 sampled data points had the characteristic of interest, the HF was classified as having satisfactory performance for the indicator. This method of classification has been used in other studies previously.[10] The DR of 5 was obtained using a sample size of 6 with pU=95% and pL=50%, as well as α_threshold and β_threshold of 0.11 each. The actual α and β errors varied from one district to another due to differences in HF population across districts.

In-depth interviews were conducted with 12 midwives and 14 mothers of children aged 0 to 11 months as part of the qualitative data collection process to provide insights into the quantitative findings presented in the data collection section.

Sampling of Interview Locations (Villages) in the HF Catchment Areas of Sampled HFs

To determine the coverage of other SMH indicators crucial to preventing and detecting birth defects at birth, a community-based survey was conducted in each sampled HF's catchment area, in addition to the HF-based assessment of some indicators. A list of all the villages in the catchment area of the HF was obtained from the HF's in-charge and weighted for population size using a 3-category weighting scale (3 for high population, 2 for medium population, and 1 for low population). The weighting of the villages was agreed upon by consensus between the health workers and HF in-charge to ensure reliability. Six interview locations were then selected from each HF's list of weighted villages using simple random sampling with replacement, resulting in a sample size of 246 mothers of children aged 0 to 11 months for the community survey. The selected interview location/village was then segmented with the help of a village guide, and 1 segment was randomly sampled. This process was repeated until a segment containing less than 15 households was reached, based on previous studies, to make it easier to identify the starting point.[14,15]

The final segment was used to list all the households, using the names of the heads of households or other identifiers. From this list, one household was selected at random as the reference household, and the research assistants began the search for an eligible respondent from the next-nearest household starting from the front door of the reference household. Once data collection was completed in one village/interview location, the research assistants moved on to the next sampled village. Additionally, 6 children were randomly selected from the maternity register of each sampled HF to assess the screening of children using the Appearance, Pulse, Grimace, Activity, and Respiration (APGAR) score, resulting in 246 records of new-born children. The APGAR score was used as a proxy measure of screening for birth defects, as previous research has established its association with birth defects.[16]

Data Collection

Data was collected within each HF about the screening of new-born children for birth defects, using the APGAR score with a sample of 6 children from the period of July 2020 to May 2021. Additionally, data was collected about the availability of 5 core equipment necessary for delivering safe motherhood interventions, including delivery beds, delivery sets, Ambu-bags, protective wear for midwives, bulb syringes, and hand washing facilities. District Health Information Software (DHIS2) data was extracted using a checklist on indicators such as 1st and 4th ANC, family planning, skilled birth attendance, and postnatal care attendance for the financial years 2016/2017, 2017/2018, 2018/2019, and 2019/2020.

The community household data was collected using a structured questionnaire for mothers of children aged 0 to 11 months in each interview location. The questionnaire was completed using the Open Data Kit (KIT) on android mobile devices and uploaded to the survey server.

Explanatory in-depth interviews were conducted with 12 midwives and 14 mothers of children aged 0 to 11 months to provide an account of the observed quantitative findings. Five midwives were selected from 4 HFs that performed exceptionally well, while the other 7 were from 4 worst-performing HFs across the 4 districts. Interviews were conducted until saturation point was reached, meaning that no new information emerged from the participants.[17,18]

Rating coverage of the Child Disability and Birth defects Rehabilitation (CDR)-Safe motherhood services delivery

The assessment of performance was conducted at 3 different levels: the Health Facility (HF), district, and intervention region level as earlier described. At the district level, if a district did not meet the Decision Rule (DR) set for it, it was considered to not reach the 80% target, hence in need of urgent support in the affected indicator. For the overall project intervention, coverage was considered satisfactory if the performance for that indicator was at least 80%.

Quality Control

Research assistants were trained for 3 days prior to data collection. One day was spent pre-testing the tools at Kajjansi HC IV and its catchment area in Wakiso district. To ensure coherent understanding among mothers/ respondents who did not understand English, the tools were translated into the local language (Luganda) used in the study area. The same sampling and data collection approaches were used across all the HFs and their respective catchment areas.

Ethics

Ethical approval to conduct this study was sought from Mildmay Uganda Research Ethics Committee (MUREC) – approval number REC REF 0603-2020 and by the Uganda National Council of Science and technology (UNCST) – research registration number HS896ES. The research was carried out in accordance with the Helsinki Declaration's principles. Parents were provided with sufficient information about the risks and benefits of their children participating in this study, as well as consent and confidentiality concerns. Respondents were assured of confidentiality during data collection, including assurances that their names would not appear in any publication. Interviews were conducted in privacy where no one would hear the conversation between the data collector and the respondent. In terms of their records, neither the mothers' nor the children's names were written anywhere in the tools. The study report does not contain any information that can lead to identity of a respondent.

RESULTS

Table 2 displays the attributes of the survey participants. The majority (51.2%) of the participants were aged between 20 to 29 years. Out of the total number of respondents, Mityana district had the highest number of participants, accounting for 31.7% (78/246) of the total. The majority of the participants (54.5%) were married, while 38.2% of the respondents were from households with a size of 4 to 5 members. Most of the respondents (72%) lived within a 0 to 5 km radius from the health facility. About 52.8% of the participants had completed primary education, and 61% of them belonged to the catchment areas of HC III-level health facilities.

Population Level Coverage Estimates for Safe Motherhood Indicators

Table 3 displays the estimates of coverage at the population level. The results indicate that 95.9% (95% CI: ± 2.5) of the mothers reviewed attended at least one ANC visit during their last pregnancy, while only 64.2% (95% CI: ±6) made at least 4 visits. Additionally, only 47.2% (95% CI: ±6.2) of the mothers had initiated ANC attendance in the first trimester of pregnancy. About 56.9% (95% CI: ±6.2) of the mothers had an abdominal ultrasound scan during their last pregnancy. Folic Acid uptake and at least two doses of Fansidar for malaria prevention were high, with coverage rates of 91.7% (95% CI: ±3.4) and 94.3% (95% CI: ±2.9) respectively. However, only 79.3% (95% CI: ±5.1) of the mothers were counselled about breast-feeding during pregnancy. The lowest coverage rate was observed for testing for syphilis during pregnancy, with only 35.0% (95% CI: ±6) of the mothers of children aged 0 to 11 months being tested for syphilis during their last pregnancy.

The results further show that 87.4% (95% CI: ±4.1) of women received skilled attendance during birth, and 87% (95% CI ±4.2) of the reviewed children born in the health facilities had their APGAR score recorded in the maternal register to investigate for birth defects. Additionally, 63% (95% CI: ±6) of mothers attended postnatal care within 6 days after giving birth, and 63.8% (95% CI±6) initiated breastfeeding within the first hour after delivery. Finally, the population coverage for children aged 0 to 11 months who received Oral Polio Vaccine (OPV0) immediately after birth was 85.8% (95% CI: ±4.4).

To assess their understanding of the causes of child disability, the mothers were asked to name at least 3 causes of child disability or birth defects. Only 60.2% of the mothers demonstrated knowledge on the causes of child disability. To assess their understanding of how to prevent child disability, the mothers were asked to name at least 4 ways of preventing child disability and birth defects. 62.2% (95% CI ±6.1) of the mothers had knowledge on how to prevent child disability and birth defects. Furthermore, the mothers were asked if they knew the right place (a health facility) where to take their children for examination and investigation if they suspected their child had a disability. Of the 246 mothers interviewed, 95.5% (95% CI ±2.6) knew where to take their child for examination and investigation (i.e., to a HF). Population-level coverage estimates for core safe motherhood indicators are presented in Table 3.

LQAS Classification and Qualitative Explanation of coverage of the Safe Motherhood Indicators for the Districts Antenatal care (ANC) services utilisation

Table 4 presents the results of the LQAS assessment of the coverage of the core safe motherhood indicators for the study districts. The ANC indicators show that no district achieved the target coverage of 80% based on the corresponding DR; including ANC attendance in the first trimester, ultrasound scanning during pregnancy, and screening for syphilis during pregnancy. Only 37.5% (95% CI: ±14.8) of the health facilities showed optimal use of ultrasound scan services among pregnant women. It was found that most mothers do not see the need to take an ultrasound scan after being physically examined by the midwife during ANC and after being told that their child is fine. This is supported by the statement of one mother who said that; *"I did not go for the scan because I was told everything was okay"*.

The availability of ultrasound services is lower in HC II facilities, with only 36.7% of respondents reporting access. However, access improves at higher levels of the healthcare system. Mothers living in rural areas where

ultrasound services are not available face access challenges and are unlikely to travel even if they have been advised to take an ultrasound scan, as they perceive it as expensive due to involved transportation costs. Additionally, in most communities, the desire to determine the sex of the child is a more common reason for having an abdominal ultrasound scan than the checking for foetal abnormalities or disabilities, as reported by one respondent.

> *Most women are trying to find out the sex of the child. They will ask for the money for the scan for that. They come back and tell you that this is a boy but never tell you in case of any disability on the child's finger, foot or eyes. They only tell you the sex of the child* (Midwife, HC III, Mityana district).

The study found that in all study districts, none of the HFs had unacceptable coverage regarding 1stANC attendance; 97.5% (95% CI: ±4.8) of the HFs had at least 5 out of 6 sampled mothers attend ANC at least once. However, only 42.5% (95% CI: ±15.2) of the HFs had optimal performance in terms of ANC utilisation continuity of at least 4 visits. Furthermore, only 17.5% (95% CI: ±11.5) of the HFs had satisfactory performance with regards to mothers initiating their first ANC visit during the first trimester. Additional in-depth interviews with stakeholders revealed that the late commencement of ANC was a key factor contributing to the failure to achieve the minimum required 4 ANC visits.

> *We have trained the mothers of this place about goal-oriented antenatal and we have informed them to start antenatal as soon as one realises that she is pregnant. However, some mothers in this place think that if you go early, they will take drugs for all the times they visit* (Midwife, Mubende RRH).

It was also pointed out that some mothers will come late just to get the ANC card;

> *They only come to the antenatal clinic because they want to get an antenatal card. Because of this, they will come late in the pregnancy that even some deliver from antenatal* (Midwife, Kasambya HC III).

The study revealed that there is generally low motivation among mothers to use ANC services. Many mothers only attend ANC to receive the (ANC) card that is often asked for at HF during child birth. Additionally, some husbands are hesitant to provide their wives transport funds and other expenses for multiple ANC visits, which they perceive as a financial burden. Some women also believe that making as many as 4 ANC visits is unnecessary, especially if they have not been informed of any pregnancy-related problems.

Screening pregnant mothers for syphilis is vital in identifying those who may have the infection, which, if left untreated, could lead to stillbirth, miscarriage, or harm to the baby. However, the study found that only 12.5% (95% CI: ±10) of the HFs had optimal performance in this regard.

A high proportion, 87.8% (95% CI: ±7.4) of HFs demonstrated optimal performance regarding folic acid supplementation to pregnant women during ANC, and no district fell short of the DR.

Regarding HFs' provision of counselling on breastfeeding during pregnancy, Mubende was the only district that fell short of the DR.

The district-level analysis indicates that Mubende had the poorest performance, failing to reach the coverage target in 6 of the 8 ANC indicators. In contrast, each of the remaining districts failed to attain optimal performance in 4 of the 8 ANC indicators.

Delivery Services

Less than half of the districts had unsatisfactory coverage for the 2 delivery service indicators that were assessed. Only one district, Kassanda, fell below the 80% coverage target for deliveries at HFs with skilled assistance; 78% (95% CI: ±12.7) of HFs in Kassanda demonstrated optimal performance.

Postnatal Services

The study found that the administration of Oral Polio Vaccine (OPV) at birth (OPV0) had the highest level of optimal performance among Postnatal Care (PNC) indicators, with 78% (95% CI: ±12.7) of Healthcare Facilities (HFs) meeting the coverage target. In contrast, the initiation of breastfeeding within the first hour after delivery had the lowest coverage of HFs with optimal performance; only 36.4% (95%CI: ±12.7) of the HFs reached the coverage target. Regarding OPV0 provision, Mubende district fell below the 80% coverage target, while all the districts but Kassanda did not reach the coverage target for early initiation of breastfeeding. The overall coverage of HFs with optimal performance in reviewing mothers within 6 hours after delivery was 60% (95% CI: ±15), 7 of the 8 districts (except Luwero) did not attain the 80% coverage target. Furthermore, only 50.0% (95% CI: ±15.3) of HFs had optimal performance in postnatal care attendance at day 6; no district reached the 80% coverage target.

Knowledge about Child Disability Prevention and Management

The level of maternal knowledge on the causes of child disability was found to be unsatisfactory, with only 43.9% (95% CI: ±15.2) of HFs achieving optimal performance, and no district reached the 80% coverage target. Similarly, the proportion of HFs with optimal performance regarding mothers' knowledge on how to prevent child disability was low at 43.9% (95% CI: ±15.2); all the districts did not reach the 80% coverage target for this indicator except Mubende. However, most mothers reported that they would seek care at a health facility if they suspected their child had a disability, with 92.7% (95% CI: ±8.0) of HFs achieving optimal performance in this regard – no district fell short of the 80% coverage target in this indicator.

In general, Mubende district had the lowest performance, falling short of the 80% coverage target in 13 of the 18 indicators. According to data from the Ministry of Health's Health Management Information Systems, Mubende district had more complex health system challenges, as evidenced by it's poor safe motherhood and maternal and child health performance and was thus prioritised for initial implementation. The same difficulties may have hampered the interventions' effectiveness. Furthermore, the later implementation districts may have benefited from the experience obtained by the project team while dealing with Mubende and accordingly adjusted their implementation approach. Mityana and Kassanda followed, each with 9 indicators short of target. Luwero

district had the best overall performance, failing to reach 80% of its HFs with optimal performance in only 8t out of the 18 SMH indicators.

Providing safe motherhood services in lower-level HFs of HC II has been challenging, as these facilities lack the necessary equipment for deliveries. Referring mothers to other facilities for delivery can also be complicated, particularly if they have travelled from far away. As a result, many women end up delivering with the assistance of traditional birth attendants, who are often numerous in communities served by HC IIs. A midwife at a Health Centre II provided some insight on this issue;

> *The HF is still a lower-level facility. We lack most of the things because it's not a centre where you can offer most of those services for safe motherhood properly. There are a lot of things that we need and don't have. You find most mothers don't deliver from the HF. They have those Traditional Birth Attendants (TBA) they go to who are very many within the community. The woman will also not come to the facility citing lack of services and that's how they find themselves going to the TBA. They also loose that morale* (Midwife, HC II, Kassanda district)

As a result, some midwives, particularly those in HCII, report that the project has not progressed well as their role is limited to creating awareness about SMH and childhood disability. Furthermore, health workers have been successful in providing safe motherhood talks, particularly through public platforms. As they are aware that they may not receive some SMH services, some pregnant women and caregivers of children with disabilities may choose to bypass lower-level HCs and seek services at hospitals where they expect to receive better care.

> *You know, we love the hospital and despise the lower-level HFs. In case I get pregnant I go there because it is now nearby. Previously it was new and I used to despise it. It has been here but like I told you we love the hospital. You see we even travel to Mubende leaving Lusalila here (*Mother of 8 months aged child, Lusalira-Mubende).

This partly explains why the SMH and CDR indicators may not show optimal performance at lower-level HFs if they are located close to hospitals or health centre IVs.

TABLE 1: Sample Size of the Health Facilities (HFs) in the District

District	HC II	HC III	HC IV	Hospital	Eligible HFs (total)	n	Actual α error	Actual β error	DR
Mityana	5	15	3	1	**24**	13	0.0303	0.0498	9
Mubende	2	7	0	1	**10**	8	0	0.0303	6
Luwero	0	10	3	1	**14**	10	0	0.0350	7
Kassanda	5	6	2	0	**13**	10	0	0.0699	7
Total	12	38	8	3	**61**	**41**			

TABLE 2: Characteristics of the Respondents (Mothers of Children 0-11 Months) (N=516)

Variable		Frequency	Percentage
District	Kassanda	60	24.4
	Luwero	60	24.4
	Mityana	78	31.7
	Mubende	48	19.5
	Total	246	100.0

Continued

TABLE 2: Continued

Participants per HF level	Regional Referral Hospital	6	2.4
	General Hospital	12	4.9
	HC IV	48	19.5
	HC III	150	61.0
	HC II	30	12.2
	Total	246	100.0
Age category	Less than 20	31	12.6
	20-29	126	51.2
	30 and above	89	36.2
	Total	246	100.0
Marital status	Cohabiting	64	26.0
	Single	48	19.5
	Married	134	54.5
	Total	246	100
Household size	1-3 members	78	31.7
	4-6 members	94	38.2
	7-10 members	71	28.9
	Greater than 10	3	1.2
	Total	246	100.0
Distance from the HF	0-5 km	177	72.0
	6-10	31	12.6
	>10 km	38	15.4
	Total	246	100.0
Education level	Not educated	29	11.8
	Primary	130	52.8
	Secondary	78	31.7
	Post-secondary	9	3.7
	Total	246	100.0

TABLE 3: Population-Level Coverage Estimates by Core Safe Motherhood Indicators

Indicator	Mubende (n=48)	Kassanda (n=60)	Mityana (n=78)	Luwero (n=60)	Overall coverage (N=246)
ANC services: *# and % mothers of children aged 0-11 months who;*					
"had at least one ANC check during the last pregnancy	46 (95.8%; 95% CI ±5.7)	58 (96.7%; 95% CI ±4.5)	73 (93.6%; 95% CI ±5.4)	59 (98.3%; 95% CI ±3.3)	236 (95.9%; 95% CI ± 2.5)
" had their first ANC check during the first trimester in the last pregnancy	19 (39.6%; 95% CI ±13.8)	21(35%; 95% CI ±12.1)	42 (53.8%; 95% CI ±11)	34 (56.7%; 95% CI ±12.5)	116 (47.2%; 95% CI ± 6.2)
" had at least 4 ANC checks during the last pregnancy	34 (70.8%; 95% CI ±11.7)	43 (66.7%; 95% CI ±11.9)	48 (61.5%; 95% CI ±10.8)	33 (55%; 95% CI ±12.6)	158 (64.2%; 95% CI ±6)
" had an abdominal ultrasound scan during the last pregnancy	21 (43.8%; 95% CI ±14)	26 (43.3%; 95% CI ±12.5)	51 (65.4%; 95% CI ±10.6)	42 (70%; 95% CI ±11.6)	141 (56.9%; 95% CI ±6.2)
"were screened for syphilis during the last pregnancy	19 (31.7%; 95% CI ±11.8)	12 (25%; 95% CI ±12.3)	33 (42.3%; 95% CI ±11)	22 (36.7%; 95% CI ±12.2)	86 (35.0%; 95% CI ± 6)
"were given folic acid during the last pregnancy	43 (89.6%; 95% CI ±8.6)	53 (88.3%; 95% CI ±8.1)	72 (92.3%; 95% CI ±5.9)	58 (96.7%; 95% CI ±4.5)	226 (91.7%; 95% CI ±3.4)
" received at least 2 doses of Fansidar* during the last pregnancy	47(97.9%; 95% CI ±4.1)	53 (88.3%; 95% CI ±8.1)	74 (94.9%; 95% CI ±4.9)	58 (96.7%; 95% CI ±4.5)	232 (94.3%; 95% CI ±2.9)
" were provided counselling about breastfeeding during the last pregnancy	34 (70.8%; 95% CI ±12.9)	46 (76.7%; 95% CI ±10.7)	64 (82.1%; 95% CI ±8.5)	51 (85%; 95% CI ±9)	195 (79.3%; 95% CI ±5.1)
Delivery services: *# and % mothers of children aged 0-11 months who;*					
" gave birth at a HF with a skilled health care provider	43 (89.6%; 95% CI ±8.6)	47 (78.3 %; 95% CI ±10.4)	66 (84.6%; 95% CI ±8)	59 (98.3%; 95% CI ±3.3)	215 (87.4%; 95% CI ±4.1)
# and % children screened for birth defects at birth**	32 (66.6%; 95% CI ±13.3)	47 (78.3 %; 95% CI ±10.4)	76 (97.4%; 95% CI ±3.5)	59 (98.3%; 95% CI ±3.3)	214 (87%; 95% CI ±4.2)
PNC services: *# and % mothers of children aged 0-11 months who;*					
" received a postnatal check within six days of giving birth	28 (58.3%; 95% CI ±13.9)	41 (68.3%; 95% CI ±11.8)	49 (62.8%; 95% CI ±10.7)	37 (61.7%; 95% CI ±12.3)	155 (63%; 95% CI±6)
" initiated breastfeeding within the 1st hour of birth	30 (62.5%; 95% CI ±13.7)	48 (80%; 95% CI ±10.1)	46 (59%; 95% CI ±10.9)	33 (55%; 95% CI ±12.6)	157 (63.8%; 95% CI±6)
" whose newborns were administered OPV0 immediately at birth	39(83.3%; 95% CI ±10.6)	51(85%; 95% CI ±9)	71(91%; 95% CI ±6.4)	50(83.3%; 95% CI ±9.4)	211 (85.8%; 95% CI ±4.4)

TABLE 3: Continued

Knowledge of mothers on child disability prevention and management *# and % mothers of children aged 0-11 months who;*					
" correctly mentioned at least three causes of child disability	32(66.7%; 95% CI ±13.3)	38 (63.3%; 95% CI ±12.2)	44 (56.4%; 95% CI ±11)	34(56.7%; 95% CI ±12.5)	148 (60.2%; 95% CI ±6.1)
" correctly mentioned at least four ways of preventing child disability and/or birth defects	30(62.5%; 95% CI ±13.7)	41 (68.3 %; 95% CI ±10.6)	51(65.4%; 95% CI ±10.6)	31(51.7%; 95% CI ±12.6)	153 (62.2; 95% CI ±6.1)
"mentioned that they would take their child to a HF if they suspected that the child had a disability or birth defect	44 (91.7%; 95% CI ±7.8)	56 (93.3%; 95% CI ±6.3)	76 (97.3%; 95% CI ±3.6)	59 (98.3%; 95% CI ±6.3)	235 (95.5%; 95% CI ±2.6)

* *Indicator coverage computed using data from the maternity/delivery register

TABLE 4: LQAS Classification of Health Facilities by Core Safe Motherhood Indicators

Indicator	Mubende (n=8) DR=6	Kassanda (n=10) DR=7	Mityana (n=13) DR=9	Luwero (n=10) DR=6	Coverage	(95% CI)
ANC services HFs with at least 5 of the sampled 6 mothers of children aged 0-11 months in their catchment area;						
" who had their first ANC check during the first trimester in the last pregnancy	0	0	4	3	17.1%	±11.5
" who had at least one ANC check during the last pregnancy	8*	10*	12*	10*	97.5%	±4.8
" who had at least 4 ANC checks during the last pregnancy	5	4	4	5	42.5%	±15.2
" who had an abdominal ultrasound scan during the last pregnancy	1	2	7	5	37.5%	±14.8
" who were screened for syphilis during the last pregnancy	0	1	3	1	12.2%	±10
" who were ever given folic acid during the last pregnancy	5	8*	12*	10*	87.8%	±7.4
" who received at least 2 doses of Fansidar* during the last pregnancy	7*	8*	13*	10*	95.1%	±6.6
" who were provided counselling about breastfeeding during pregnancy	4	7*	10*	8*	72.5%	±13.7

TABLE 4: Continued

Delivery services HFs with at least 5 of the sampled 6 mothers of children aged 0-11 months in their catchment area;						
" who gave birth at a HF with a skilled health care provider	6*	6	10 *	10*	78%	±12.7
HFs with children screened for birth defects at birth**	4	9*	12*	10*	85.0%	±10.9
PNC services HFs with at least 5 of the sampled 6 mothers of children aged 0-11 months in their catchment area;						
" who received a postnatal check within six days of giving birth	5	5	7	7*	60.0%	±15
" who initiated breastfeeding within the 1st hour of birth	3	7*	4	2	36.4%	±14.7
whose newborns were administered OPV0 immediately at birth	5	8*	12*	7*	78.0%	±12.7
Knowledge of mothers on child disability prevention and management HFs with at least 5 of the sampled 6 mothers of children aged 0-11 months in their catchment area;						
"who correctly mentioned at least three causes of child disability	3	5	7	3	43.9%	±15.2
"who correctly mentioned at least four ways of preventing child disability	5	4	5	4	43.9%	±15.2
" mentioned that they would take their child to a HF if they suspect a disability in the child (knowledgeable of what to do if they suspect a child to have a disability)	6*	9*	13*	10*	92.7%	±8.0
Number of indicators in which the district has acceptable coverage based on DR	5	9	9	10		

*District's number of HFs with acceptable performance has reached the decision rule and therefore,the district attained the 80% perfromance threshold

**Indicator coverage computed using data from the maternity/delivery register

DISCUSSION

The aim of this study was to determine the coverage of Safe Motherhood (SMH) and early child services that are crucial for preventing birth defects. The results indicate that all districts had achieved satisfactory coverage (≥80%) in terms of healthcare facilities (HFs) with optimal performance in the first Antenatal Care (ANC) visit and administering intermittent preventive treatment of malaria with at least two doses of Fansidar. The HFs in the entire project area had satisfactory performance in providing Folic Acid during pregnancy, but Mubende district fell below the target. Other indicators with satisfactory coverage included screening for birth defects at birth (except for Mubende district), mothers with knowledge of where to take a child suspected of having a disability (all districts achieved the target), and availability of required SMH tools (all districts had acceptable performance). However, in 7 indicators (utilisation of ultrasound scan during pregnancy, first ANC attendance in the first trimester, syphilis screening, postnatal care visit at day 6, early initiation of breastfeeding, mothers knowledgeable about the causes of child disability, and mothers with knowledge of how to prevent childhood disability), no district achieved the 80% coverage target for their HFs' performance.

The findings suggest that while there is a high uptake of the first ANC visit, there is low continuity of care as evidenced by the poor coverage of HFs and districts with optimal performance in mothers who attend at least 4 ANC visits. Late initiation of ANC is a significant factor contributing to poor continuity of care, not only in the project area but also in Uganda as a whole.[19,20] The drop in continuity of ANC service utilisation can be attributed to various factors including; long distances to health facilities, low functionality of lower-level HFs, and poor perceived quality of care. Mothers often prefer tertiary care from hospitals located far away, which partly explains the low uptake of ANC services. However, the poor performance of Mubende district, which hosts the only regional referral hospital in the project area, challenges this assumption. It is possible that mothers who prefer hospital-based ANC services do not continue with ANC services due to the long distance. This discontinuity affects the demand for other services like ultrasound scans and counselling on breastfeeding, which are usually scheduled later in pregnancy during goal-oriented ANC.[21]

Although the first ANC attendance is high, screening for syphilis is a service that has poor overall coverage. This suggests that the HFs are not providing adequate testing services for syphilis during the first ANC visit.[22,23] In the future, efforts to improve the screening for syphilis and ultrasound scan services should prioritise empowering the HFs to provide these services before mobilising communities to demand them. The ANC provides an opportunity for prevention, detection, and preparation for the timely management of childhood disability once detected. The low continuity in ANC uptake in the project area implies that there is a missed opportunity for these essential services, including health education on birth defects and disability prevention, micronutrient supplementation such as folic acid to prevent neuro tube defects like spina bifida, iron supplementation to prevent anaemia, and prophylaxis against malaria. Failure to prevent malaria may lead to stillbirths, premature deliveries, or underweight babies.

Initiating ANC early during pregnancy is crucial for screening and managing conditions such as diabetes, which if left untreated, can lead to birth defects of the spine, brain, and limbs, such as sacral agenesis and holoprosencephaly. Delayed initiation of ANC also means missing out on opportunities for early screening of family history related to birth defects and education on preventing birth defects associated with drug intake during the first trimester.[24] This may also result in missed opportunities for early detection of birth defects, which could lead to delayed corrective measures. When mothers are not screened for syphilis, those who have the disease but remain undetected will miss out on the necessary treatment, which is essential for preventing the complications that the disease can cause.[9,25] The low coverage in this indicator suggests that screening for other diseases that can cause birth defects, such as sexually transmitted infections, rubella, and non-communicable diseases, may also be missed.

Apart from physical examinations and screening for danger signs during pregnancy, the World Health Organization recommends ultrasound scans to be conducted before the 24th week of pregnancy to detect any foetal anomalies and improve the overall pregnancy experience for women.[26] One of the project's interventions aimed to increase the use of abdominal ultrasound scans during pregnancy by educating pregnant women about their importance and recommending that they receive at least one scan. However, this study found that both the supply and demand for ultrasound services were low in all project districts. It was unclear whether the scans were being used to detect birth defects, as we did not collect information on the gestational age or purpose of the scan. Some women reported that they found the scans too expensive, while others mentioned that the additional transportation costs required to travel to HFs that provided the service is a burden. These findings are consistent with a recent study on the availability of diagnostic technologies in low and middle-income countries, including Uganda, which found limited access to ultrasound scans in basic and middle-level HFs that constitute the majority of facilities in Uganda's healthcare system.[23] Furthermore, it has been noted that many mothers only opt for an ultrasound scan to determine the gender of the baby. This highlights the need for increased education and awareness on the importance of ultrasound scans in detecting and preventing birth defects and congenital anomalies.

The coverage of deliveries at healthcare facilities with a skilled provider came close to meeting the 80% target in all districts except Kassanda. Additionally, all districts achieved the target of 80% coverage for newborns examined for birth defects and receiving the OPV0 vaccine at birth. The achievement of 80% coverage for skilled birth attendance is particularly noteworthy, considering the challenges posed by the COVID-19 pandemic. During the pandemic, the national facility delivery rate decreased to 62%, significantly lower than the expected 89%.[19] It is important to acknowledge that communities residing within the catchment areas of HC IIs still encounter the issue of inadequate skilled birth attendants, resulting in

many mothers giving birth with traditional birth attendants. This problem is caused by difficulties in accessing HFs such as HC III and above, which is where skilled birth attendance typically occurs, according to Uganda's healthcare system.

Despite the interventions in all the districts, the low coverage of postnatal care (at 6 days) is a concerning finding. This may have implications on the detection of birth defects and disabilities in babies that may have been missed during birth. Moreover, mothers may miss out on timely education regarding the possible causes of child disabilities in the postnatal/neonatal period, ways to prevent them, and actions to take if they suspect their child to have a disability. Additionally, some children may have been born in environments that put them at risk of infections, physical harm, and injury, which can only be ascertained during postnatal care.[27]

Although all the districts showed satisfactory performance in terms of mothers knowing what to do if they suspect their child has a disability, the lack of knowledge regarding the causes of birth defects and how to prevent them remains a barrier to the prevention of childhood disabilities.[28] This can hinder parents and caregivers from taking the necessary steps to prevent birth defects and manage disabilities at an early stage. For instance, if a mother is not aware that certain medications taken during pregnancy can cause birth defects, she may unintentionally put her unborn child at risk. Similarly, if parents are not familiar with the early signs of developmental delay, they may not seek timely medical attention, leading to more severe disabilities. Therefore, educating and raising awareness about the causes of birth defects and how to prevent them remains an important aspect to empower parents and caregivers to take proactive steps to prevent birth defects and manage disabilities early, resulting in better health outcomes for children.

CONCLUSIONS

This study demonstrates that there is a discrepancy in the performance of HFs in the critical SMH indicators across various districts. All districts achieved the target coverage in some indicators, such as ANC first visit, mothers receiving two doses of Fansidar for malaria prevention, mothers having knowledge of what to do in case of child disability, and availability of basic tools for SMH services. Folic acid supplementation during pregnancy and screening for birth defects using the APGAR score exceeded the target coverage overall, but at least one district fell below the coverage target in each indicator. All districts fell below the target coverage in indicators such as the first ANC visit in the first trimester, ANC-4, mothers having at least one ultrasound scan during the last pregnancy, screening for syphilis, PNC check at day 6, mothers having knowledge of the causes of child disability, and mothers knowing how to prevent child disability.

Despite being the first district to implement the initiatives, Mubende had the lowest overall performance of the districts, failing to meet the target in 13 of 18 indicators, most likely because the health system bottlenecks that made it to be prioritised for intervention earlier than the other districts have persisted. Luwero district performed best, falling short of the coverage target in the least (8) number of indicators, while Mityana and Kassanda each failed to reach the target in 9.

To address the differences in performance across districts and indicators, it is recommended that project planners adjust their strategies for indicators or districts that are performing poorly or falling behind in some of the well-performing indicators, taking into account the barriers identified in the study. Intervention strategies for Mubende district particularly need to be changed or adapted because it has had a longer duration of intervention but with lower coverage compared to districts that started interventions more recently. Additionally, the districts that have demonstrated high performance in indicators with mixed results offer an opportunity for learning. For future similar projects, it is recommended to include peer or collaborative learning sessions for cross-district learning, enabling poorly performing districts to learn from top performers and continuously adapt or adopt strategies.

Study limitation

Due to a lack of baseline data, the study was unable to attribute the findings to the project. Another qualitative publication, on the other hand, will explain and link the project processes, their implementation, and perceptions of their implementation and effectiveness. Future projects of a similar nature should consider using a control-before-and-after design to accurately measure the impact. This method would allow for the quantification of the project's impact by comparing the project group's outcomes to those of a control group before and after the project's implementation. Although, our community-survey component focused on the catchment areas of each sampled HF, good coverage may not necessarily reflect efforts of the HF in reference as we did not investigate where respondents received the services the study assessed. However, low coverage in a HF's catchment depicts the need for more action from the facility, and this is in line with objectives of this study.

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ORIGINAL ARTICLE

Factors Affecting Immediate Use of Contraception Among Women Hospitalised for Abortion in Two Public Hospitals in Kigali, Rwanda: A Cross Sectional Study

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ABSTRACT

Background: The 2019-20 Rwanda demographic health survey revealed an overall use of modern contraceptives of 58% but participants were not likely to use family planning in the postpartum period. Three quarters of participants intended to use contraception only after they had resumed menses and not breastfeeding. This study intended to measure post-abortion contraception uptake and to evaluate factors affecting immediate post abortion contraception uptake among patients consulting two public hospitals in Kigali, Rwanda.

Methods: This is an observational cross-sectional study of women admitted for abortion in 2 hospitals' obstetric units in Kigali; the University Teaching Hospital of Kigali (CHUK) and Muhima District Hospital (MH) from November 2019 to April 2020. Admission registry was accessed daily to determine abortion admissions. After informed consent, participants underwent a standardised interview prior to their discharge from respective hospital.

Results: There were 252 participants over 6 months; 88.5% were counselled for post-abortion contraception and 52% desired contraception prior to hospital discharge. Upon discharge, 70.2% of the study participants who wished immediate post abortion contraception received it before discharge and 29.8% had no contraception despite having expressed interest for immediate post abortion contraception. Being married and involving husband in choosing post-abortion contraception were significantly associated with use of post-abortion contraception.

Conclusion: Post-abortion contraception uptake in 2 large public hospitals in Kigali remains low. Being married and involving husband in choosing post-abortion contraception are positive factors associated with post-abortion contraception uptake while choosing a permanent contraception is associated with not receiving any contraception at the time of discharge from hospital. There is a need to consider prescribing an alternative interim methods of contraception to women desiring permanent sterilisation.

INTRODUCTION

Almost half of pregnancies conceived worldwide between 2015 and 2019 were unintended and 61% of those unintended pregnancies ended in abortion.[2] During the same time frame, 38% of unintended pregnancies conceived in Africa ended in abortion.[2] It is estimated that 58 million women of reproductive age in Africa have an unmet need for modern contraception and evidence has found 79% of all unintended pregnancy are due to unmet need for contraception.[3,4]

After an abortion, patients have a wide range of choice for contraception. Patients are allowed to use any method of family planning unless medically contraindicated. Methods that may not be safe to use immediately after giving birth may be used safely post abortion.[5] Oral contraceptive pills, injectables, combined patch, implants, condoms, and withdrawal can be started immediately. If the subject has any infection, it is recommended that IUDs and female sterilisation is delayed until the infection is resolved/ treated. If there is injury to the genital tract, female sterilisation, spermicides, IUDs, diaphragms, combined vaginal ring and cervical caps should be postponed until the injury is healed.[5]

The likelihood of initiating contraception decreases significantly when the method is not offered immediately and the risk of an unplanned pregnancy increases from 15.3% to 27.3% and subsequent abortion increases from 9.9% to 17.2%.[5,6] Due to time needed for an additional visit for IUD insertion, even in high resource settings, only less than a third of women who plan to insert an IUD later after abortion will actually have one inserted within 6 months post abortion.[7]

In low resource settings, a number of factors have been associated with positive post abortion contraceptive uptake including; obtaining services in a private

facility, seeking an induced abortion, being older than 25 years, having a first trimester abortion, choosing a medical abortion and prior use of contraception.[8] Rates of post abortion contraception vary geographically and in Somalia, 98% of post abortion care clients were counselled for post abortion contraception and 88% accepted a contraceptive method before leaving the facility.[9]

Providing immediate access to contraception after an abortion can be challenging. A number of issues influence contraceptive use, these include; limited choice of contraceptive methods since purchasing and stocking a wide range of contraceptive methods is prohibitively expensive, especially for IUDs and implants, lack of knowledge and denial of methods to certain groups by healthcare providers, patient's lack of education about available methods, fear of side effects, partner disapproval and religious beliefs.[10,11]

The 2019-20 Rwanda demographic health survey revealed an overall use of modern contraceptives of 58% but participants were not likely to use family planning in the postpartum period.[1] Three quarters of participants were intending to use contraception only when they had resumed menses and not breastfeeding. Furthermore, in a study on post-abortion complication in Rwanda, only 14.6% of participants planned on using contraception post-abortion.[12] Limited data is available on the factors affecting post-abortion contraception in Rwanda.

Kigali city, which is the Capital of Rwanda accounts for one third of all induced abortions despite having only 10% of the country's reproductive age women.[13–16]

The purpose of this study was to measure post-abortion contraception uptake and to evaluate factors affecting immediate post abortion contraception uptake among patients consulting Kigali University Teaching Hospital and Muhima District Hospital.

METHODS

Study Design

This is a hospital based cross-sectional study that was conducted from November 2019 to April 2020 at Kigali University Teaching Hospital (CHUK) and Muhima Hospital (MH), among patients admitted for abortion.

Study Setting

CHUK is the largest teaching and referral hospital in Rwanda. CHUK's department of Obstetrics and Gynaecology has approximately 3000 admissions and 2000 deliveries annually.[13,14] MH has 9,000 deliveries per year and has the busiest maternity in Kigali, Rwanda.[17]

CHUK and MH have contraception services that offer counselling and provision of contraception methods. Oral contraceptive pills, injection with; depoprovera, copper IUDs, Implanon, Jadelle, male and female condoms and bilateral tubal ligation are the modern contraception available in both hospitals. Muhima hospital have Obstetricians and Gynaecologists, residents in obstetrics and gynaecology, general practitioner, intern doctor and midwives working in maternity while CHUK have obstetricians and gynaecologist, residents in obstetrics and gynaecology, and midwives

Participants

On a daily basis, admission registries at CHUK and MH were used to determine study participants. All patients who consulted for induced or spontaneous abortion during the study period were recruited. Ectopic and molar pregnancies, pregnancies of more than 20 weeks of gestation and patients who underwent hysterectomy prior to discharge were excluded. Before participation in the study, all participants were given information about the study. All subjects gave informed written consent before participating. 11 patients who declined to participate were also excluded. They declined to participate as they had no time to be interviewed on discharge.

Data from participants was obtained through interview, conducted prior to participants' discharge from the hospital. Responses were directly recorded in the data collection form. All information obtained from the subjects was treated with confidentiality and used only for research purposes.

Data Analysis

The analysis and interpretation of data was performed using statistical software SPSS 21 and presented as frequency tables. The chi-square (X^2) test was used for statistical data interpretation. Statistical significance was defined as a p value of less than or equal to .05.

Patient and public Involvement

10 Patients from Muhima hospital and 6 from CHUK were involved while testing the data collection form used for data collection. They were given the form and provided comments on each question asked. Furthermore, the study proposal was presented at CHUK in the department of Obstetrics and Gynaecology for review and presented again to share the study findings. Furthermore, a copy of study findings was submitted to the management of each hospital that participated in this study.

Ethical Approval

The study was approved by University of Rwanda, School of Medicine, registration number: IRB No 417/CMHS IRB/2019 and authorised by the ethics committee of the participating hospitals.

RESULTS

The study recruited 252 patients, 200 from MH and 52 from CHUK respectively. The age of participants ranged from 15 to 52 years with a mean age of 29.97 years. One third of the participants were unmarried. Three quarters were from Kigali city. (Table 1)

88.5% of all study participants reported having been counselled for post-abortion contraception while they were in hospital and 52% desired post-abortion contraception before discharge from the hospital. 70.2% of the study participants that wished immediate post abortion contraception received it before discharge from the hospital. Implants were the most used contraception, accounting for 19.8% of the participants, followed by Depo-Provera (9.1%), IUD (4%), and oral contraceptive pills (3.6%). The rest of the participants (63.5%) did not have any form of contraception prescribed at the time of hospital discharge.

Being nulliparous or primiparous, married or cohabitating

with a male partner, involving the husband in choosing post-abortion contraception, and having a spontaneous abortion of a planned pregnancy were statistically/ significantly associated with use of post-abortion contraception (all *p* values <.05).

Choosing a permanent contraception was significantly associated with not receiving post-abortion contraception among the group of women who wanted to use contraception before discharge from the hospital ($p < .05$), (Table 2).

TABLE 1: Demographics of Study Participants

Demographic Characteristics	N (%)
Age	
<20years	23 (9.1%)
20-34years	147 (58.3%)
≥35 years	82(32.5%)
Religion	
Protestant	149(59.1%)
Catholic	68(27%)
Muslim	31(12.3%)
None	4(1.6%)
Marital status	
Married	169(67.1%)
Unmarried	83(32.9%)
Residence	
Kigali city	191(75.8%)
Rural Provinces	61(24.2%)
Parity	
≤1	168(67.1%)
>1	83(32.9%)
Has at least a living child	
Yes	133(52.8%)
No	119(47.2%)
Had previous abortion	
Yes	35(13.9%)
No	217(86.1%)

Continue

TABLE 2: Factors Associated with Post Abortion Contraception Uptake

	Did not Received Post abortion contraception before discharge	Received Post abortion contraception before discharge	P Value
Parity			.010
≤1	98(58%)	71(42%)	
>1	62(74.7%)	21(25.3%)	
Aborted a planned pregnancy			<.001
No	106(77.9%)	30(22.1%)	
Yes	54(46.6%)	62(53.4%)	
Married /Cohabitating with a male partner.			.021
No	61(73.5%)	22(26.5%)	
Yes	99(58.6%)	70(41.4%)	
Male partner involvement in choosing contraception			.005
No	92(71.9%)	36(28.1%)	
Yes	68(58.8%)	56(45.2%)	
Prior use of contraception in the past			.316
No	87(66.4%)	44(33.6%)	
Yes	73(60.3%	48(39.7%)	
Choosing a permanent contraception use			<.001
No	28(23.3%)	92(76.7%)	
Yes	11(100%	0(0%)	
Advanced maternal age			.053
No	101(59.4%)	69(40.6%)	
Yes	59(72%)	23(28%)	
Young maternal age			.784
No	146(73.4%)	83(26.6%)	
Yes	14(60.9%)	9(39.1%)	
Residence			.798
Urban	124(63.9%)	70(36.1%)	
Rural	36(62.1%	22(37.9%)	
Induced abortion			.001
No	106(57.6%)	78 (42.4%)	
Yes	54(79.4%)	14(20.6%)	

DISCUSSION

The study found that the overall post-abortion contraception uptake before discharge from the hospital was low at 36.5%. A report from the Rwanda Ministry of Health on expanding access to post-abortion care services in Rwanda reported a better overall post-abortion contraception uptake of 59% with variation across districts which ranged from 35% to 84%.[18] Furthermore, studies in other African developing countries have reported post-abortion contraception uptake ranging from 61.5% to 88%.[9,19–21]

The low post-abortion contraception uptake in the 2 largest hospitals in Kigali may be due to the fact that the selected hospitals were among the busiest in Rwanda and therefore priority wasn't given to multiple sessions of counselling about post-abortion contraception. Furthermore, 29.8% of patients who wanted immediate post abortion contraception were discharged without receiving any contraception. This is concerning given that one in every 3 induced abortion in Rwanda occurs in Kigali.[16]

This study found that being married or cohabitating with a husband, involving him in choosing post-abortion contraception, and ability of women to choose contraception when the husband declined the use of family planning were the significant positive determinants of post-abortion contraception uptake. These findings align with several others studies in conducted in Africa that have shown that a woman's perception of her husband's approval of using contraception was significantly associated with contraceptive use.[22–24] Without communicating with their partners, women who are unsure of their husband's opinions might decline contraception due to fear of the partner's opposition.[19]

Being married or cohabitating with a male partner, in addition to the husband's involvement in choosing post-abortion contraception were key factors associated with post-abortion contraception uptake. Contrary to the finding in a study done in Bahir Dar, Ethiopia where single mothers were more likely to use contraception. This study's findings are in line with several others studies in Ethiopia, Kenya and Zanzibar where married women were found to have a better post-abortion contraception uptake.[8,19–21,24]

The study demonstrated that women whose pregnancy was planned, were more likely to use post-abortion contraception. Surprisingly, there was no association with prior use of contraception, thus raising the concern whether the pregnancy was really planned. Contrary to the findings of the above cited studies in Ethiopia, Kenya and Zanzibar, plus a common believe that "prior contraception use" is a significant factor of contraception uptake, it was not significant in this study. The study rather found a negative association for women who were using contraception one month before conceiving the aborted pregnancy. We postulate that women who conceived on their preferred reversible contraception method might be reluctant to use it post-abortion and may choose a permanent contraception.

Choosing a permanent contraception was found to have a negative association with contraception uptake since all the women who opted for tubal ligation did not receive any contraception on discharge. Women who previously used any contraception and opted for a permanent contraception before discharge from the hospital who unfortunately were discharge with no contraception can partly explain the difference in findings of whether prior use of contraception is a positive factor for post-abortion contraception uptake. Not prescribing an alternative method of contraception until the tubal ligation is performed is a common finding with other studies. In Nepal 83% of women who desired tubal ligation left the hospital without contraception due to non-trained staff and lack of equipment.[25]

CONCLUSION

To get more insight in Rwanda, future studies should analyse reasons for not receiving requested contraception, particularly, tubal ligation post-abortion and why alternatives are not discussed even if temporary. Based on this study's findings, we recommend partner involvement in post-abortion contraception to increase uptake and a follow up study to identify barriers in provision of tubal ligation post-abortion for women who need permanent contraception.

Study Limitations

This study provides insight on factors affecting immediate post-abortion contraception uptake at discharge from CHUK and MH, however it has the following limitations. It was only performed for a 6-month period and may not reflect fluctuations that occur over time. Furthermore, it was performed at discharge from the hospital with no follow up of patients. Data of women who opted for contraception on subsequent visit or who discontinued contraception after hospital discharge were not captured. Also, the study is a cross-sectional study and was not able to confirm if patients who planned to get contraception later actually got one.

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ORIGINAL ARTICLE

High Seropositivity of Markers of Viral Infections among Women with Unfavorable Pregnancy Outcomes in Mwanza, Tanzania: The Urgent Need for Control Interventions

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ABSTRACT

Background: Viral infections such as Human cytomegalovirus (HCMV), Rubella virus (RV) and Herpes simplex virus-2(HSV-2) are implicated in causing adverse pregnancy outcomes with limited data from Africa. Here we report the magnitude of these viruses among women with unfavorable pregnancy outcomes (WUP) in Mwanza, Tanzania.

Methods: A cross sectional study involving 198 WUP was conducted between March and June 2019 in Mwanza. Enzyme linked immunosorbent assay was used to detect HCMV and RV IgM and IgG antibodies while immunochromatographic test was used to detect HSV-2 IgM and IgG antibodies. Data were analyzed by using STATA version13.0.

Results: The median age of enrolled women was 28(IQR, 24-34) years. Of these 194(98%) were HCMV IgG seropositive while only 2(2.1%) were IgM seropositive. Out of 180 women tested for RV, 175(96.7%) were IgG seropositive while only 1(1.2%) was RV IgM seropositive. Regarding HSV2; out of the 146 women tested, 21(14.4%) were seropositive for HSV2 IgG, and only 3(2.1%) were HSV-2 IgM seropositive. Having primary education ($p=.046$) and being married ($p=.035$) were significantly associated with HSV-2 IgG seropositivity.

Conclusion: A substantial proportion of WUP have markers of viral infections for potential pathogens that might be associated with unfavorable pregnancy outcomes necessitating further studies to establish causal effect relationship.

BACKGROUND

Previous unfavorable pregnancy outcome implies previous adverse fetal outcome in terms of two or more consecutive spontaneous abortions, history of fetal death, intrauterine growth retardation, still birth, early neonatal death and/ or congenital anomalies.[1] The human cytomegalovirus (HCMV), Rubella virus (RV) and herpes simplex type 2 virus (HSV-2) are the common pathogens causing congenital infections worldwide. HCMV infection during pregnancy is far more complex than other infections due to the ability of the virus to be frequently reactivated during the child bearing age and be transmitted to the fetus in spite of maternal immunity.[2]

HCMV rarely causes disease in healthy individuals. However; it can result into spontaneous abortion, intrauterine fetal death (IUFD), still birth, early neonatal death or congenital anomalies.[1,3] The seropositivity rate for HCMV has been found to range from 14.2% in Iran, to 91.05% in India in women with unfavorable pregnancy outcomes.[4, 5] In Africa among pregnant women, the HCMV prevalence of 96% and >73.95% has been reported in Egypt and Tanzania respectively.[6 7 8] On the other side, RV infection in early pregnancy has been associated with adverse pregnancy outcomes such as abortions, stillbirths and congenital Rubella syndrome (CRS). In high-income countries where strategic immunization programs such as Rubella immunization, has been implemented, the number of CRS cases have been widely reduced.[9] However, it remains a public health problem in most of resource constrained countries particularly in the sub-Saharan Africa.[10] Regarding Herpes simplex virus type 2(HSV2), vertical transmission with HSV2 often results into neonatal herpes. Neonatal herpes is a serious condition in newborns with an estimated incidence of 10 per 100,000 live births globally.[11-14]

Different viral pathophysiological mechanisms have

been documented to cause negative effects to the newborns, one being upregulation of cytokines and interferons in infected chorion epithelium and endothelia cells which could contribute to congenital defects. The other one is through inhibition of intracellular assembly of the chorionic epithelium cells which lead to inhibition of mitosis and restrict development of precursor cells for fetal development.[15]

Screening of these viruses is not included in the current antenatal package in most of low and middle-income countries. A previous study in Mwanza showed high HCMV IgG seropositivity which was linked with previous history of abortion. The study also observed that all women with history of stillbirth and having baby with congenital malformation were HCMV IgG seropositive.[8] On the other side adverse pregnancy outcomes associated with RV has been reported in this setting.[16] This implies that these viruses might significantly contributes to unfavorable pregnancy outcomes in this setting. In a view of that this study was conducted to establish the magnitude of these infections among women with previous unfavorable fetal outcomes. This information may create public awareness and influence policy makers to consider formulating a policy of screening for these viruses prior to or during pregnancy and treating those with severe complications to prevent adverse pregnancy outcomes.

METHODS

Study Design and Study Area

Between March 2019 and June 2019 an analytical cross-sectional hospital-based study was conducted from three selected health facilities in Mwanza. The study was carried out at clinics and postnatal/gynecology wards of the department of Obstetrics and Gynecology at Bugando Medical Centre (BMC-49), Sekou Toure Regional Referral Hospital (SRRH-60) and Sengerema DDH (SDDH-89). Conveniently we selected the BMC which is a tertiary zonal hospital serving an estimated population of 18 Million people[17] and SSRH to represent urban population. In addition, SDDH was selected to represent rural population.

BMC is a consultant/referral and teaching hospital for the Lake and Western zones of the United Republic of Tanzania. It is situated along the shores of Lake Victoria in Mwanza City; it has 947 bed capacity and has approximately 450 numbers of deliveries per month and more than 311 women with previous unfavorable fetal outcomes of unknown cause for the past one year (January 2017 to March 2018). SRRH is a regional referral hospital located in North western part of Tanzania along the shores of the Lake Victoria in Mwanza city. It has 375 bed capacity, with approximately 700 numbers of deliveries per month and more than 140 cases of previous unfavorable fetal outcomes reported in three months according to register book (Mfumo wa Taarifa za Uendeshaji Huduma za Afya-MTUHA). SDDH is located in a rural area with an estimated population size of 663,034, bed capacity of 320 beds, approximately 750 deliveries, and more than 130 cases of previous unfavorable fetal outcomes in three months (MTUHA register book).[17]

Study Population, Eligibility Criteria and Sampling Techniques

The study included women with previous unfavorable pregnancy outcomes which occurred not more than two years attending at BMC, SRRH and SDDH for either antenatal or maternity/postnatal services during the study period. The study included all non-pregnant women with previous unfavorable pregnancy outcomes that occurred within two years and women with established cause of unfavorable pregnancy outcomes such as DM, thyroid disease, syphilis, hypertension, severe anemia, SCD and antiphospholipid syndrome were excluded.

Sample size (n) was calculated using Kish Lisle formula (1965) for cross sectional studies using the prevalence of 14.2% from previous study[4] whereby a total of 187 was obtained. However, a total of 198 women were enrolled. Convenient sampling of patients who met the inclusion criteria was performed until the sample size was reached. Socio-demographic data and blood samples were collected from 198 consenting participants.

Sample Collection and Laboratory Procedures

About 4 - 5 ml of blood was drawn aseptically from median cubital vein from each consented participant and kept in plain sterile vacutainer tubes (Becton Dickinson LTD, Nairobi, Kenya). The tubes were kept at upright position at temperature 21-25 C^{o} and then transported to CUHAS microbiology laboratory. Sera were extracted, stored in cryovials and kept at -80^{0}C until processing. Before analysis sera were removed from a deep freezer and left at room temperature for 20 to30 minutes. HCMV and RV antibodies were analysed by indirect enzyme linked immunosorbent assay (ELISA) as per manufacturer's instructions (Qingdao Hightop Biotech Co.Ltd, China) with sensitivity and specificity of > 99%. HSV2 antibodies were detected by using rapid immunochromatographic test as per manufacturer's instructions (Exact Diagnostic Devices -USA). This test has a sensitivity of 95% and specificity of 94.7%. All tests were performed following the guidelines written by the manufacturer; the quality control (QC) directives were followed accordingly.

Study Variables and Data Analysis

Dependent (outcome) variables was seropositivity of HCMV, RV and HSV2 while independent variables included socio-demographic characteristics (age, marital status, educational level, occupation), maternal characteristics (gravidity, parity, gestation age) miscarriage, stillbirth, prematurity, organ transplant and other health system related characteristics (antenatal care attendance, booking place) number of family member (family size), type of house, type of toilet, source of drinking water, history of illness in the previous pregnancy.

Data was double entered, verified and cleaned using Excel 2007. Statistical data analysis was done using STATA version 13.0 (StataCorp LP, College Station, TX, USA. Categorical variables such as residence, socioeconomic status, blood transfusion and past obstetrics history such as history of miscarriage, history of stillbirth, and preterm delivery were described as proportions whereas continuous variables like age, household members were summarized as medians (interquartile range). The variables with a p-value of less than 0.05 were considered statistically significant. Socioeconomic status (SES) was determined by house type, toilet type and source of water

whereby high socioeconomic status was defined by having modern house, modern toilet and using tap water.

Ethical Considerations

Ethical clearance was sought from the joint Catholic University of Health and Allied Sciences /Bugando Medical Centre (CUHAS/BMC) Ethics and Review committee (CREC) with ethical clearance number CREC/346/2019. Permission was requested from relevant governmental and hospital's authorities. A written informed consent was requested from the participants after explaining the aims of the study. In this study we enrolled women above 16 years, as per Tanzania ethical guidelines, an individual above this age is allowed to sign a written informed consent.

RESULTS

Socio-Demographic Characteristics of Enrolled Women

A total of 198 women with unfavorable previous pregnancy outcome were recruited in this study. The median age of study participants was 28(IQR 24 -34) years. Among these women, 89(44.95%) and 109 (55.05%) were from rural and urban areas, respectively. The median number of household members `was 5(IQR: 4-7). The majority of them 167 (84.34%) were married while two thirds 134 (67.68%) had primary education level. More than a half 118(59.6%) were found to have low socioeconomic status (SES) (Table 1).

Clinical Characteristics and Previous History of Unfavourable Pregnancy Outcomes in Mwanza

Among 198 women with previous unfavorable pregnancy outcomes, 193(97.5 %) had history of abortion and out of these 186 (94%) experienced 1-3 abortions. A considerable proportion 42(21.2%) of these women had history of blood transfusion. About one third 64(32.3%) had history of preterm birth while more than half 114(58.0%) had history of stillbirth. It was also noted that 2(1.0%) women had history of delivering children with congenital anomalies (Table 2).

Seropositivity of HCMV, RV and HSV2, and Associated Factors Among Women with Previous Unfavourable Pregnancy Outcomes in Mwanza, Tanzania

Among 198 women with previous unfavourable pregnancy outcomes tested, 194 (98%, 95% CI: 96.0-99.9) were found to be HCMV IgG seropositive while only 2(2.1%. 95% CI: 0.8-5.1) were IgM seropositive.
Out of 180 women who tested for RV antibodies only 1(1.2%, 95% Cl 1.1-3.5) tested positive for RV IgM antibodies while 175(96.7%, 95% cl 94.1-99.3) tested positive for RV IgG antibodies.

Regarding HSV2, out of 146 women tested for HSV2 antibodies, 21(14.4%, 95% CI: 8.6-20.0) tested positive for HSV-2 IgG antibodies and 3(2.05%, 95% CI: 0.2-4.3) tested positive for HSV-2 IgM antibodies.

Primary level of education (X^2 =6.15, p=0.046) and being married (fishers exact=0.079, p=0.035) were significantly associated with HSV-2 IgG seropositivity while factors associated with HCMV and RV seropositivity could not be investigated because almost all had the outcome of interest. The two women who were HCMV IgM seropositive; had history of abortion, history of stillbirth, all of them did not present with rash and all of them were multipara.

TABLE 1: Distribution of Socio-Demographic Characteristics Of 198 Women With Unfavourable Previous Pregnancy Outcomes Enrolled In Mwanza Region, Tanzania

Characteristics	Number (n)	Percentage (%)/Median
**Age (years)	198	28[IQR24-34]
Education		
Primary	134	67.6
Secondary	36	18.2
College	14	7.10
No education	14	7.1
Occupation		
Peasant	43	21.7
Employed	15	7.6
Business	80	40.4
House wife	60	30.3
Residence		
Rural	89	44.9
Urban	109	55.1
*SES		
High	80	40.4
Low	118	59.6
Marital status		
Married	167	84.4
Single	31	15.6
**Family members	5	4-7

*SES= socioeconomic status, ** continuous variables summarised as median

TABLE 2: Clinical Characteristics and Previous History Among Women with Previous Unfavorable Pregnancy Outcomes in Mwanza

Characteristics (variables)	Frequency (n)	Percent (%)
Abortions		
No	5	2.5
Yes	193	97.5
Number of abortions		
0	5	2.50
1-3	186	93.9
> 3	7	3.6
Preterm birth(baby)		
No	134	67.7
Yes	64	32.3
No of preterm birth		
0	134	67.7
1	57	28.7
>2	7	3.5
Stillbirth		
No	84	42.4
Yes	114	57.6
No of stillbirth (IUFD)		
0	84	42.4
1	86	43.4
2	26	13.1
3	2	1.1
Rash		
No	194	98.0
Yes	4	2.0
H/ baby with disability		
No	196	98.9
Yes	2	1.0
H/Blood transfusion		
No	156	78.8
Yes	42	21.2
HIV status		
Negative	188	94.9
Unknown	10	5.0

DISCUSSION

Viruses such as Human cytomegalovirus (HCMV), Rubella virus (RV) and Herpes simplex type 2 (HSV2) are common cause of unfavourable pregnancy outcomes mostly in low- and middle-income countries (LMICs). This study investigated presence of antibodies to these viruses among women with previous unfavorable pregnancy outcomes in the Lake Victoria zone. In the current study, the HCMV IgG seropositivity was 98% which is significantly higher than 73.9% that was reported among normal pregnant women in the same settings about three years ago.[11] This could be explained by the fact that, the current study enrolled women with previous unfavorable pregnancy outcomes which signifies the possible role of HCMV in causing adverse pregnancy outcomes in this setting. This has been observed in previous studies whereby abortion, stillbirth and preterm deliveries were significantly associated with HCMV IgG seropositivity.[18, 19] Further studies to investigate the role of HCMV in relation to previous unfavorable pregnancy outcomes are warranted in this setting.

The observed HCMV seropositivity among women with unfavourable pregnancy outcomes in the current study is comparable to the previous reports in India and Iraq that reported seropositivity of 91.05%, and 96%, respectively.[5,20] This can be explained by the fact that in the current study the median number of the family size among enrolled women was high which can favor HCMV transmission as previously reported.[21] In addition, most of women in the current study were found to have low socioeconomic status (SES) which has been associated with high HCMV transmission rates elsewhere.[4, 21] As previously reported, low SES is often accompanied with poor hygienic and overcrowding conditions which has been found to favor HCMV transmission.[22-24]

In the current study, seropositivity of specific HCMV IgM antibodies was low which is comparable to a previous study in the same setting among normal pregnant women.[11] However, this observation is different from

previous studies in Jordan, and west Iraq which documented IgM seropositivity of 2.3% and 60.2% ,respectively.[20,25] Increased family size has been associated with high HCMV transmission which has been confirmed in the current study whereby median number of household members was high including those who were IgM seropositive. This has confirmed the previous observation whereby children were implicated as sources of HCMV transmission to their parents.[26] In the current study, due to high seropositivity with almost all population studied being IgG seropositive, associated factors were not studied. This is different from previous studies which observed association between HCMV seropositivity with low SES.[4, 21] In other similar study in Tikrit, Iraq high seropositivity of HCMV IgM was associated with large family size.[21]

On the other hand, RV seropositivity of IgG was found to be very high which is different from previous studies conducted among pregnant women in Ibadan Nigeria[27] and Bangladesh[28] that reported the seropositivity of 68.5% and 84.3%, respectively. This might be due to geographical variation of the seropositivity of RV. In comparison to a previous study in similar setting among normal pregnant women more than 5 years ago, there is no significant differences in IgG seropositivity.[29] Despite high level of natural immunity among women of reproductive age in the study area[9], RV might be associated with adverse pregnancy outcomes as reported previously in the same setting.[16] The seropositivity of RV IgM antibodies among women with previous unfavorable pregnancy outcomes in this study was 1.2% which is comparable to a previous study among normal pregnant women in the same setting.[29] However, this is inconsistent with previous studies in Karachi, Pakistan that reported seropositivity of 18%.[30] The factors associated with seropositivity were not investigated due to very high Rubella IgG seropositivity and very low Rubella IgM seropositivity observed in this study. This observation is comparable to the previous studies conducted in Mwanza[29] and Ibadan Nigeria among a pregnant women.[27]

Regarding HSV-2, IgG seropositivity was found to be slightly low compared to a previous study in Mwanza which reported seropositivity of 34.5% among pregnant adolescent girls.[31] The possible explanations could be differences in age whereby younger age has been associated with more risk behaviors compared to the population in the current study. In addition, seasonality may also account for differences whereby the current study was conducted from May to August which might be different from previous studies. Seasonal variation has been suggested to be an important factor in HSV-2 transmission elsewhere.[32] The observed IgM seropositivity in the current study is comparable to a previous report in Nigeria whereby 2.8% of the study participants were HSV-2 IgM seropositive.[33]

Low education level and being married was significantly associated with HSV2 IgG seropositivity. Low education level is often accompanied with poor understanding on the risk factors which can put individuals at risk of acquiring STIs including HSV2. This has been confirmed in the current study whereby more than two thirds of the enrolled women had primary education level. Being married was significantly associated with HSV2 IgG seropositivity in the current study. This is similar to the previous study in Shandong Province China.[34] As documented in previous report, being married might be accompanied by risk behaviors by partners such as infidelity that might expose individual women to contracting STIs including HSV2.[35] Factors associated with HSV-2 IgM seropositivity among women with previous unfavorable pregnancy was not computed due to very low HSV-2 IgM seropositivity observed in this study.[36]

In this study we could not establish whether infection of these viruses occurred before, during or after pregnancy therefore this can be considered as one of the limitations. In addition, being the cross-sectional study cannot assess a causality relationship between the exposure and the outcome.

CONCLUSION AND RECOMMENDATIONS

Compared to RV and HSV-2, IgG seropositivity of HCMV among women with previous unfavorable pregnancy outcomes residing in urban and rural areas of Mwanza region was significantly higher than a previous report among normal pregnant women in the same setting.

Limitation

The recall bias from the participants and the recruitment included the participants 2 years after having bad pregnancy outcomes and this could have affected our study.

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ORIGINAL ARTICLE

Factors Associated with Modern Contraceptive Use Among Out of School Adolescent Girls in Majengo and Njoro Wards of Moshi Municipality, Tanzania

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ABSTRACT

Background: Low uptake of modern contraceptives among adolescents remains a serious public health concern with over 20 million adolescents in need of modern contraceptives are not using any. In Tanzania where the adolescent fertility rate is 112 per 1000, only 15.2% of adolescents are using modern contraceptives. Contraceptive use stands out to be one of the key interventions to reduce the burden of adolescent pregnancy which is high in the country at 22%. There is little information on factors associated with modern contraceptive use among out of school adolescents, who are at an increased risk of adolescent pregnancies.

Objective: To determine the prevalence and factors associated with modern contraceptive use among out of school adolescent girls in Moshi municipality, Kilimanjaro region.

Methodology: This was a population based cross-sectional study, conducted in Moshi municipality in Kilimanjaro region 2 wards; Majengo and Njoro. The wards were randomly selected out of the 21 wards in the region. Household survey was conducted in the wards and adolescents aged 10 to 19 years who were out of school and consented and or assented to participate in the study were recruited. Data was collected using Kobo Collect ™ on an Android device. Data was analysed using SPSS version 20. To determine the factors associated with modern contraceptive use, crude and adjusted analysis using logistic regression analysis was done.

Results: A total of 298 out-of-school adolescents were enrolled, with a median age of 19 (IQR 17- 19) years. The prevalence of ever use of modern contraceptives among 154 sexually active adolescents was 51%, and 35% were current users of the methods. Two of common methods ever used were; injectables (27.3%) and male condoms (3.2%) respectively. Factors independently associated with ever use of modern contraceptives were; being married or cohabiting (aOR: 5.7) and having 2 or more sexual partners in the past 12 months (aOR: 5.9).

Conclusion: Ever and current use of modern contraceptives among out-of-school adolescents were reported at 51% and 35% respectively. Respondent's marital status and number of sexual partners was associated with ever use of modern methods. Strengthening of adolescent-friendly SRH services outside facility setting is needed given very few are currently using a modern method. Further, through inter-sectoral collaboration interventions to keep adolescent girls at school should be strengthened.

INTRODUCTION

The World Health Organization (WHO) defines adolescents as young people between 10 and 19 years of age.[1] Uptake of modern contraceptives among adolescents is low globally.[2] Globally, over 20 million adolescents in need of modern contraceptives are not using any.[2] In Tanzania, 96% of adolescents are aware of modern contraceptives but only 15.2% use any of these methods.[3] As a result, an estimated 11% of births globally occur among girls aged 15 to 19 years, 95% of which occur in Low- and Middle-Income Countries (LMICs).[4]

Numerous studies report that the overall pooled prevalence of pregnancy among adolescents is 19.3% in sub-Saharan Africa (SSA), and that 120 out of every 1000 girls within SSA experience unplanned pregnancies. This prevalence is reported highest in the East African region at 21.5%.[5]

Tanzania has the 17th highest adolescent fertility rate in Africa with a fertility rate of 81 births per 1,000 women aged 15 to 49 and 112 per 1000 adolescents aged 15 to 19 years.[6] Adolescent (aged 15-19) pregnancy rates have increased in Tanzania since the last 2010 Demographic and Health Survey (DHS)

from 23% to 27% in 2015/16 and then slightly decreased to 22% in 2022.[7] Tanzania also has a high teenage pregnancy rate with at least 6% of teenage girls aged 15 to 19 years currently being pregnant.[8] Moreover, the current Modern Contraceptive Prevalence Rate (m-CPR) among adolescents is 15.2%. This shows a significant decline from 18.9% in 2015 and 2016 which is significantly lower compared to the national average of 32%.[9] So unmet needs for Family Planning is high among adolescents aged 15 to 19 years in Tanzania and there is poor progress in rates of unmet need for modern contraception use (30% in 2004/05, 25.3% in 2010 and 26.5% in 2015/16 respectively.[8])

Stemming from these concerns, adolescent pregnancy results in poor health and socio-economic consequences not only to the adolescent mother but also on their babies.[10] Poor health outcomes such as increased risk of eclampsia, puerperal endometritis and systemic infections due to abortion may all result in increased maternal morbidities and mortality.[11] Also, babies born to adolescent mothers have a higher risk of low-birth-weight preterm delivery and severe neonatal conditions.[12] Moreover, adolescent pregnancies cause poor socio-economic outcomes to adolescent girls due to stigma, rejection or violence by the partner, parents or peers which further results into increase in the number of school dropouts. From UNFPA (United Nations Population Fund), Tanzania Family planning fact sheet, it is reported that, between 2003 and 2011, 55,000 girls dropped out of school in Tanzania because they were pregnant, this will definitely impact their future education and employment opportunities.[7] About 1.5 million out of 9.9 million adolescents in Tanzania are out of school and 40% of these never attended secondary education.[13]

Modern methods of contraception include; sterilisation, Intrauterine Devices (IUDs), subdermal implants, oral contraceptive pills, condoms and other barrier methods, injectable, emergency contraceptive pills, contraceptive patches, spermicidal foams and other agents and vaginal ring.[14] Modern contraceptives have the potential to prevent adolescents from conceiving and thus prevent negative health consequences to the adolescent mothers and their babies, as well as socio-economic consequences such as dropping out of school, stigma and violence.[15]

According to TDHS 2015/2016, 86.7% of married adolescent girls and 66.9% of unmarried sexually active adolescent girls do not use modern contraceptive methods, and in a 2022 report, 84.8% of unmarried sexually active adolescent girls do not use modern contraceptive methods. In Kilimanjaro region, prevalence of modern contraceptive use among women of reproductive age is 48.9%, however, there is a dearth of information on the use of contraceptive among adolescent girls.[16]

Several interventions have been put in place by the Government of Tanzania and stakeholders in order to increase modern contraceptives uptake among adolescent girls. A 5-year Implementation Plan for Family Planning 2018-2022 was strategised for Tanzania mainland by the Ministry of Health, Community Development, Gender, Elderly and Children (MoHCDGEC) of United Nation of Tanzania; Plan sets targets for increased use of all family planning methods. Aims to increase the uptake of family planning methods and identifies priority areas as well as the financial resources required.[7]

Additionally, The Government of Tanzania also updated its commitment at the Family Planning Summit in London, UK on July 11, 2017. Tanzania will increase the availability of modern contraceptive methods at all levels of its health system; specifically, increase its allocation for Family Planning (FP) commodities from 14 billion Tanzania shillings (Tsh) in 2017 to 17 billion Tsh by 2020, Expand the availability of at least 3 modern contraceptive methods at primary level and at least 5 modern contraceptive methods at secondary and tertiary level facilities from 40% to 70% and Scale-up the number of health facilities providing youth-friendly reproductive health services from 30% to 80%.[17]

Interventions for Adolescent Sexual and Reproductive Health (ASRH) using mobile phones have shown positive progress. Findings suggest that mHealth interventions are becoming a more common method to connect youth to Sexual and Reproductive Health (SRH) information and services in LMICs, and evidence is emerging that mobile phones are an effective way to reach young people and to achieve knowledge and behaviour change.[18]

In Kilimanjaro however, there is a dearth of published information on modern contraceptive use specific for out of school adolescents.

Despite the interventions, the burden of adolescent pregnancies still remains regardless of interventions on modern contraceptive use in Tanzania. In Kilimanjaro, 6% of girls became pregnant before the age of 19 years in 2015 and this increased to 7.6% in 2022.[8] There is still a long way to achieving the target 3.7 of the Sustainable Development Goals (SDGs) which calls on countries; to ensure universal access to sexual and reproductive health-care services, including for Family Planning, information and education, and the integration of reproductive health into National Strategies and Programs by 2030.[19] Therefore, this study aimed at determining the prevalence and factors associated with modern contraceptive use among out of school adolescent girls in Majengo and Njoro wards in Moshi Municipality, Kilimanjaro region. Being conducted at ward level, a sub national level where policies are implemented in the country, this study is the first to be conducted among out of school adolescents and therefore will give a blueprint that will guide policies targeted at increasing the uptake of modern contraceptives among adolescents.

METHODS

Study Design and Setting

This was a household based cross sectional study conducted in August 2020 at Moshi Municipality in Kilimanjaro region. The region is situated in Northern Tanzania and is subdivided into seven districts namely, Moshi municipality, Moshi rural, Rombo, Mwanga, Same, Hai and Siha. The main economic activities are food and cash crop production, commercial activities, tourism and forestry.

The Moshi municipality covers an area of about 59 square kilometres and is the smallest municipality in Tanzania by area. According to the 2018 estimates, Moshi municipality has a population of 225,225 people of which 52.2% are

females. The municipality is administratively divided into 21 wards, due to COVID 19 movement restrictions, only 2 wards could be enrolled for the study; Majengo and Njoro and these were randomly selected.

Study Participants, Sampling and Sample Size

The study involved out of school adolescent girls aged 15 to 19 years from selected wards in Moshi municipality and who were willing to participate. Adolescents who did not consent and/or assent or those who had serious medical conditions that prompted them not to participate in the study were excluded. Moshi municipality was purposely selected out of 7 districts due to COVID 19 movement restrictions. Two wards were randomly selected out of 21 wards in Moshi municipality. Small sheets of paper containing one of the names of the 21 wards in Moshi municipality were put in a jar, vigorously shaken and 2 sheets were randomly drawn from the jar. Majengo and Njoro wards were selected. In each of the selected ward, streets were randomly selected. All the households with adolescents meeting the inclusion criteria were visited and adolescents available were invited to participate. All participants who were available on the day of the visit or agreed to be located where they work and willing to take part in the study were enrolled. Fisher's formula was used to estimate the minimum required sample size with a prevalence of 32.7%, based on a study conducted in Uganda[2] and adding a 15% of non-response, arriving at a sample size of 303, however due to the COVID 19 pandemic movement restrictions only 298 samples were reached.

Data Collection

Data collection tool used was a questionnaire which had questions in English and Swahili. The tool had open and closed ended questions and was in an electronic format, kobo collect. The sections in the tool were; socio demographic characteristics, economic status, reproductive status, sexual behaviour, accessibility and availability of contraceptive services and these were filled by the interviewer with help of the data collection officer. During the day of data collection, face to face interviews were also done to collect more information from respondents. Interviewers were trained and emphasised to observe and follow standard protocols to avoid interviewer bias. After the interview, adolescents were given brief information about what is family planning and contraception, where to obtain family planning and contraceptive services. The data collection process was conducted for 4 weeks.

Study Variables

In this study, the dependent variable was ever use of modern contraceptive which was a binary outcome and coded as, (Yes) for those who had ever used modern contraceptive and (No) for those who had never used any modern contraceptive.

Independent variables included Socio-Demographic Information; Age, Residence, Marital status, Religion, Education level, Age of the partner, Partners education level, currently working status, Sexual and Reproductive Health Information; Age at sexual Debut, Parity, Ever had sexual intercourse, Last sexual intercourse, Number of sexual partners in a lifetime, Modern contraceptive knowledge, Discussion with partner on condom use, Source of modern contraceptives.

Data Processing and Analysis

At the end of each day, after collection of information, the team passed through the questionnaires to check if they were filled correctly and test for validity. Data from Kobo collect was then exported to Statistical Package for Social Sciences (SPSS) version 20 (IBM Corporation, Armonk, NY, USA). Data was analysed using SPSS version 20 (IBM SPSS Statistics for Windows, Version 20.0. Armonk, NY: IBM Corp). Continuous variables were summarised using measures of central tendency with respective measures of dispersion. Categorical variables were summarised by frequency and percentages. To determine the factors associated with modern contraceptive use, crude and adjusted analysis using logistic regression analysis was done. A magnitude of association was assessed using Odds Ratio (OR) and their respective 95% Confidence Intervals. A p-value of <0.05 was considered statistically significant.

Ethical Consideration

Ethical clearance was obtained from Kilimanjaro Christian Medical University College Research Ethics Committee prior to commencement of the study. The permission letter from the university was taken to the District Medical Officer (DMO) of Moshi municipality to request permission to conduct the study. The DMO gave written permission that requested the ward leaders to assist us in carrying the research project. Ward leaders introduced the researchers to a link person who was an indigenous and well familiar with the households which had out of school adolescent girls in that particular ward. During the day of data collection, in addition to assent from the adolescent girls under 18 years of age, written informed consent was sought for from a parent or guardian or next of keen or employers for all participants and thumb prints were used for those who could not write. For those above 18 years, consent was sought prior to commencement of the study All participants were identified using identification numbers and not names to guarantee anonymity.

RESULTS

Background Characteristic of the Study Participants

Participant Socio-Demographic Characteristics

A total of 298 out of school adolescent girls participated in this study. The median age was 18 years (IQR 17-19). Majority of the study participants (79.6%) lived with their parents or guardians and were single (75.8%). More than half of the participants (58%) dropped out of school during their secondary education level. (Table 1)

Participant's Sexual and Reproductive Health Characteristics

Among the 298 participants, 154 (51.7%) reported ever having sexual intercourse. The mean age at sexual debut among the 154 sexually active adolescents was 17 (SD of 1.7) years and 85 (55%) reported to have ever been pregnant, Table 2

Prevalence, Preference, Availability and Access of Modern Contraceptive Use

The proportion of 154 sexually active adolescent girls

who have ever used modern contraceptives was 50.6%. (Table 2). Most common method of contraceptive ever used by the participants was Injectables (27.9%), followed by hormonal pills (3.2%), male condoms (3.2%) and Implants (2.6%). 82.2% of adolescents admitted that it was difficulty to get modern contraceptives and the commonest source of modern contraceptives reported were health facilities (80.3%). Majority of participants (49%) did not know whether or not Modern contraceptives are offered for free. Media (Television and radios) positively impacted awareness of modern contraceptives as reported by approximately 30% of the respondents, Table 3.

Factors Associated with Ever Using Modern Contraceptives Among Sexually Active Out of School Adolescent Girls

On crude analysis, age, marital status and knowledge on modern contraceptives were the factors associated with ever use of modern contraceptives. The prevalence of ever using modern contraceptives was observed to increase with age, was higher among married/ cohabiting adolescent girls and those with knowledge of modern contraceptive. (Table 4).

On adjusted analysis while controlling for other factors, the factors that were significantly associated with ever use of modern contraceptives were; being married/ cohabiting and having 2 or more sexual partners in the last 12 months. Those who were married or cohabiting had significant 5.66 higher odds of using modern contraceptives compared to those who were single (OR: 5.66; 95% CI: 2.63, 12.12). Also, those who had 2 and more sexual partner in the last 12 months had significant 5.85 higher odds of ever use of modern contraceptives compared those who had only one sexual partner (OR: 5.85; 95% CI: 1.33, 25.63).

TABLE 1: Participant Socio-Demographic Characteristics (N=298)

Variable	Frequency	Percentage
Age		
10-14	28	9.2
15-19	270	90.6
Residence		
Urban	295	99.0
Rural	3	1.0
Marital status		
Single	226	75.8
Married/Cohabiting	69	23.2
Widowed/Divorced/Separated	3	1.0
Education level		
No formal education	13	4.4
Primary education	112	37.6
Secondary education and above	173	58.0
Religion		
Christian	117	39.3
Muslim and others	181	60.7
Living with		
Parent/guardian	237	79.6
Partner/Alone	61	20.4
Alcohol consumption		
Yes	27	9.1
No	271	90.9

TABLE 2: Participants Sexual and Reproductive Health Characteristics (N=154)

Variable	Frequency	Percentage
Ever had sexual intercourse (N=298)		
No	144	48.3
Yes	154	51.7
Age at sexual debut		
<15	12	7.8
≥15	142	92.2
Parity (N=85)		
One	70	45.5
Two +	16	10.4
Last sexual intercourse		
3 months ago (N=154)	94	31.5
12 months ago (N=60)	34	11.4
Number of sexual partners in a past 12 months		
Only one	143	92.9
Two or more	11	7.1
Knowledge on modern contraceptives (N=298)		
No	100	33.6
Yes	198	66.4
Ever used modern contraceptive		
No	76	49.4
Yes	78	50.6

TABLE 3: Preference, Availability and Access of Modern Contraceptives among Out of School Adolescent Girls in Majengo and Njoro Wards, Moshi Municipality

Variable	Frequency	Percentage
Modern method Currently used(N=154)		
Injectables/Depo Provera	43	27.9
Hormonal pills(Oral)	5	3.2
Male condoms	5	3.2
Implants	4	2.6
Methods of Contraception Known(N=154)		
Injectables/Depo Provera	62	40.3
Hormonal Pills (Oral)	57	37.0
Female condoms	16	10.4
Intrauterine device (IUD)	12	7.8
Implants	9	5.8
Female sterilization (BTL)	2	1.3
Vasectomy	2	1.3
Male condoms	0	0.0
Source of Contraceptive(N=81)		
Health Facilities	65	80.3
Pharmacies	23	25.9
From Friends	3	3.7
Are methods offered for Free Or payment(N=298)		
Don't Know	146	49.0
Free	87	29.2
Have to Pay	65	21.8
Is it easy or difficult to get/access contraceptive methods in this area(N=298)		
Difficulty	245	82.2
Easy	53	17.8
Source of information on Contraceptives(N=198)		
Health facility	93	47.0
Friends/peers	85	42.9
Television	59	29.8
Radio	58	29.3
Family member (sister/brother)	35	17.7
Health care workers	28	14.1
Internet	25	12.6
Poster/Banner	21	10.6
Parents	27	9.1
Sexual partner	15	7.6

TABLE 4: Factors Associated with Ever Use of Modern Contraceptives Among Sexually Active Out of School Adolescent Girls

Factors	Ever used m-CRP n (%)	Crude Analysis			Adjusted Analysis		
		Odds Ratio	95% CI	p-value	Odds Ratio	95% CI	p-value
Age		1.57	1.06, 2.33	0.023	1.50	0.95, 2.35	0.079
Residence							
Urban	77(50.7)	1		0.985	1		
Rural	1(50.0)	0.97	0.06,15.86	0.985	1.41	0.04, 56.29	0.855
Marital status							
Single	29(34.1)	1			1		
Married/Cohabiting	48(72.7)	5.15	2.55, 10.40	<0.001	5.66	2.63, 12.12	<0.001
Widowed/Divorced/Separated	1(33.3)	0.97	0.08, 11.10	0.978	0.37	0.02, 5.94	0.485
Education level							
No formal education	3(100)	1					
Primary education	27(58.7)	1.69	0.84,3.40	0.144			
Secondary education and above	48(45.7)	-	-	-			
Religion							
Christian	23(43.4)	1			1		
Muslim & Other	55(54.5)	1.56	0.80, 3.05	0.193	1.41	0.65, 3.06	0.391
Age at sexual debut							
<15	7(53.8)	1					
≥15	71(50.4)	0.87	0.28,2.72	0.810			
Parity							
Only one	50(71.4)	1					
Two +	12(80)	1.6	0.41, 6.28	0.500			
Number of sexual partners in a past 12 months							
Only one	61(64.9)	1			1		
Two or more	11(32.4)	2.78	0.71, 10.91	0.142	5.85	1.33, 25.63	0.019
Modern contraceptive knowledge							
No	70(49.0)	1	1				
Yes	8(72.7)	4.18	1.31, 13.34	0.016	3.54	0.91, 13.79	0.068

DISCUSSION

The aim of this study was to determine the prevalence and factors associated with modern contraceptive use among out of school adolescent girls in Moshi Municipality, Kilimanjaro region. In this study, the prevalence of ever using modern contraceptives was 50.6%, prevalence in this study is high when compared to a study that was conducted in Ghana in which the prevalence was reported to be 18.3%.[20] A similar study conducted among countries in SSA also reported a lower prevalence of 21.1%.[21] Similarly, the findings of this study were slightly higher than findings of related study done in Tanzania in which the prevalence of contraceptive use among adolescents who had ever had sex was reported to be 43.6%.[22] The slight difference in the results could be due to the small proportion of participants in this study who had ever had sex (154) compared to this study's 260. This can also be explained by the interventions done by the government, such as; introduction to family planning services that are free and adolescent friendly tailored programs aimed at meeting the demands of adolescents' increase in knowledge, skills and use of interventions.[23] A study in Ethiopia reported a prevalence of 39.6% and the odds of contraceptive use were lower among those with no formal education which is similar to our study's observation.[24] Similar findings were observed in a study conducted in South Africa and Zambia in which adolescent with formal education were more likely to use contraceptive.[25,26]

Participants who reported being married or cohabiting had higher odds of modern contraceptive use compared to those who reported to be single. These findings align with findings of a study done in Ghana in which contraceptive use was high among married female adolescents.[20] A similar study done among countries in the SSA reported similar findings.[21] Married female adolescents are more likely to use modern contraceptive when compared to single female adolescents probably because these maybe more capable to afford contraceptive as they have partner support. Also, married female adolescents are more likely to engage in sexual activity than single female adolescents.

Number of sexual partners in the last 12 months was also a significant factor associated with modern contraceptive use. Adolescent girls who had 2 or more sexual partner were 5.85 times significantly more likely to use modern contraceptive when compared to single adolescent as demonstrated a similar study that was conducted in Nigeria.[27] This might be as a result of increase in sexual engagement. Nevertheless, Adolescents with 2 or more children had higher odds of using contraceptive methods compared to those with one or no child, these findings align with a study conducted in Zimbabwe.[28]

CONCLUSION

Sexual and reproductive health is an essential, sensitive matter especially when targeting modern contraceptive use which has a huge role to play when addressing adolescent pregnancy as addressed in Sustainable development Goals target 3.7. This study reports a prevalence of modern contraceptive use of 50.6% among those who have ever had sex. The study, also reports that most of the participants had modern contraceptive knowledge. Furthermore, we report that participants who used modern contraceptives were mostly among those who dropped out of primary education. The study also notes that; age, marital status and knowledge on modern contraceptive are significant predictors of use of modern contraceptive.

Therefore, The government should strengthen inter-sectoral collaborations and interventions that spread awareness in the community about modern contraceptive use, especially among out of school adolescents.

Strengths and limitations of the study

Strengths

This was a house-hold based survey where participants were selected randomly. This enabled us to capture and observe a range of issues concerning modern contraceptives and helped us to identify how people conceptualise their situation, how they interrelate socially, and how they modify their beliefs. The participants got a chance to individually address their concerns on modern contraceptive use after the interview.

The study was conducted at a subnational level, that is the level of wards. Since all health-related policies are implemented at a subnational level, finding of this study therefore, give a spectrum of what is happening at a subnational level and thus lays a blueprint in creation of policies on contraceptive use among out of school adolescent girls.

Limitations

The study was conducted during the COVID 19 pandemic. Travel restriction limited the number of districts that could be enrolled for the study. Out of 7 districts, only one district was considered, and only 2 wards were enrolled out of the 21 wards in Moshi Municipality.

During data collection, questions on sexuality were a very sensitive matter to ask girls below the age of 15 years, and thus some of the participants could have under-reported their sexual activity due to social desirability bias. Some parents preferred that their daughters are interviewed in their presence. This might have interfered with the participants' freedom to freely respond to asked questions, and thus might have an effect on the reported findings.

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ORIGINAL ARTICLE

Trends and factors associated with adolescent pregnancies in Tanzania from 2004-2016: Evidence from Tanzania Demographic and Health Surveys

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ABSTRACT

Background: Adolescent pregnancy increases the risk of maternal and child morbidity and mortality. We aimed to determine trends and factors associated with adolescent pregnancy in Tanzania from 2004 to 2016 using the Tanzania Demographic and Health surveys (TDHS).

Methods: We carried out an analytical cross-sectional study using the TDHS data for the years 2004 to 2005, 2010 and 2015 to 2016 among adolescent girls aged 15 to 19 years. Data analysis was performed using STATA version 15. Data analysis considered the complex survey design inherent in the demographic and health survey (DHS) data. The Poisson regression model was used to estimate Prevalence Ratios (PR) and 95% confidence intervals for factors associated with adolescent pregnancy.

Results: We analysed data for a total of 10,972 adolescents for the three TDHS rounds. The proportion of adolescent pregnancy significantly decreased from 26% to 22.8% from the year 2004/05 to 2010 and then increased again to 26.7% in 2015/16. Adolescents who were aged 18 to 19 years (APR 1.52; 95% CI, 1.38 to 1.68) married or cohabiting with their partners (APR 2.15; 95% CI, 1.93 to 2.40; $P<.001$), widowed/divorced/separated (APR 2.32; 95% CI, 2.03 to 2.66; $P<.001$), and among those who started sexual activity before 15 years of age (APR 1.20; 95% CI, 1.11 to 1.31; $P<.001$) were more likely to become pregnant during adolescence. In contrast, adolescents with secondary school education level and above were the least likely to become pregnant (APR 0.62; 95% CI, 0.51 to 0.75; $P<.001$) compared to those with no formal education.

Conclusion: One in four adolescent girls aged 15 to 19 in Tanzania have already started childbearing and despite fluctuation, high rate of adolescent pregnancy persists. Preventive interventions should focus on adolescents with low education level, married/cohabiting with their partners, and who have started sex before 15 years of age. We advocate for the increase of school attendance until high school level to reduce the risk of early pregnancy in adolescents. Furthermore, qualitative studies are crucial to explore reasons for the rising trend of adolescent pregnancy in most zones of Tanzania, particularly between 2010 and 2015/16.

BACKGROUND

Adolescent pregnancy is a pregnancy occurring in girls aged 10 to 19 years.[1,2] Globally, one in five girls give birth by the age of 18, which contributes to about 11% of total births worldwide,[2] with approximately 95% of adolescent births occurring in low- and middle-income countries, and over 50% of women give birth before the age of 20 years in sub-Saharan Africa (SSA).[3]

Tanzania is among the countries in SSA with the highest rate of adolescent pregnancy, which has been increasing over time from 23% in 2010 to 27% in 2016).[6] Factors that influence adolescent pregnancies vary with settings. For example, in Nepal, poverty, unemployment and low education levels of both the adolescents and their partners were identified as key drivers of adolescent pregnancy.[7] A systematic review in Africa revealed that rural residence, ever married, lack of parent to adolescent communication on sexual and reproductive health (SRH) issues and no women education was associated with adolescent pregnancy.[8] Other factors such as coercive sexual relations, gender power relations, poverty early marriages, use of alcohol, substance abuse, cost of contraceptives and misconceptions about contraceptives and non-friendly adolescent reproductive services were reported in other systematic reviews in a Sub Saharan

Africa (SSA).[9,10]

Various interventions have been implemented to reduce adolescent pregnancy in Tanzania, such as strategies to offer Adolescent-Friendly Sexual Reproductive Health Services (AFSRHS) which provide free contraceptive services, family planning education, and comprehensive sexual education.[11,12] Coverage of AFSRH services is reported to have increased from 30% in 2010 to 63% in 2017, but far from the national target of 80% by 2020.[12,13] In 2019 the country started 5 years (2019 to 2022) National Accelerated Investment Agenda for Adolescent Health & Wellbeing (NAIA), which is implemented by several ministries.[14] NAIA has six pillars, of which the second is preventing teenage pregnancies.[14] Despite these interventions, the country is far from reaching the national target of reducing the adolescent fertility rate to less than 90 births per 1000 adolescents by 2020.[12]

In Tanzania, studies on factors associated with adolescent pregnancies using national-level data are limited. Previous studies that investigated factors associated with adolescent pregnancy were at the subnational level. Tanzania and Demographic Health Survey (TDHS) reports also give information on the prevalence of adolescent pregnancies but do not analyze predictors of adolescent pregnancies. Information on change of factors associated with adolescent pregnancies over time is therefore lacking. This analysis aimed to determine trends and factors associated with adolescent pregnancies in Tanzania from 2004 to 2016 using the TDHS data. Results from this study will assist the policymakers and program managers to frame an integrated strategy and programmatic response to reduce adolescent pregnancies and improving their health and socio-economic life.

METHODS

Study design and setting

This was an analytical cross-sectional study conducted using nationally representative secondary data from the three TDHS of 2004/2005, 2010 and 2015/2016 respectively. The study included data from all 31 regions of Tanzania. Tanzania is one of the largest countries in Africa, covering 947,300 square kilometers. According to the 2012 census, the population was 44.9 million, of which 9.9 million (23%) were adolescents between 10 and 19 years of age. The average annual growth rate according to the 2012 population and housing census was 2.7%.[15] The average fertility rate in Tanzania was estimated to be 5.2 children born per woman, and mothers' mean age at first birth was 19.8 years.[6]

Study Population, Sample Size, and Sampling

The TDHS used a multistage sampling technique in selecting study participants, which was designed to provide estimates for the entire country, for urban and rural areas on the mainland and Zanzibar. This sampling design was guided by the considerations of the availability of an existing sampling frame to get the full coverage of the target population.

Stage one involved the selection of a stratified sample from a list of enumeration areas (EAs) that had been obtained from the recent census conducted in Tanzania. These EAs were the clusters. In rural areas, an EA is a natural village, or a segment of a large village, or a group of small villages; in urban areas, an EA is a street or a city block. This sample of EAs was selected with considerations of probability proportional to size (PPS) that takes into account the size of the enumeration area. A listing procedure was then performed on each of the selected EAs such that all dwellings and households are listed.

In the second stage, a complete list of households available in each of the selected EAs, a fixed variable number of households, was selected by equal probability systematic sampling technique. In each of the selected households, a questionnaire was then completed to identify women aged 15 to 49 years. Every eligible woman was then interviewed.

In this study, the population included in the analysis consisted of adolescent girls aged 15 to 19 years. Adolescents with missed records on birth history were excluded from the study since they did not have their pregnancy records. This resulted in a total weighted sample of 10,964 from the three TDHS; 2,297 adolescents in 2004/2005 (3,666 weighted cases), 2,221 adolescents in 2010 (3,613 weighted cases) and 2932 adolescents in 2015/2016 (3,693 weighted cases) (Figure 1).

Study Variables and Variable Measurements

In this study, the dependent variable was an adolescent pregnancy. This was a binary variable coded "Yes" if an adolescent girl reported to have ever had a birth or was pregnant at the time of the interview and "No" if she reported the contrary. This definition was adapted from TDHS as this information is consistently available in all the TDHS. The independent variables in this study included socio-demographic and sexual and reproductive health characteristics. Socio-demographic characteristics include adolescent age in years (15 to 17, 18 to 19), working status (working, not working), education level (no education, primary, secondary and above), wealth index categories (poorest, poorer, middle, richer, richest), marital status (never in a union, married/cohabiting, widowed/divorced/separated), residence (urban-rural), geographical zones (western, northern, central, southern highlands, southern, south-west highlands, lake, eastern, Zanzibar), and partner education level (no education, primary, secondary and above). Reproductive health characteristics include age at first sex in years (<15, ≥15), age at first marriage in years (<15, 15 to17, 18 to 19) and modern contraceptive use (No, or Yes).

Statistical Analysis

Data analysis, using STATA version 15, accounted for the complex nature of survey design through the application of weights, primary sampling unit (cluster) and strata for the adjustment of the cluster sampling survey design. Descriptive statistics were summarized using frequency and proportions for categorical variables and continuous variables using mean and median, and respectively standard deviation and interquartile range (IQR).

Poisson regression analysis was used to determine factors associated with adolescent pregnancy as an alternative to the classical logistic regression, as the proportion of adolescent pregnancies was greater than 10%. The choice of this model was also motivated by the non-convergence of the log-binomial regression model.

The Poisson regression model estimated prevalence ratios (PR) with their 95% CI for factors associated with adolescent pregnancy. Bivariate Poisson regression was conducted to examine the unadjusted association between exposure variables and the likelihood of adolescent pregnancies. Variables with a *p-value* <.05 in the bivariate analysis were entered in the multivariable model to adjust for the potential confounding effect. We used stepwise forward elimination regression methods for model building. Models with the lowest Akaike information criteria (AIC) were regarded as more parsimonious, hence more suitable to explain how independent and dependent variables are associated. Multicollinearity was evaluated among the explanatory variables to be included in the Poisson regression model by inspecting the correlation matrix and assessing estimation problems of the model parameters.

Ethical Considerations

Ethical approval was obtained from the Kilimanjaro Christian Medical University College Research and Ethics Review Committee (CRERC no.PG/012/2019). The parent study obtained written, informed consent from the study participants. Interviews were conducted in a private place around the household, and participants were identified using unique identification numbers to ensure confidentiality and privacy of participant information. Permission to use the TDHS data was obtained from the Demographic Health Survey program. Data was used solely for the current study.

RESULTS

Background Characteristics of Study Participants

Background characteristics of the study participants are shown in Table 1. Data were analyzed for a total of 10,972 adolescents in this study. The proportion of adolescents who were working decreased across the survey years from 57.6% in 2004/2005, to 49.1% in 2010 and 45.0% in 2015/2016. The proportion of participants having a secondary or above education level increased from 11.4% in 2004/2005 to 34.5% in 2010 and 35.1% in 2015/2016. The proportion of adolescents who resided in rural areas remained constant between 2004/2005 (70.2%) and 2010 (70.4%) but then decreased to 62.7% in 2015/2016.

Nearly one in four adolescents (23.1% to 26.6%) in the three surveys reported starting sex at age <15 years. The proportion of adolescents who were married/cohabited decreased from 26.3% in 2004/2005 and 18.4% in 2010 but then increased to 23.0% in 2015/2016. The proportion of adolescents who were using contraceptives increased from 12.1% in 2004/2005 to 25.3% in 2010 and then decreased to 17.0% in 2015/2016.

The Trend of Adolescent Pregnancy Between 2004/2005 to 2015/16

The proportion of adolescent pregnancy significantly decreased from 26% to 22.8% between 2004/05 and 2010, and then increased again to 26.7% in 2015/16 (Figure 2).

Between 2004/05 and 2010 TDHS rounds, adolescent pregnancy decreased in seven zones, namely northern, central, southern highland, southern, south-western, lake, and Zanzibar. Contrastingly, between 2010 and 2015/16 adolescent pregnancy decreased in only two zones: southern, and lake zones, while it remained the same in the northern zone, (Figure 3).

Factors Associated with Adolescent Pregnancy Between 2004/05 – 2015/16

In the bivariate Poisson regression analysis, adolescent age, employment status, education level, household wealth index, marital status, geographical zones, place of residence, contraceptive use, age at first marriage, and age at first sexual intercourse were significantly associated with adolescent pregnancy. In multivariable analysis, adolescent age, education level, marital status, and age at first sexual intercourse were the independent predictors of adolescent pregnancy after adjusting for other variables, (Table 2).

The prevalence of adolescent pregnancy was 52% higher among adolescents aged 18 to 19 years compared to those aged 15 to 17 years (APR 1.52; 95% CI, 1.38 to 1.68; *P<.001*). Adolescents with secondary education and above had a 38% lower prevalence of pregnancy compared to those with no formal education (APR 0.62; 95% CI, 0.51 to 0.75). Compared to adolescents who had never been in a union, those who were married or cohabiting and widowed/divorced/separated had 2.2 (APR 2.15; 95% CI, 1.93 to 2.40) and 2.3 (APR 2.32; 95% CI, 2.03 to 2.66) times higher prevalence of pregnancy. Adolescents who started sexual activity at age <15 years, had a 20% higher prevalence of pregnancy than those starting at age ≥15 years (APR 1.20; 95% CI, 1.11 to 1.31), (Table 2).

FIGURE 1: Flow Chart for the Selection of Study Participants "For Adolescent Pregnancies"

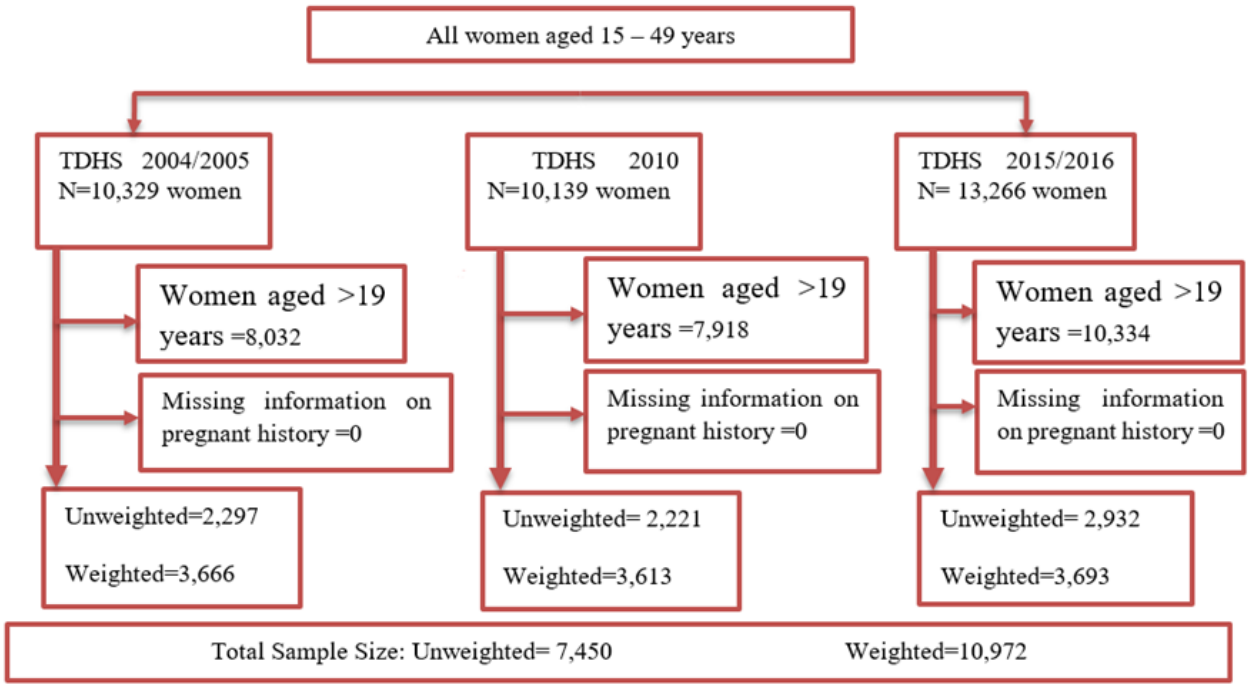

FIGURE 2: Trends of Adolescent Pregnancies from DHS 2004/05 to 2015/2016

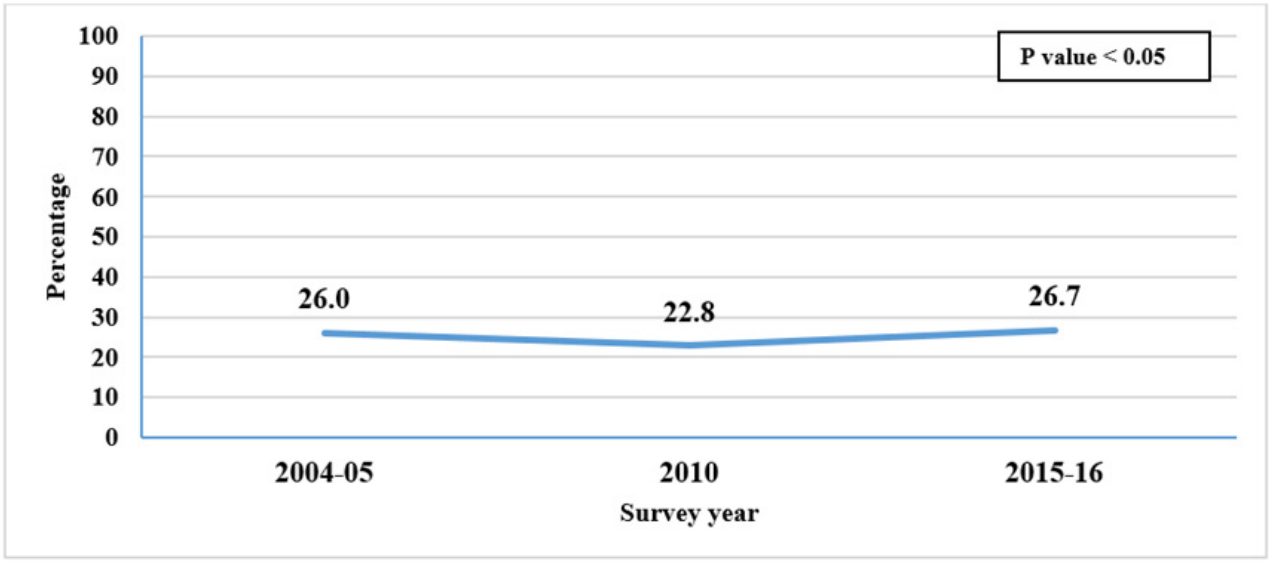

FIGURE 3: Prevalence of Adolescent Pregnancies by Zones from DHS 2004/05 to 2015/2016

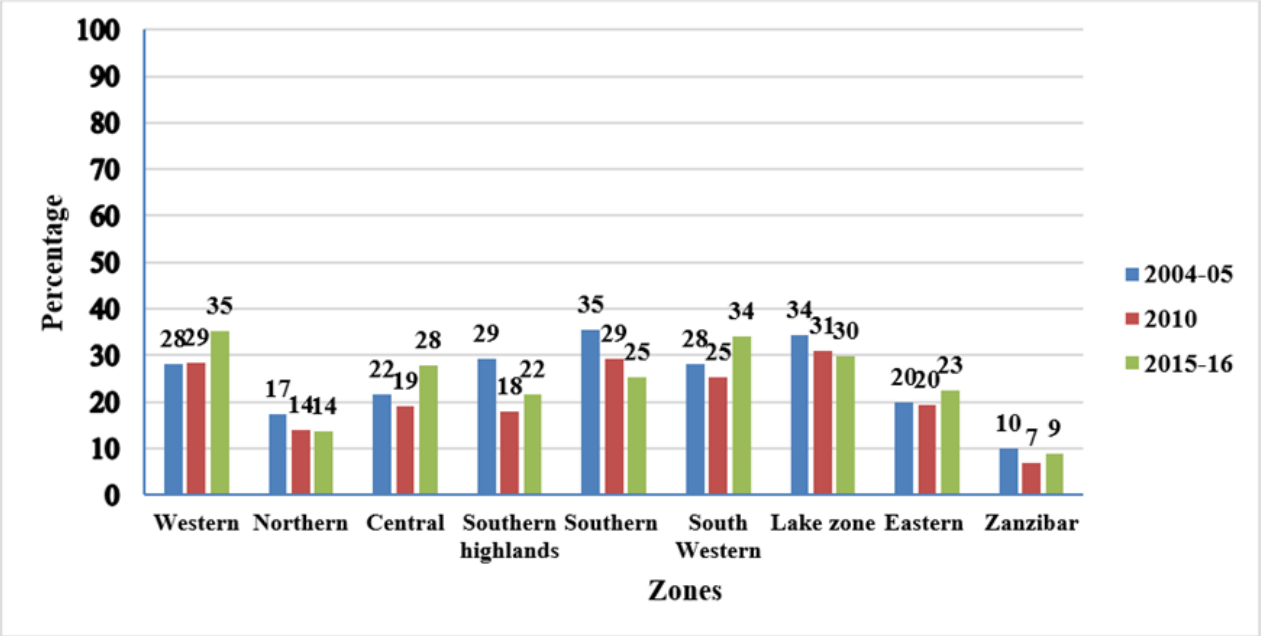

TABLE 1: Background Characteristics (weighted) of Study Participants in Tanzania Demographic and Health Survey 2004/2005, 2010 and 2015/2016 (N=10,972) in Different Zones

Variable	TDHS Survey Year		
	2004/05 (n=3666) n (%)	2010 (n=3613) n (%)	2015/16 (n=3693) n (%)
Women Age (Years)			
15-17	2,206 (60.2)	2,322 (64.3)	2,165 (58.6)
18-19	1,460 (39.8)	1,291 (35.7)	1,528 (41.4)
Mean ± SD	17.0 ± 1.4	17.0 ± 1.4	17.0 ± 1.5
Working status			
Not working	1,552 (42.4)	1,820 (50.9)	2,027 (55.0)
Working	2,110 (57.6)	1,759 (49.1)	1,657 (45.0)
Education level			
No education	757 (20.6)	300 (8.3)	2,22 (6.0)
Primary	2,491 (68.0)	2,068 (57.2)	2,175 (58.9)
Secondary and above	418 (11.4)	1,245 (34.5)	1,296 (35.1)
Wealth index			
Poorest	580 (15.8)	442 (12.3)	640 (17.3)
Poorer	733 (20.0)	655 (18.1)	587 (15.9)
Middle	673 (18.4)	718 (19.9)	596 (16.2)
Richer	639 (17.4)	817 (22.6)	774 (21.0)
Richest	1,041 (28.4)	979 (27.1)	1,096 (29.6)
Marital status			
Never in union	2,642 (72.1)	2,902 (80.3)	2,759 (74.7)
Married/living together	963 (26.3)	664 (18.4)	849 (23.0)
Widowed/divorced/separated	61 (1.6)	47 (1.3)	85 (2.3)

Continued

TABLE 1: Continued

Variable	TDHS Survey Year 2004/05 (n=3666) n (%)	2010 (n=3613) n (%)	2015/16 (n=3693) n (%)
Place of residence			
Urban	1,095 (29.8)	1,070 (29.6)	1,377 (37.3)
Rural	2,572 (70.2)	2,543 (70.4)	2,316 (62.7)
Geographical zones			
Western	445 (12.1)	319 (8.8)	412 (11.1)
Northern	428 (11.7)	456 (12.6)	426 (11.5)
Central	370 (10.1)	344 (9.5)	332 (9.0)
Southern highlands	234 (6.4)	242 (6.7)	186 (5.1)
Southern	178 (4.9)	167 (4.6)	150 (4.1)
Southwest	360 (9.8)	308 (8.5)	341 (9.3)
Lake zone	993 (27.1)	1109 (30.7)	1,080 (29.2)
Eastern	533 (14.5)	536 (14.8)	642 (17.4)
Zanzibar	125 (3.4)	132 (3.8)	124 (3.3)
Partner education level			
No education	241 (23.5)	142 (20.0)	117 (13.8)
Primary	719 (70.2)	512 (72.3)	564 (66.5)
Secondary and above	64 (6.3)	54 (7.7)	167 (19.7)
Age at first sex (years)			
<15	351 (23.1)	345 (26.6)	472 (24.5)
≥15	1,172 (76.9)	950 (73.4)	1,454 (75.5)
Median (IQR)	15 (2)	15 (2)	15 (3)
Modern contraceptive use			
No	1,312 (87.9)	941 (74.7)	1,544 (83.0)
Yes	180 (12.1)	318 (25.3)	316 (17.0)

[a]Frequencies do not tally with the total due to missing values in these variables
Abbreviation: TDHS, Tanzania Demographic and Health Survey

TABLE 2: Factors Associated With Adolescent Pregnancy in Tanzania, Tanzania Demographic and Health Survey 2004/2005, 2010 and 2015/2016 (N=10972)

Variable	Total	Pregnant n (%)	CPR (95% CI)	P Value	APR (95% CI)	P Value
Women age (years)						
15-17	6,694	831 (12.4)	1		1	
18-19	4,278	1,932 (45.2)	3.64 (3.25, 4.07)	<.001	1.52 (1.38, 1.68)	<.001
Working status						
Not working	5,400	771 (14.3)	1		1	
Working	5,527	1,982 (35.9)	2.51 (2.24, 2.81)	<.001	1.06 (0.97, 1.17)	.204
Education level						
No education	1,278	596 (46.6)	1		1	
Primary	6,735	1,941 (28.8)	0.62 (0.55, 0.69)	<.001	0.97 (0.88, 1.07)	.491
≥Secondary	2,959	226 (7.6)	0.16 (0.13, 0.20)	<.001	0.62 (0.51, 0.75)	<.001
Wealth index						
Poorest	1,662	581 (35.0)	1		1	
Poorer	1,974	661 (33.5)	0.96 (0.84, 1.09)	.517	1.05 (0.94, 1.16)	.389
Middle	1,988	558 (28.1)	0.80 (0.69, 0.94)	.006	1.08 (0.96, 1.21)	.187
Richer	2,230	533 (23.9)	0.68 (0.59, 0.80)	<.001	1.06 (0.94, 1.20)	.362
Richest	3,118	430 (13.7)	0.39 (0.33, 0.48)	<.001	0.87 (0.73, 1.04)	.122
Marital status						
Never in union	8,303	749 (9.0)	1		1	

Continue

TABLE 2: Continued

Variable	Total	Pregnant n (%)	CPR (95% CI)	P Value	APR (95% CI)	P Value
Married/cohabiting	2,476	1,857 (75.0)	8.31 (7.41, 9.33)	<.001	2.15 (1.93, 2.40)	<.001
Widowed/divorced/ separated	193	157 (81.9)	9.07 (7.84, 10.50)	<.001	2.32 (2.03, 2.66)	<.001
Place of residence						
Urban	3,542	625 (17.7)	1		1	
Rural	7,430	2,139 (29.0)	1.63 (1.41, 1.89)	<.001	0.95 (0.84, 1.08)	.458
Geographical zones						
Western	1,176	362 (30.8)	1.94 (1.52, 2.48)	<.001	0.99 (0.83, 1.19)	.929
Northern	1,310	208 (15.9)	1	1		
Central	1,046	263 (25.2)	1.59 (1.23, 2.03)	<.001	1.03 (0.85, 1.25)	.732
Southern highlands	662	149 (22.5)	1.42 (1.07, 1.89)	.016	1.16 (0.95, 1.43)	.152
Southern	495	149 (30.0)	1.89 (1.42, 2.52)	<.001	1.00 (0.82, 1.22)	.998
South west	1,009	293 (29.0)	1.83 (1.38, 2.42)	<.001	1.18 (0.97, 1.44)	.106
Lake zone	3,183	987 (31.0)	1.95 (1.58, 2.42)	<.001	1.00 (0.85, 1.18)	.999
Eastern	1,711	322 (18.8)	1.19 (0.90, 1.57)	.233	0.96 (0.78, 1.17)	.667
Zanzibar	380	30 (7.8)	0.49 (0.38, 0.64)	<.001	1.11 (0.90, 1.36)	.333
Modern contraceptive use						
No	3,797	1,910 (53.0)	1		1	
Yes	814	351 (43.1)	0.86 (0.75, 0.98)	.021	0.94 (0.85, 1.04)	.239
Age at first sex						
<15	1,168	662 (53.3)	1.13 (1.03, 1.24)	.009	1.20 (1.11, 1.31)	<.001
≥15	3,577	1,684 (47.1)	1		1	
Age at first marriage						
<15	395	328 (83.0)	1			
15-17	1,789	1,370 (76.6)	0.92 (0.86, 0.99)	.060		
18-19	485	317 (65.4)	0.79 (0.70, 0.89)	<.001		

Abbreviations: CPR, Crude Prevalence ratio; APR, Adjusted Prevalence Ratio

DISCUSSION

The study aimed to determine the trend and factors associated with adolescent pregnancy in Tanzania from 2004 to 2016. We found that the prevalence of adolescent pregnancy has fluctuated in a 10 year period. Prevalence decreased from 26% in 2004/2005 to 22.8% in 2010 and increased again to 26.7% in 2015/2016, showing variation by geographical zones. Education level, adolescent age, marital status, and age at first sexual intercourse were independent predictors of adolescent pregnancies.

This study reported the fluctuating trend of adolescent pregnancies, which is consistent with a previous study in 5 East African countries (Kenya, Malawi Tanzania, Uganda, and Zambia),[16] but different with findings in Nepal and Ethiopia which reported a decrease in the proportion of adolescent pregnancy over time.[8,17] An upward trend in adolescent pregnancy during the latest survey could be caused by several policy level conversations and debates in the last few years. as it was observed that condom and contraceptive use among adolescents declined between 2010 and 2015/16 surveys. The proportion of adolescent girls using a condom at last sex declined from 50% to 37% between 2010 and 2015/16 surveys. The proportion of adolescents who were using contraceptives increased from 12.1% in 2004 to 25.3% and then decreased significantly to 17% in the 2015/16 survey. While the median age of debut remained the same at 15 years, the proportions of adolescent girls who were in the union and/or divorced or separated declined from 27.9% to 19.7% in 2010, then increased to 25.3 in 2015/16 respectively. Efforts to improve the availability and access to quality adolescent-friendly sexual and reproductive health services (AFSRHS) cannot be overemphasized in our setting. Coverage of AFSRHS has increased from 30% in 2010 to 63% in 2017, below the recommendation of 80%.[12,13] Furthermore, the availability of quality and comprehensive adolescent and youth-friendly SRH services given by different stakeholders, and at the community level is needed.

In this study, adolescent girls with secondary education and above had a lower prevalence of adolescent pregnancies compared to those with no education. These findings are consistent with findings from Ethiopia and Nepal.[7,8,17] Educated adolescents may be more empowered and better informed about their fundamental and legal rights that are essential to make a logical decision about healthy life, such as rejecting early marriage and early sexual intercourse. In the current study, only 4% of adolescents with secondary education were either married or cohabited with their partners. The findings are in contrast with the study done in Bangladesh that reported no significant protective effect of education against adolescent pregnancy.[18] The small sample size

(389), convenience sampling technique and the fact that older women aged >19 years constituted almost 74% of the study sample in Bangladesh could explain these differences.

Adolescent girls who were married or cohabiting and those who were widowed/divorced/ separated had a higher prevalence ratio of adolescent pregnancy compared to those who were never in a union. These findings corroborate previous studies conducted in Uganda, Ethiopia and Nepal.[8,17,19] This could be attributed to the early sexual debut related to early marriage and increased encounter with sexual intercourse.[20] Studies have shown that adolescents who are in a marriage or cohabiting relationship have a lower prevalence of contraceptive use than others.[8,17,19] In this study, about 50% of the married/cohabiting teenagers started sexual intercourse before 15 years of age. This therefore, calls for policy-level interventional actions particularly considering that law on adolescent/child marriage are still controversial in Tanzania. While marriage is prohibited below 15 years, it is permitted under religious and cultural circumstances. Interventions should also be targeted not only on adolescent girls but also elders/communities who make the marriage decision for their adolescent girls. Countries like Nepal have a law banning adolescent marriage (<20 years) since 1963, which is not the same in Tanzania.

Adolescents who started sexual intercourse before 15 years of age had a 20% higher pregnancy rate compared to those who started sexual intercourse at ≥15 years of age, which is consistent with findings from Ethiopia.[17] In most SSA and Asian countries, early sexual debut occurs in the context of child/adolescent marriages where young girls do not have any say or choice on sexual or pregnancy issues and access to health care.[9] Sexual practices under 15 years of age are unsafe, and most adolescents of this age do not have enough sexual and reproductive health education.[20,21] Early sexual debut tends to lead to higher sexual risk-taking behavior, such as having multiple partners, poor contraceptive use and early pregnancy.[22,23] Inter-sectoral and multiple comprehensive interventions are needed to address both early sexual debut and adolescent pregnancy. Key among the interventions is keeping girls in secondary schools,[16,24] improving access to correct knowledge and skills in SRH issues, and improving access to quality AYFSRH services.

Study Strengths and Limitations

The study utilized the national representative data, which makes the findings generalizable. This study has estimated trends and factors associated with adolescent pregnancy in Tanzania; these findings are useful and can inform policy and decision makers. Nevertheless, are several limitations that might affect our conclusions. The data on age at first sex were self-reported by adolescent girls, which might have led to recall bias and hence over- or underestimation of the effect. Furthermore, being a cross-sectional, we were not able to establish causal relationships. Additionally, our analysis was limited to looking at births and current pregnancies and did not capture adolescent pregnancies that ended in miscarriage or abortion. Context and characteristics could be different for adolescent pregnancies ending in miscarriage or abortion. However, the study has provided countrywide picture of adolescent pregnancy which could be used as a basis to conduct longitudinal in-depth investigations.

CONCLUSION

One in four adolescent girls aged 15-19 years in Tanzania has already become pregnant. The trend of adolescent pregnancy declined from 2004 to 2010 but increased in 2016. Adolescents who were married or living together with a partner and those who started sexual intercourse before 15 years old have higher pregnancy prevalence rate, while adolescents with secondary education have lower rate of adolescent pregnancy. Intervention programs should target mainly adolescents with no formal education, prevent early marriage, discourage early sexual initiation among adolescents so as to reduce adolescent pregnancy and related complications. Qualitative studies are crucial to explore reasons for the rising trends of adolescent pregnancies, particularly between 2010 and 2015/16 THDS rounds. Furthermore, a study on adolescent pregnancy that includes miscarriage and abortion is needed.

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ORIGINAL ARTICLE

Nurses' Level of Knowledge on Management of Preeclampsia / Eclampsia and the associated factors in Northern Tanzania: An Analytical Cross-Sectional Study

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ABSTRACT

Background: Preeclampsia /Eclampsia is among the hypertensive disorder of pregnancy. It is accompanied by high blood pressure, protein in the urine, convulsion, and sometimes oliguria. This condition results in higher maternal morbidity and mortality worldwide.

Objectives: The objective of this study was to assess nurses' level of knowledge and factors influencing nurses' knowledge of managing preeclampsia /Eclampsia in Northern Tanzania.

Method: The study was analytical cross-sectional study design. A total sample of 176 nurses working in the maternity block was enrolled in the study. A census sampling technique was used to get 176 nurses. A closed-ended structured questionnaire was used to collect data. Statistical Package for the Social Sciences (SPSS) version 26 was used for data analysis.Knowledge was categoried into low and high knowledge,two, less than 50% had low knowledge and above 50% had high knowledge. Inferential analysis using a logistic regression model was used to establish factors associated with knowledge.

Results: The study revealed that more than half of interviewed nurses 129(73.3%) had high knowledge while 47(26.7%) had low knowledge on management of preeclampsia/Eclampsia.After controlling for confounders, factors associated with knowledge were nurse who got On job training on Preeclampsia/Eclampsia management.

Conclusions: Some essential predictors of knowledge were shown among nurses, but generally, knowledge about the management of preeclampsia/eclampsia among nurses was high. Managing women with preeclampsia/eclampsia and their fetuses, there is a great need for advanced strategies to increase knowledge about the management to nurses.

BACKGROUND

Maternal death is among the significant public health problems, whereby hypertensive disorders of pregnancy, including Preeclampsia/ Eclampsia, raise the number of maternal and fetal morbidity and mortality worldwide. These disorders are reported to be the second leading cause of maternal mortality.[1] Preeclampsia is a cardiovascular condition causing endothelial malfunction and vasospasm after 20 weeks gestation and can occur as late as 4-6 weeks after delivery. Preeclampsia is the occurrence of high blood pressure in pregnancy after 20 weeks, whereby diastolic blood pressure rises ≥ 90 mm Hg and Considerable protein in urine > 0.3g/24 hours[2] Preeclampsia with severe features may present with a blood pressure of 160/110 mm Hg or more. low platelet count, renal failure, sudden onset of headache which does not respond to medication, and visual impairment.[3]

Additionally, it accounts 14% of maternal death globally, 22,000 maternal death in Asia, 3800 maternal death in Latin America and 150 in the Caribbean, while sub-Saharan Africa account about 16.0%, besides yearly report 25,000 maternal death in Africa, data from world health organization.[4] In Ethiopia, the prevalence of pregnancy-induced hypertension is 2.2% to 18.3% whereby accounts for 19% of deaths.[4]

In Tanzania, the maternal mortality ratio is high as 556 deaths per 100,000 live births[5] whereby deaths due to eclampsia are 35%, in northern Tanzania accounts for 28 %.[6] In Kilimanjaro cause, 18% of Maternal deaths.[7]

According to Tanzania, maternal and perinatal surveillance sets design that when maternal demise occurs should be reported within 48 hours and assessment within seven days to recognize the cause of death, regardless of all design the number of maternal demises still increasing by eight times in 2018 from 2017 in Dodoma region.[8] Thus increasing the number of pregnancy-induced hypertension leads to more referral cases.[8] The study reveals that the

maternal mortality rate remains high in developing countries, primarily due to deprived access to prenatal care, delay in managing a woman with hypertensive disorder of pregnancy, and inadequate service provider skills.[9]

Preeclampsia/eclampsia can lead to poor growth of the baby during intrauterine life. This accounts for 30%, inadequate weight and delivered before time, were by 73.3%.[10] The reason for the occurrence of complications revealed by other studies was a lack of knowledge and skills in diagnostic measures like urinalysis for diagnostic purposes. Also, they identified that complication occurs as a result of inadequate knowledge, undesirable attitude toward hypertension in pregnancy, poor awareness, decision, and treatment.[4]

Moreover, the management of the woman with preeclampsia /eclampsia depends on the following factors such as the severity of the disease, gestational age, maternal and fetal condition.[11] The nurse to identify all of these must possess the required knowledge to overcome the situation.

In Tanzania, the MoHCDGEC works in collaboration with health partners (to provide training and workshops on BEmONC and CEmONC, but still, pre/eclampsia is the second after PPH cause of maternal deaths in the country.

The study revealed that nurses have insufficient knowledge of the management of pre-eclampsia/eclampsia as evidenced by a study done in Egypt which reported that 30% of nurses had poor knowledge of how to care for the pregnant woman with fit following eclampsia.[1] Also, a study was done in rural Karnataka State, India, revealed insufficient common knowledge.[12] There was no data on the level of nurses' knowledge on the management of Preeclampsia/Eclampsia in Northern Tanzania. The study aimed to assess the level of knowledge to nurses working in an obstetric unit in the Kilimanjaro region

METHODS

Study design and Target Population

This study presents an analysis of nurses' knowledge on the management of Preeclampsia/Eclampsia. The study was aimed to assess nurses' level of knowledge and factors influencing nurses' knowledge on the management of preeclampsia /Eclampsia. Study respondents were nurses working in the obstetric unit

Study Setting

The study was conducted in northern Tanzania. The selection of the region was based on the fact that preeclampsia /Eclampsia is the among direct cause of maternal death in the region but also no study ever conducted in the region concerning Preeclampsia/ Eclampsia management to nurses on facility basis,as nurses are the one who stay with the patient for longer time compared to other medical personel. The Kilimanjaro region is located in the Northern zone of Tanzania, which consists of 6 districts named Rombo, Mwanga, Same, Siha, Hai, and Moshi, whereby Moshi is divided into Moshi Municipal and Moshi district. The region has 13,209 km^2 and 1,376,702 population. Kenya borders the region to the north and east. The Kilimanjaro region borders Tanga Region to the south. The southwest by the Manyara Region, and the west by the Arusha Region.

This study employed a cross-sectional study. Under cross-sectional design, the variables in a sample were studied only once to conclude their relationships. The study applied a survey in a cross-sectional design, which uses questionnaires to seek information from respondents at one point in time.[13] The choice of cross-section design was based on the fact that the design helped to provide the information concerning the relationship between participant variables and factors influencing nurses' knowledge in the management of preeclampsia /eclampsia. Furthermore, the design fits the research question that was studied hence enable the researcher to get a clear picture of the existing situation and assess the relationship between variables and the factors influencing nurses' knowledge in the management of preeclampsia / eclampsia in a single study.

Sample Size Calculation and Sampling Technique

Sample Size Calculation

Cochran formula (1977) was used to compute the sample size for the study.

$$n = \frac{z^2 P q_{14}}{e^2}$$

Where:
n = minimal sample size
e = the desired level of precision [marginal error] 5%
P=11.8% which is proportional to Knowledge on Prevention and Management of Preeclampsia and Eclampsia among Nurses in the health facility which was obtained from the study done in Dodoma region Tanzania[1] with a formula obtained from Charan,J and Biswas.[14]
q = 1-P
Z = confidence interval 1.96 = 95%

$$\text{Sample size} = \frac{1.96^2 \times 0.118(1-0.118)}{0.05^2} = 159.9$$

The minimum required sample size was 160, and I added 10% for non-response.

The total sample size was 176 nurses

Sampling Technique

The study involved seven councils of the Kilimanjaro region, whereby all seven council hospitals, regional hospital, and consultant(zonal) hospital of the region were selected conveniently (a referral point for eclampsia cases), the random sampling technique was used to select health center whereby one hearth center was selected randomly in each council, the following health center was selected Keni, Charlotte, Hedaru, Kisangara, Himo OPD, Kisiki and Majengo Furthermore, census sampling were used to get nurses who are working in an obstetric unit in all health facilities selected.

Data Collection Tool
A structured questionnaire was used for data collection. The instruments used for this study were adapted from Olaoye[15] and modified. The modification was done to the question observed not clear or does not suit the need for the current study. The pre test was done to the instrument to a total of 17 participants at Makole health centre for clarity of the tool,after pre test the instrument was revised and finalized for use in data collection. The instrument consists of two parts; part 1: Background information, part 2: Knowledge of management of preeclampsia/ eclampsia. Whereby 40 questions were used to measure knowledge. The major themes used in the knowledge questions were nurses' knowledge on the management of preeclampsia/ Eclampsia, drugs used to manage patients with preeclampsia/eclampsia, and dosage of magnesium.

Data Collection Procedure
The data were collected by using self -administered questionnaire. Datum was collected by two trained assistant researchers and a principal researcher. The participant answered questionnaires; the filled questionnaires were collected by the researcher or a trained researcher assistant. The duration for data collection was four weeks.

Variable and how the Variable was Measured Knowledge
The study measured knowledge by asking 40 close-ended questions(multiple choice); every question comprised 1 point, so the total score was 40. Moreover, The score was categorized into two those scored less than 50% were termed as having low knowledge and those with more than 50% having high knowledge

Data Analysis
The collected data were coded and entered into SPSS version 26 to obtain the results of the study. The data analysis involved descriptive statistics in computing means, standard deviations, frequencies, percentages, and linear regression. There is simple and multiple logistic regression to find predictors of knowledge. In simple logistic regression, the aim was to find the specific predictors of knowledge. After was computed whereby all variables with a *p-Value* of < .05 had a significant relationship with nurses' knowledge. Moreover, multiple logistic regression was computed to variables with a p-Value of less than 0.2 for the adjustment of confounders; again, the variable with a p-value of <0.05 decided to be having a significant relationship with nurses' knowledge.[13]

Ethical Consideration
The ethical clearance for this study was obtained from the Health Research Ethics Committee of the University of Dodoma. The researcher also obtained a permission letter from the authority at the University of Dodoma and RAS Kilimanjaro Region, the permission made by the university on behalf of the government with code number MPEC/R/10/1 dated 4th july 1980 which empower the university vice chancellor to issue research clearance, the clearance letter were obtained on 23rd November 2020 where the study was conducted. The ethical clearance letter attached as picture. An individual informed consent was attained from study applicants after full enlightenment of the study goals and processes. Privacy and confidentiality were guaranteed to all study respondents.

RESULTS
Socio-demographic Characteristics of Study Respondent
Sociodemographic characteristics of study participants: A total of 176 nurses were included in this study, with a response rate of 100%. The mean age of study participants was 35.70 years with a standard deviation of 10.64 years. The minimum age is = 21, and the maximum age is = 67. The majority of the participants' 83(47.2%) age was range from 26-35 years. Concerning the professional training majority of study participants, 96 (54.5%), were nurses with the diploma. Concerning years in the nursing profession, 55 (31.3%) was having experience of more than 12 years. Concerning the level of the facility, more than half of the respondents, 91(51.7%), were from district hospitals. The majority of nurses, 137 (77.7%), were not attended on the job training. More information concerning the sociodemographic of study respondents is indicated in Table 1

Nurses' Knowledge Description on Management of Eclampsia /Preeclampsia
The maximum score was 39 points, while the lowest was 11 points with a variance of 30.75. The respondents' mean score for knowledge of preeclampsia/Eclampsia was 23.52 ±5.54. More than a half 91(51.7%) of respondent they knew the meaning of eclampsia. The majority of respondents, 158(89.8%), know the drug of choice to control the eclamptic fit. The majority of respondents, 139(79%), know a drug to give a woman with eclampsia when diastolic remains 110mmmHg after management. Most of the respondents 161(91.5%), know that an Early ANC visit is vital in preventing preeclampsia/Eclampsia. The majority of respondents, 161(91.5%), know that if the woman gets eclampsia, she/he should shout for help. For more information concerning the description of the respondent, knowledge see Table 2

The knowledge mean score was 23.52, the maximum score was 39 points, while the lowest was 11 points with a variance of 30.75. When the scores were categorized, the study showed that the respondents,129(73.3%) had high knowledge of the management of preeclampsia/ eclampsia while 47(26.7%) had low knowledge of preeclampsia /Eclampsia management as shown in figure 1

The Relationship between Nurses' Characteristics and Knowledge on Preeclampsia/Eclampsia
Variables which showed significant relationship with knowledge were level of health facility a nurse is working (p=0.015), type of health facility (*p=0.001*), number of nurses in the unit (p=0.015), number of patients served per day (*p=0.001*) and ever received on job training (*p=0.018*) Table 3

Factors Associated with Nurses' Knowledge on Management of Preeclampsia / Eclampsia
Before adjustment for confounder, the following variables were statistically significant were, type of the facility [Non government (OR =3.74 at 95%CI =1.62-8.633,

P <0.002)], number of patient served per day [40 to 50 patients(OR =2.708 at 95% CI =1.087 -6.745,P<0.032)],again number of patient served per day [60 and above patients(OR =10.875 at 95% CI =2.159 -54.766,P<0.004)] and nurse who got training /workshop of management of preeclampsia /Eclampsia [On job training (OR =0.333 at 95% CI =0.122 -0.91,*P<0.032*)]. (Table 4)

FIGURE 1: Categories of Knowledge

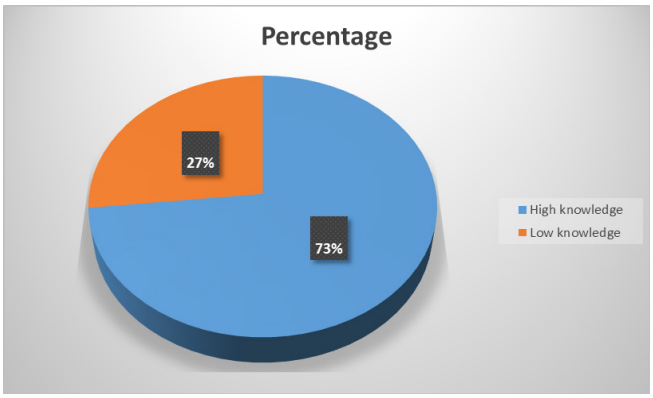

TABLE 1: Sociodemographic Characteristics of Study Respondents

Variable	Frequency (n)	Percent (%)
Age category		
Less than 25 years	23	13.1
26-35	83	47.2
36 and above	70	39.8
Gender		
Male	34	19.3
Female	142	80.7
Marital status		
Widowed	4	2.3
Married	102	58
Not married	70	39.8
Level of professional training		
Certificate in Nursing	44	25
Diploma in nursing	96	54.5
BSc Nursing and above	36	20.5
Years in the nursing profession		
Below three years	54	30.7
4 to 7 years	44	25
8 to 11 years	23	13.1
Above 12 years	55	31.3
Level of facility		
District hospital	91	51.7
Health center	49	27.8
Consultant hospital	18	10.2
Regional Referral Hospital	18	10.2
Type of health facility		
Government	112	63.6
Non-Government	64	36.4
Years working (experience) in the obstetric unit		
Below three years	48	27.3
4 to 7 years	77	43.8
8 to 11 years	22	12.5
Above 12 years	29	16.5
Orientation newly assigned in Obstetric		
Yes	114	64.8
No	62	35.2
Number of nurses in Obstetric units		
< 10	49	27.8
10 to 20	91	51.7
31 to 40	18	10.2
above 41	18	10.2
On the job training (workshop)		
Yes	39	22.2
No	137	77.8
Observing colleagues		
Yes	25	14.2
No	151	85.8
Job Aid reference		
Yes	38	21.6
No	138	78.4

Continue

TABLE 1: Continued

Factors Associated with Knowledge on the Management of Preeclampsia/Eclampsia after Adjustment for Confounders

After adjustment for confounder, the variable which were statistically significant was, nurses' who got on training /workshop of management of preeclampsia / Eclampsia [On job training (OR =0.333 at 95% CI =0.122 -0.91,P<0.032)], the following were confounders for knowledge on managing preeclampsia/eclampsia were level of professional training and newly graduate nurse or those shifted from other unit to get orientation or training on care of preeclampsia/eclampsia patient and other obstetric condition they were considered as confounders as they can contribute to the factors by 80% see Table 5 for more information

TABLE 2: Description of Respondent Knowledge Items

knowledge of preeclampsia/Eclampsia	Incorrect n(%)	Correct n(%)
What is eclampsia	85(48.3)	91(51.7)
What is the drug of choice for the management of eclamptic fit?	18(10.2)	158(89.8)
What is the dosage of magnesium sulfate loading dose?	111(63.1)	65(36.9)
What is the dosage of magnesium sulfate for maintenance dose?	83(47.2)	93(52.8)
What drug patient should be given if diastolic pressure remains 110mmHg or more?	37(21)	139(79)
What causes the fetus to suffer from Pre-eclampsia/eclampsia?	75(42.6)	101(57.4)
What is the sign of eclampsia?		
Visual disturbance	58(33)	118(67)
Convulsion	56(31.8)	120(68.2)
Low urine output or production	105(59.7)	71(40.3)
Does chronic hypertension predispose to eclampsia?	36(20.5)	140(79.5)
Does high body weight compare to height predispose to eclampsia?	111(63.1)	65(36.9)
Does carrying more than one fetus in a womb predispose to eclampsia?	124(70.5)	52(29.5)
Does a woman above 40 years of age predispose to eclampsia	86(48.9)	90(51.1)
Does Eclampsia lead to Cardiac failure?	87(49.4)	89(50.6)
Does Eclampsia lead to Visual loss?	114(64.8)	62(35.2)
Does Eclampsia lead to Postpartum haemorrhage?	59(33.5)	117(66.5)
Does Eclampsia lead to Early separation of the placenta?	82(46.6)	94(53.4)
Does attending the antenatal clinic as indicated prevent Eclampsia?	15(8.5)	161(91.5)
Does the use of an aspirin supplement prevent Eclampsia?	140(79.5)	36(20.5)
Does reducing body weight prevent Eclampsia?	128(72.7)	48(27.3)
Does doing light exercises prevent Eclampsia?	125(71)	51(29)
Does shout for help needed during fit?	15(8.5)	161(91.5)
Does ensure the woman's airway is open needed during fit?	65(36.9)	111(63.1)
Does giving an antihypertensive drug needed during fit?	42(23.9)	134(76.1)
What care should be provided to a woman after convulsion?		
Should I give oxygen 4-6 litres per minute by mask if available?	105(59.7)	71(40.3)
Should I observe colour for cyanosis and the need for oxygen?	33(18.8)	143(81.3)
Should I Aspirate the mouth and throat as necessary?	77(43.8)	99(56.3)
What physical examination is needed to the patient after convulsions/fits	63(35.8)	113(64.2)
What is the recommended intravenous line for managing eclampsia?	42(23.9)	134(76.1)
Which sign/symptoms differentiate a patient with Eclampsia from other hypertensive disorders?	88(50)	88(50)
What is the sign of magnesium toxicity?	42(23.9)	134(76.1)
Should I assess respiratory rate? Is the respiratory rate at least 16 per minute?	81(46)	95(54)
Should I assess patellar reflexes? Are Patellar reflexes present?	42(23.9)	134(76.1)
Should I Assess urinary output? Is Urinary output at least 30 mL per hour over the preceding four hours?	95(54)	81(46)
Does a woman with Eclampsia given magnesium sulfate after delivery?	26(14.8)	150(85.2)
If yes, for how long women with eclamptic fit should be given magnesium sulfate?	63(35.8)	113(64.2)
What is the immediate measure in case of magnesium toxicity?		
Can I Withhold or delay the drug?	111(63.1)	65(36.9)
Can I assess ventilation?	136(77.3)	40(22.7)
Can I give Calcium Gluconate 1gm (10 ml in 10% solution)	32(18.2)	144(81.8)
Can I give hydralazine?	8(4.5)	168(95.5)

TABLE 3: The Relationship Between Nurses' Characteristics and Knowledge on Pre-Eclampsia/Eclampsia

Variable	Inadequate knowledge n (%)	Adequate knowledge n (%)	X^2	P-Value
Age of respondents			1.376	0.503
Less than 25 years	5(21.7)	18(78.3)		
26-35	20(24.1)	63(75.9)		
36 and above	22(31.4)	48(68.6)		
Gender			0.805	0.369
Male	7(20.6)	27(79.4)		
Female	40(28.2)	102(71.8)		
Marital status			1.485	0.476
Widowed	2(50)	2(50)		
Married	25(24.5)	77(75.5)		
Not married	20(28.6)	50(71.4)		
Level of professional training			4.54	0.103
Certificate in Nursing	17(38.6)	27(61.4)		
Diploma in nursing	23(24)_	73(76)		
BSc Nursing and above	7(19.4)	29(80.6)		
Years in the nursing profession			1.774	0.621
Below 3 years	11(20.4)	43(79.6)		
4 to 7 years	12(27.3)	32(72.7)		
8 to 11 years	7(30.4)	16(69.6)		
Above 12 years	17(30.9)	38(69.1)		
Level of health facility			10.396	0.015
Health center	24(26.4)	67(73.6)		
District hospital	19(38.8)	30(61.2)		
Regional Referral Hospital	0(0)	18(100)		
Consultant hospital	4(22.2)	14(77.8)		
Type of health facility			10.367	0.001
Government	39(34.8)	73(65.2)		
Non-Government	8(12.5)	56(87.5)		
Years of work (experience) in obstetric unit			2.036	0.565
Below 3 years	13(27.1)	35(72.9)		
4 to 7 years	17(22.1)	60(77.9)		
8 to 11 years	7(31.8)	15(68.2)		
Above 12 years	10(34.5)	19(65.5)		
Newly graduate nurse or those shifted from other unit within 3 months.			3.769	0.052
Yes	25(21.9)	89(78.1)		
No	22(35.5)	40(64.5)		
Number of nurses in obstetric unit			10.396	0.015
< 10 nurses	19(38.8)	30(61.2)		
10 to 20 nurses	24(26.4)	67(73.6)		
21 to 40 nurses	4(22.2)	14(77.8)		
41 nurses	0(0)	18(100)		
Number of patients served per day			16.564	0.001
Below 10	12(42.9)	16(57.1)		
20-30	15(44.1)	19(55.9)		
40-50	18(21.7)	65(78.3)		
Above 60	2(6.5)	29(93.5)		
Having training on Preeclampsia/Eclampsia Got On Job training workshop			4.934	0.018
Yes	5(12.8)	34(87.2)		
No	42(30.7)	95(69.3)		

TABLE 4: Predictors of Nurses' Knowledge on the Management of Preeclampsia and Eclampsia Before Adjusting for Confounders

Univariate analysis

Variables	OR	CI		p-value
		Lower	Upper	
Level of professional training				
Certificate in Nursing	1			
Diploma in nursing	1.998	0.928	4.302	0.077
BSc Nursing and above	2.608	0.936	7.266	0.067
Level of health facility				
Health center	1			
District hospital	0.566	0.27	1.185	0.415
Regional Referral Hospital	578677556	0	.	0.131
Consultant hospital	1.254	0.376	4.184	0.998
Type of health facility				
Government	1			
Non-Government	3.74	1.62	8.633	0.002
Newly graduate nurse or those shifted from other unit within 3 months.				
Yes	1			
No	0.511	0.258	1.012	0.054
Number of nurses in obstetric unit				
< 10 nurses	1			
10 to 20 nurses	1.768	0.844	3.706	0.131
21 to 40 nurses	2.217	0.634	7.745	0.212
41 nurses	1.023E+09	0	.	0.998
Number of patients served per day				
Below 10	1			
20-30	0.95	0.346	2.606	0.921
40-50	2.708	1.087	6.745	0.032
Above 60	10.875	2.159	54.766	0.004
Having training on Preeclampsia/Eclampsia Got On Job training workshop				
Yes	1			
No	0.333	0.122	0.91	0.032

TABLE 5: Factors Associated with Knowledge on the Management of Preeclampsia/Eclampsia After Adjustment for Confounders

Multivariate analysis

Variables	AOR	CI		p-value
		Lower	Upper	
Level of professional training				
Certificate in Nursing	1			
Diploma in nursing	1.415	0.603	3.322	0.425
BSc Nursing and above	2.673	0.854	8.36	0.091
Type of health facility				
Government	1			
Non-Government	2.747	0.868	8.693	0.086
Newly graduate nurse or those shifted from other unit				
Yes	1			
No	1.259	0.511	3.103	0.617

Continue

TABLE 5: Continued

Variables	AOR	CI		p-value
		Lower	Upper	
Number of patients served per day				
Below 10	1			
20-30	1.203	0.38	3.815	0.753
40-50	2.484	0.927	6.652	0.07
Above 60	5.407	0.862	33.92	0.072
Having training on Preeclampsia/Eclampsia Got On Job training workshop				
Yes	1			
No	0.317	0.106	0.946	0.039

DISCUSSION

The study found that A total of 129(73.3%) of nurses had high knowledge on management of pre-eclampsia/ eclampsia while 47(26.7%) had low knowledge
This implies that more than half of the respondents had high knowledge on management of preeclampsia/ eclampsia Similarly study done In Tanzania reported that nurses had adequate knowledge.[1]

Concomitantly Inadequate knowledge of service provider on management was also reported in a previous study in Democratic republic of Congo.[16] Again, a similar study done in Bujumbura reviels knowledge gap pertaing to hypertension in pregnancy among health care providers[17] moreover study conducted in Zanzibar reviels inadequate knowledge of service providers.[18] The reason for deference in results could be; geographical location, sample size, method of analysis and type of respondents.

Moreover study also showed those who get on job training as statistically significant,this was similar to study done in Zanzibar showed those get on job training had knowledge.[18] This was similar to a study conducted in Dar-es-Salaam –Tanzania, Bangladesh, and Nigeria, the result showed those who did not get on-job training have less knowledge than those who get training. Possibly the reason for similarities could be geographical location.[19,15,20]

CONCLUSION

This study reveals high knowledge on the management of preeclampsia/Eclampsia among nurses working in the Kilimanjaro region, Tanzania. Moreover, it revealed that nurses who had on job training on management of preeclampsia /Eclampsia were predictor of knowledge among nurses. These findings reveal a need for Further research to be undertaken using a mixed approach to explore factors influencing nurses' knowledge and perceived barriers to managing preeclampsia/ Eclampsia in the Kilimanjaro region.

For advanced educational strategies to raise knowledge on the management of preeclampsia/eclampsia among nurses.

Limitation of the study

The data collection was done for four weeks to obtain data. During data collection, respondents were busy with patient care, which led the researcher and assistant researcher to wait until they finish their activaties. To overcome this limitation, the researcher decides to be tolerant to adhering to the timetable of respondents. this made the researcher collect the data beyond the time given

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ORIGINAL ARTICLE

Assessing Essential New-Born Care Knowledge, Skills and Associated Factors among Nurses/Midwives in Zanzibar: A Cross-Sectional Study

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ABSTRACT

Background: Essential newborn care (ENC) is one of the significant strategies for neonatal survival, especially immediately after delivery. Nurses and midwives are the key healthcare providers who care for neonates immediately after birth, their knowledge and skills on ENC are very important for the preventable causes of neonatal deaths. Therefore, this study aimed to assess essential newborn care knowledge and skills among nurses/midwives in Zanzibar

Methods: A hospital-based analytical cross-sectional study that included 246 nurses-midwives was conducted in Zanzibar from January to February 2021. The purposive sampling method was used to select district and regional hospitals. Simple random sampling was used to select primary health facilities. A systematic random sampling technique was used to select study participants. A standard structured self-administered questionnaire was used. Predictors of knowledge and skills of ENC were determined using Binary Logistic regression under multivariate analysis using SPSS version 23.0. P<.05 was considered to be significant.

Result: Among the total (246) participants, 89 (36.2%) and 66 (26.8%) had adequate knowledge and appropriate skills of ENC, respectively. Having a BSc in Nursing (AOR = 8.83, 95%CI = 2.00-38.96) and the presence of guidelines (AOR = 3.52, 95%CI = 1.59 -7.80) were significantly associated with knowledge of ENC. Residing in Pemba (AOR = 0.30, 95%CI = 0.11- 0.80), availability of staff (AOR = 0.80, 95%CI = 0.02-0.32), adequate knowledge (AOR = 2.80, 95%CI = 1.15-6.84) were factors significantly associated with ENC skills.

Conclusion: Generally, nurses-midwives had suboptimal knowledge and skills on essential newborn care. Nurses-midwives are in urgent need of positive supportive supervision and low-dose– high-frequency skills training in ENC for the prevention of neonatal morbidity and mortality. Also, policymakers should be aware of this gap and should plan necessary interventions to close the gap to resecure newborns' survival.

BACKGROUND

Globally, new-born deaths were estimated to reach 2.5 million in 2018. From these, nearly 7,000 new-born deaths were documented per day.[1] Among these, 99% of the deaths occur in low-income nations and occur in the early stages after birth.[1] In Sub-Saharan Africa, the neonatal mortality rate was approximately 28/1000 live births.[1] In East African countries, the neonatal mortality rate ranges between 42 and 49 neonatal death per 1000 live births.[2] In Tanzania, from 2010 to 2015, neonatal and infant mortality rates were between 25 and 43 deaths per 1000 live births, respectively.[3]

Essential new-born care is one of the significant strategies recommended by the WHO to promote the well-being of neonatal and prevent preventable neonatal deaths which usually happen within the first few days of life after birth.[6] WHO delineates Essential New-born Care (ENC) as an all-inclusive strategy developed to strengthen the new-borns health by making interventions before pregnancy, during pregnancy, soon after birth, and during postnatal.[5] These interventions, as recommended by WHO are crucial for all newborns irrespective of their socio-demographic factors [1]

The availability of skilled nurses and/or midwives to provide ENC prevents 75% of new-born deaths during delivery and postnatal period, respectively.[5] However, three-fourths of nurses/ midwives do not have the necessary skills to provide ENC as documented in a study conducted in Nigeria.[6] This finding is against the WHO's recommendation regarding the availability of skilled personnel for provision of ENC to every baby after birth.[7]

Newborn deaths associated with conditions that are linked to poor quality of care during delivery can be easily prevented with proven cost-effective interventions.[8]

The purpose of the package for essential newborn care

is to prevent and reduce neonatal mortality and morbidity.[3] Factors that associated with essential new-born care for nurses and/or midwives have been associated with; lack of essential new-born care guidelines, lack of training related to ENC, shortage of staff in the respective units, lack of important equipment, and inadequate training and supervision.[9]

This study, therefore, aimed to assess essential new-born care knowledge and skills and associated factors among Nurses/Midwives in Zanzibar, Tanzania.

METHODOLOGY

Study Design and Setting

This study was a hospital-based analytical cross-sectional study involving quantitative approach. The study was conducted on 2 main islands; Pemba and Unguja in Zanzibar from January to February 2021. According to the National Census of 2012, Zanzibar had a total population of about 1,303,579, whereby Unguja was populated with a total of 898,721 people. In Zanzibar, healthcare service system is categorised into 3 levels: primary level comprises 122 Primary Health Care Units and Centres (PHCUs), among these, 53 are located in Pemba and 69 are located in Unguja, secondary level consists of 2 districts' hospitals situated in Pemba and one regional hospital situated in Unguja and tertiary level includes 2 specialised Hospitals located in Unguja. All health facilities mentioned above provide maternal and neonatal health services except for 40 PHCUs. The number of newborn birth in Zanzibar was estimated to be 41,639 in 2018.[10] The neonatal mortality rate was 28 deaths per 1000 live births in 2015.[11] Zanzibar was selected for this study because it has a high prevalence of neonatal mortality rate.

Study Population

This study involved 246 nurses/midwives working in the delivery rooms, neonatal and premature units in selected public health facilities in Zanzibar. We included nurses/midwives who were employed for at least one year before the time of data collection.

Inclusion/ Exclusion Criteria

Only nurses/ midwives working in selected health facilities and were willing to participate in the study were included. All study participants consented to participating in this study. Nurse/midwives who did not consent were excluded.

Sample Size and Sampling Technique

Sample Size Determination

Sample size was calculated by using the Kish Leslie formula for cross-sectional study as it was used in our previous study conducted in Northeast Ethiopia [12].

$n = Z^2 p(1-p)/ e^2$.

Where n = minimum required sample size, z = confidence level at 95% (standard value of 1.96), and p = proportion of the estimated ENC, and marginal error of 0.05. We assumed the proportion to be 17.7% as was reported in a previous study which was conducted in Tigray, Ethiopia on Knowledge and practice of immediate new-born care among midwives [13]

Therefore, the sample size was 222 and by assuming a 20% non-response rate, the final sample size (i.e.246*(1/1 −0.10)) turned to be 267.

Sampling Technique

Tertiary and regional hospitals were purposively selected with reason: having high number of new-borns. Simple random sampling method using the lottery replacement method was used to select 2 district hospitals, 4 cottage hospitals, and 31 Primary Health Care Centres (PHCC). Records of nurse and/ or midwives in all the 37 selected health facilities were reviewed. A total of 1,548 nurse and/ or midwives at all selected health facilities was observed. Proportionate Sampling technique was used to obtain the required number of nurses and/or midwives from each of the selected hospital using formula; ni = (Ni/Nt) × n as used in a previous study.[12] Where ni = required number of study participants from a given hospital, Ni = required sample size for the study, Nt = total number of nurses and/ or midwives from all selected hospitals, and n = number of nurses and/ or midwives in each of the selected health facility. The total number of nurse-midwives in the selected health facilities (n=1,548) and the sample size of 271 was proportionately allocated to the 37 health facilities. Study participants were selected using systematic random sampling technique in each given hospital. Nurses/Midwives who were able to respond to questions were approached after working hours.

Data Collection Methods and Tools

A self-administered questionnaire was used to collect data on; knowledge, and reported skills of nurse-midwives on immediate new-born care and observational checklist for facility infrastructure, equipment, supplies and drugs used for ENC. The questionnaire was adopted from a previous study which was conducted in Ethiopia.[9]practice and associated factors among healthcare providers in Northwestern Zonal health facilities Tigray, Ethiopia, 2018. Results: Among the total healthcare providers, who participated in this study, 64.8% had good knowledge and 59.8% of the respondents had a good level of essential newborn care practice. Unavailability of adequate materials (like guidelines, drug, etc. The questionnaire was in line with the WHO guidelines for essential newborn care.[13] The questionnaire was modified to fit the study's local context and purpose of the study. The tool was pretested on 27 (10%) of the total respondents. Nurse-midwives included in the pre-test were not included in the study. Following the pre-test, corrections to items that were not clear were made. The internal consistency of the tool for data collection was determined using Cronbach's alpha test, where alpha was found to be 0.87 for the tool assessing nurse-midwives knowledge on ENC. The questionnaire was organised into 3 parts: Part 1, was about the socio-demographic characteristic of nurse/midwives, part 2 included 6 questions for assessing nurses/midwives' knowledge of ENC, and part 3 contained 9 questions, which assessed the reported skills using 4 points Likert scale.[13] The checklist was used for; recording drugs, supplies, equipment, and infrastructure which are used in ENC and was adopted from a previous study that was conducted in Ethiopia.[7] The labour rooms, Operation Theatres (OTs), and Paediatric wards were examined for presence of New-born Care Corners (NCC). The NCC is defined as a special space within the labour room, OT and paediatric wards specifically for providing immediate

newborn care to all new-borns.[14] NCC area is equipped with radiant warmer to maintain neonate's temperature, also equipped with a resuscitation-kit for reviving asphyxiated neonates. Four research assistants (qualified registered nurses) were trained on how to collect data using the questionnaire and the observational checklist. Also, they were trained on ethical issues including confidentially.

Variable and Measurement

Knowledge related to ENC was measured in response to 6 multiple choice questions. Those who scored above or equal to mean were considered as having adequate knowledge and those who scored below mean were considered as having inadequate knowledge. Reported skill regarding ENC was having 9 items and it was measured in response to 4 points Likert scale: "4" Consistently, "3" Regularly, "2" Rarely, and "1" Never.[15] The nurse/midwives were asked to state how they perform ENC using the following clinical skills; observing the newborn at birth, drying the baby with a dry towel immediately after birth, and stimulate the baby while drying, assessing breathing and colour, early skin-to-skin placement, assessing eyes and apply tetracycline, examination of a newborn after delivery and before discharge, give vitamin K injection intramuscular on anterior mid-thigh and observation at the site of injection. Interpretation was as follows: good practice: if the nurse-midwives responded positive to more than or equal to 70% the practice procedures. Poor practice: if the nurse-midwives responded positive to less than 70% of the practice procedures.[16]

Data Analysis

Statistical Package for a Social Sciences (SPSS v. 20) software program was used for data entry, processing, and analysis. Descriptive statistics were used to analyse the demographic characteristics of the respondent and results were presented in proportions. Pearson Chi-square statistical test was used to assess the association between categorical variables. To account for possible confounder while assessing the factors associated with ENC knowledge and skills, multiple logistic regression models were employed. The models included several variables reported to be associated with ENC knowledge and skills.[16-18] A *p-value* of less than .05 was considered significant.

Ethical Approval and Consent to Participate

Ethical approval was obtained from research and publication committee of the Dodoma University with approval no. Ref. MA.84/261/01/94. Verbal consent was requested from the participants after explaining the purpose of the study. A request for signing the written informed consent was made after the participants agreed to participate in the study. Participants were involved in this study voluntarily and were allowed to withdraw from the study at their convenience. In order to protect autonomy, privacy and confidentiality of participants, we used codes instead of actual names of the study participants and only principal researchers and the assistants were having access to the filled questionnaires.

RESULTS

A total of 246 nurses/midwives participated in this study accounting to a 92.1% response rate. Participants were aged between 24 to 53 years with a mean age of 33.11 ± 5.96 years. The majority of the participants 232 (94.3%) were female. Most of them 147 (59.8%) were residing in Unguja. The majority of participants 174 (70.7%) had Ordinary Education Level. Regarding qualification, the majority 226 (91.9%) of them had a diploma in nursing. Most of the participants 77 (31.3%) had working experience of 3 to 4 years. Regarding health facility level, majority of the participants 180 (73.2%) were working in primary health care plus (Table 1).

Availability of Essential Guideline, Equipment, Supplies and Drugs at the Point of Care

Out of the 38 health facilities visited, only 9 (23.7%) had guidelines for ENC. The assessment also observed critical shortage of ENC supplies and drug, majority of hospitals had inadequate supplies and drugs (Table 2)

Knowledge and Skills of Nurses/Midwives Regarding Essential New-born Care

The majority 89 (36.2%) and 66 (27%) of participants had adequate knowledge and appropriate skills regarding essential newborn care, respectively (Figure 1).

Association between Knowledge and Socio-demographic Characteristics among Nurses- Midwives towards Essential New-born Care

Univariate results indicated that, knowledge of essential newborn care was significantly associated with age, residence, professional qualification, health facility level, work experience, ENC training, availability of ENC guidelines, availability of drugs and supervision. After controlling for confounders, nurse/midwives' knowledge was significantly associated with professional qualification and availability of ENC guidelines. Respondents with a Bachelor of Science in Nursing were significantly (8.8 times) more likely to have adequate knowledge compared to those with a diploma in Nursing (AOR=8.83, *p=.0040*). Those nurses/ midwives who had ENC guidelines were significantly more likely to have adequate knowledge compared to those who had no guidelines in their facilities (AOR=3.52, *p=.0020*). Other factors, like supervision, shortage of staff, availability of drugs, ENC training, and demographic characteristics were not significantly associated with knowledge (Table 3).

The Reported Skills of Essential New-born Care

The majority of respondents, 166 (67.5%), stated that they care for newborns immediately after delivery; of them, 106 (43.1%) agreed to dry babies with dry towels immediately after birth. 10 (4.1%) strongly agreed that they assess newborn's respiration and color. 14 (5.7%) of them outright agreed to cut umbilical cords between 1 and 3 centimeters. Only 10 (4.1%) nurse-midwives strongly agree to apply tetracycline and care for the newborn's eyes. Most participants 63 (25.6%) strongly agreed to conduct a physical examination of the newborns immediately after birth and before discharge. Most of the participants, 63 (25.6%) strongly agreed to place the newborns skin-to-skin contact with their mothers and early initiation of breastfeeding immediately after the baby is born (Table 4).

Factors Associated with Skills Regarding Nurses/ Midwives on Essential Newborn Care

After controlling for confounders, nurse/midwives residing in Pemba were significant less likely to have appropriate skills as compared to those residing in Unguja (AOR=0.30, *p=.0242*). With regard to shortage of staff, it was noted that respondents who reported to have shortage of staffs were significant less likely to have appropriate skills as compared to those with enough staff (AOR=0.08, *p=.0003*). Respondents who had knowledge on essential newborn care were almost 3 times more likely to have appropriate skills compared to respondents with inadequate knowledge (AOR=2.80, *p=.0235*) (Table 5).

TABLE 1: Demographic Characteristics of Respondents (N=246)

Variable	Frequency (n)	Percent (%)
Age (years)		
24-30	107	43.5
31-40	107	43.5
41 and above	32	13.0
Sex		
Male	14	5.7
Female	232	94.3
Residence		
Unguja	147	59.8
Pemba	99	40.2
Educational level		
O level	174	70.7
A level	72	29.3
Personal qualification		
Diploma of Nursing	226	91.9
Bachelor of Nursing	20	8.1
Working experience (years)		
1-3	69	28.1
4-6	77	31.3
7-9	55	22.4
10+	45	18.3
Health facility level		
Hospital	66	26.8
Primary Health care +	180	73.2
In service training		
Yes	82	33.3
No	164	66.7
Number of in-service trainings		
One to two	52	21.1
Three and above	30	12.2

TABLE 2: Availability of Essential Guidelines, Equipment, Supplies, and Drugs at the Point of Care

Guideline, equipment, supplies, and drugs	Health facilities		
Guideline	District Hospital n =3	Cottage hospitals n = 4	Primary health care centers (PHCC) n =31
Guidelines or protocol for essential newborn care	1 (33.3%)	2 (50.0%)	6 (19.4%)
Supplies and equipment			
Sterile scissors or blade	2 (66.7%)	1 (25.0%)	10 (32.0%)
Sterile disposable cord ties or clamps	3 (100.0%)	3 (75.0%)	10 (32.0%)
Towel or blanket to wrap baby	1 (33.3%)	1 (25.0%)	0 (0.0%)
Functional ambu bag (250 or 500mL self-inflating bag)	1 (33.3%)	1 (25.0%)	5 (16.1%)
Functional mask size 0 (preterm and low–birth-weight baby)	1 (33.3%)	1 (25.0%)	5 (16.1%)
Functional mask size 1 (term baby)	1 (33.3%)	1 (25.0%)	5 (16.1%)
Drugs			
Tetracycline ointment	2 (66.7%)	3 (75.0%)	11 (35.5%)
Injectable vitamin K	1 (33.3%)	1 (25.0)	4 (12.9%)

TABLE 3: Factors Associated with Knowledge and Socio-demographic Characteristics among Nurses/ Midwives (N=246)

Variable	Unadjusted analysis		Adjusted analysis	
	OR[95%CI]	p-value	AOR[95%CI]	p-value
Age (years)				
24-30	Reference			
31-40	2.92[1.57,5.44]	.0007	1.53[0.42,5.51]	.5164
41+	15.54[5.90,40.94]	<.0001	6.41[0.84,48.74]	.0728
Resident				
Unguja	Reference			
Pemba	0.57[0.33,0.99]	.0453	0.45[020,1.01]	.052
Educational level				
O-level	Reference			
A-level	0.36[0.19,0.69]	.0021	0.55[0.21,1.46]	.2298
Profession qualification				
Diploma of Nursing	Reference			
Bachelor of Nursing	12.37[3.51,43.57]	<.0001	8.83[2.00,38.96]	.004
Health facility level				
Hospital	3.53[1.96,6.35]	<.0001	1.59[0.43,5.95]	.4886
Primary Health Care plus	Reference			
Work experience (years)				
1-3	Reference			
4-6	0.87[0.38,1.99]	.7468	0.560.17,1.89]	.353
7-9	4.07[1.85,8.98]	.0005	2.25[0.51,9.98]	.2874
10+	9.67[4.05,23.12]	<.0001	2.30[0.34,15.82]	.3964
Training ENC				
Yes	4.03[2.30,7.07]	<.0001	1.75[0.72,4.26]	.2205
No	Reference			
Present guideline				
Yes	3.23[1.86,5.60]	<.0001	3.52[1.59,7.80]	.002
No	Reference			
Availability of drugs				
Yes	3.75[1.98,7.13]	<.0001	2.28[0.87,5.95]	.0927
No Reference				
Shortage of staffs				
Yes	0.47[0.21,1.09]	.079	0.87[0.28,2.75]	.8129
No	2.11[0.92,4.85]			
Supervision				
Yes	3.43[1.65,7.12]	.0009	0.79[0.26,2.44]	.6822
No	Reference			

TABLE 4: Reported Skills Regarding Nurses/Midwives on Essential Newborn Care

Variable	Never=1 n (%)	Rarely=2 n (%)	Regularly=3 n (%)	Consistently=4 n (%)	Mean (SD)
Observing newborn at birth	48(19.51)	21(8.54)	166(67.48)	11(4.47)	2.68(0.69)
Immediately after birth dry the baby with a dry towel	42(17.07)	22(8.94)	106(43.09)	76(30.89)	2.96(0.92)
Assessing the breathing and color of the newborn,	92(37.40)	56(22.76)	88(35.77)	10(4.07)	2.21(0.84)
Cutting cord 1_3cm	122(49.59)	67(27.24)	43(17.48)	14(5.69)	2.02(0.82)
Assessing eyes and applying tetracycline	126(51.22)	52(21.14)	58(23.58)	10(4.07)	2.11(0.76)
Place the baby skin-to-skin contact and early initiation of breastfeeding	38(15.45)	30(12.20)	115(46.75)	63(25.61)	2.86(0.94)
Give vitamin K injection IM on anterior mid-thigh	112(45.53)	109(44.31)	22(8.94)	3(1.22)	1.67(0.69)
observing the site of injection.	116(47.15)	57(23.17)	63(25.61)	10(4.07)	2.11(0.80)
Examination of a newborn after delivery and before discharge	116(47.15)	91(36.99)	29(11.79)	10(4.07)	1.83(0.79)
Overall skills	180(73.17)	0(0.00)	66(26.83)	0(0.00)	2.27(0.44)

TABLE 5: Association between Skills, Knowledge, and Social-demographic characteristics among Nurses/ Midwives toward ENC (N=246)

Variable	Unadjusted analysis OR [95%CI]	p-value	Adjusted analysis OR [95%CI]	p-value
Age (years)				
24-30	reference			
31-40	1.54 [0.81,2.95]	0.1915	0.98 [0.21,4.64]	0.9833
41+	5.59 [2.39,13.10]	<0.0001	0.50 [0.05,5.20]	0.5644
Resident				
Unguja	Reference			
Pemba	0.30 [0.16,0.58]	0.0004	0.30 [0.11,0.86]	0.0242
Educational level				
O level	Reference			
A level	0.57 [0.29,1.10]	0.0952	0.85 [0.30,2.47]	0.7698
Personal qualification				
Diploma of Nursing	reference			
Bachelor of Nursing	3.80 [1.50,9.66]	0.0050	1.64 [0.48,5.62]	0.4307
Health facility level				
Hospital	1.88 [1.02,3.45]	0.0425	1,41 [0.33,5.95]	0.6429
Primary Health care +	Reference			
Working experience (years)				
1-3	reference			
4-6	0.60 [0.26,1.41]	0.2428	0.92 [0.21,3.96]	0.9077
7-9	1.35 [0.59,3.08]	0.4755	1.11 [0.20,6.33]	0.9053
10+	4.50 [1.98,10.22]	0.0003	4.89 [0.54,44.10]	0.1570
Training ENC				
Yes	2.45 [1.37,4.38]	0.0026	1.59 [0.62,4.13]	0.3371
No	Reference			

Continue

TABLE 5: Continued

Variable	Unadjusted analysis OR [95%CI]	p-value	Adjusted analysis OR [95%CI]	p-value
Present guideline				
Yes	2.80 [1.54,5.09]	.0007	1.51 [0.61,3.77]	.3748
No	Reference			
Availability of equipment				
Yes	0.52 [0.29,0.92]	.0242	0.64 [0.23,1.79]	.3978
No	Reference			
Availability of drugs				
Yes	2.60 [1.36,4.98]	.0038	2.15 [0.73,6.38]	.1661
No	reference			
Shortage of staffs				
Yes	0.07 [0.023,0.185]	<.0001	0.08 [0.02,0.32]	.0003
No	Reference			
Supervision				
Yes	2.56 [1.23,5.31]	.0116	0.77 [0.24,2.47]	.6574
No	Reference			
Knowledge				
Adequate	5.60 [3.05,10.31]	<.0001	2.80 [1.15,6.84]	.0235
In adequate	Reference			

DISCUSSION

Essential newborn care is of paramount important for the health of the newborn and its survival. Midwives' adequate knowledge and appropriate skills on ENC at time of delivery and afterwards determine the newborn's health outcome.[14] Additionally, research shows that effective skills of ENC avert about 50% to 75% of newborn deaths during delivery and postnatal period respectively[5], as this highly depends on the competence of nurse/ midwives on how they provide ENC. Key findings in this study include positive association between professional qualification, availability of guideline and nurse/midwives' adequate knowledge on ENC. On the other hand, ENC skills were positively associated with midwives residing in Pemba (urban), availability of staff and adequate knowledge.

In the current study, only 36.2% of midwives had adequate knowledge on ENC. This result is more or less similar to results observed in a study conducted in Uganda which reported ENC among midwives to be at 46.5%.[19] Contrary to our findings, a study conducted in Ethiopia reported that 74.7% of the midwives had adequate knowledge on newborn care [18]504, out of this 84,437 was from neonatal death and this mortality is related to immediate obstetric and newborn care of babies provided by health care providers; But little was known about the level of knowledge and practice related to immediate newborn care and their associated factors among health care providers generally in Tigray region and specifically in the Eastern Zone so the aim of this study was to assess knowledge and practice of immediate newborn care and associated factors among health care providers in the Eastern zone public health facilities, Tigray, Ethiopia. Methods: A cross-sectional study was conducted from December 2015 to February 2016. A total of 16 health care facilities were selected for study using simple random sampling techniques and all health care providers in the selected health care facilities who participated in immediate newborn care were involved in the study. Data were entered, cleaned and analyzed using SPSS version 20.0. Ethical clearance was obtained from Adigrat University institutional ethical review board and Tigray regional health bureau. Consent was obtained from participants to conduct the study. Result: In this study 215 participants were contacted, with a response rate of 99.1%. Generally, from the health care providers who participated in this study, 74.65% had adequate knowledge on newborn care and overall 72.77% of the participants were having good newborn care practice. Among the health care providers participated in the study, 151 (70.9%. Another study conducted in Afghanistan by reported that 66% of midwives had adequate knowledge on ENC.[20]

Baseline findings from study conducted in Zambia also reported contrary findings of nurses' knowledge (65%) on ENC.[21] This study's finding is smaller compared to findings of a study done in Ethiopia (57.9%).[7] The difference observed might be due to the in-service training regarding ENC and professional qualification. In our study, midwives who received in-service training on ENC and diploma in nursing were only 33.3% and 91.9%, respectively. Study done in Northwest Ethiopia and eastern Tigray reported that obstetric health care providers who received in-service training were 45.3% and approximately 70%, respectively. Moreover, participants in the study conducted in Northwest Ethiopia and eastern Tigray who had diploma in nursing were 46.8% and 69.6%, respectively.[14]

Regarding midwives' skills for ENC, only 27% of them had appropriate skills. Our finding was contrary to study conducted in Ethiopia by Asteray et al which

reported that 62.7% of obstetric care providers had appropriate ENC skills.[19] Another study conducted in Tigray, Ethiopia in 2016 reported that, 72.8% of the study participants had appropriate ENC skills.[16] The difference observed in our study and other studies' findings may be associated with low level of professional qualification as majority (91.9%) of nurse and / or midwives in our study were having a diploma in nursing and with inadequate in-service training. It is reported that regularly in-service training regarding ENC improves daily hands-on skills.[16]

In the current study, nurse-midwives who had a bachelor degree were almost 9 times more likely to have adequate knowledge on ENC compared to those with diploma level of education. This keeps in line with findings reported elsewhere.[22, 23] The similarity in the findings may be due to the training curriculum and the duration of training. In our study's area, training for diploma in nursing is for 3 years without internship meanwhile bachelors of science in nursing is for 4 years plus an additional 1 year for internship. Thus, nurses with bachelors of science in nursing have more exposure in neonatal care compared to those with a diploma in nursing.

Availability of guideline on ENC in this study was positively associated with adequate knowledge. This observation is similar to results of a study conducted in Tigray, Ethiopia which reported that, availability of materials including guidelines for ENC were significantly associated with adequate knowledge and practice of ENC.[9]

Working experience of 7 years and above was a predictor for nurses-midwives' knowledge on ENC. However, it was not statistically significant. This keeps in line with the findings reported in a study conducted in Tanzania which reports that nurses who had 5 years and above working experience had adequate knowledge on newborn resuscitation.[18]

This study also assessed midwives' skills on essential newborn care. Eight important components of ENC were assessed. These include; stimulation of baby to breath, assessment of breathing, the newborn being kept warm immediately after birth, cord-care, initiating breastfeeding within the 1st hour of delivery, administration of eye ointment, and administration of vitamin K.[23] Majority (95%) of the participants claimed that they comply with ENC guidelines. However, when observed while conducting deliveries, they had poor skills relating to ENC. For example, only 39. 84% assessed breathing and the colour of the newborn, 27.65% of the midwives assessed the eyes of the newborn and applied tetracycline; 15.86% examined the newborn after delivery, 10.16% placed the baby's skin to skin contact of the mom's abdomen and ensured initial breastfeeding; 29.68% gave injection of Vitamin K, and only 26.83% observed infections of the code.

Indeed, the nurse-midwives' skills are poor to an alarming situation. This observation is backed-up by finding from other studies which reports that the knowledge of nurses/ midwives is inadequate.[25,26] This situation poses threats to not only the health of the newborn baby, but also to the health of their mothers. It doesn't appeal into the intuition that a nurse who performs poorly to newborns would, for example, do better in taking care of a Caesarean section wound. The poor skills observed through this research could explain why 99% of the deaths occur in low-income nations and occur, particularly in the early stages after birth.[1], Zanzibar being among the countries with high mortality rates. While low knowledge of ENC among nurses and/ or midwives could be the reason for the poor skills, lack of staff nurses-midwives and poor facilities form another reason for the poor skills. It is argued that there are poor quality facilities in the third world countries and thus the increasing number of newborn death.[24] Another cause of inappropriate ENC skills may be due to unavailability of guideline for ENC in the labour wards.

Nurse/midwives who were having adequate knowledge on ENC were almost 3-fold more likely to have appropriate skills. This keeps in line with findings of a study conducted elsewhere which reported that high odds of inadequate knowledge influence poor practice of ENC.[25] In another study conducted in Ethiopia, adequate knowledge was found to be significantly associated with good practice on ENC.[26] A similar study conducted among Health Professionals in Governmental Health Facilities of Bahir Dar City and Gulomekada District also reported that good knowledge regarding ENC influence appropriate practices.[27]

Regarding shortage of staff, the current study found that health facilities with shortage of staff were less likely (AOR = 0.08) to have appropriate skills related to ENC. Similar findings were reported in a study conducted in Northeast Ethiopia.[25] Research shows that effective skills of ENC avert about 50% to 75% of newborn deaths during delivery and postnatal period respectively[5], and this is highly dependent on the competence of nurse/ midwives.

CONCLUSION AND RECOMMENDATION

Generally, nurses-midwives had suboptimal knowledge and skills on essential newborn care. In order to rescue the situation, Nurses-midwives are in urgent need of positive supportive supervision and low dose–high frequency skills training in ENC for prevention of neonatal morbidity and mortality. Also, policymakers should be aware of this gap and should plan necessary interventions to close the gap.

Limitation

Self-reported practice has recall bias, also a cross sectional study design does not show temporal cause and effects. Future studies should address these limitations.

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ORIGINAL ARTICLE

Incongruity Between Knowledge and Preventive Practices on Hepatitis B Infection Among University Students in North-eastern, Tanzania

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ABSTRACT

Background: Young population is at high risk of acquiring sexually transmitted infections including hepatitis B virus, and thus the key target group for intervention. University students are reported to have inadequate knowledge concerning HBV. This study aimed to generate information on students' knowledge and attitudes surrounding HBV preventive practices.

Methodology: A cross-sectional study was conducted in three Tanzanian universities in Moshi town of the northern Tanzanian region of Kilimanjaro. A total of 283 students were interviewed regarding their knowledge, attitudes, and practices regarding Hepatitis B Virus infection. Bloom's cut-off of 80% was used throughout to determine whether respondents had appropriate Knowledge, Attitudes, and Practices (KAP). Chi-squared test was used to measure independent associations between observed KAP levels with any demographic risk factors, with a P value of 0.05 as the cut-off for statistical significance.

Results: There was a fairly good knowledge about HBV among students among the three universities such that; 22.3%, 33.9% and 43.8% of the students had good, moderate and poor knowledge about HBV, respectively. While 46.3% of the students showed neutral attitude towards HBV, 29.3% and 24.4% had positive and negative attitudes, respectively. Only 6.0% of the students had good practices for HBV whereas 21.6% and 72.4 showed moderate and poor practices respectively. With regards to good knowledge, associated demographic factors included: Being single ($P=.007$); Having a master's degree ($P=.039$) and being a student at MWECAU ($P=.001$). Being single and being a student at MWECAU were also independently associated with positive attitude to HBV ($P=.007$) and ($.001$), respectively. No demographic factor was associated with HBV practices.

Conclusions: The overall knowledge regarding HBV was fairly good among students from the three universities. Neutral attitude towards HBV demonstrated by the studied students may indicate stigma against HBV carriers. Notwithstanding the positive knowledge and the moderate attitude about HBV, there was an apparent poor practice towards HBV prevention especially vaccination and screening. Our findings, underscore the need to bridge the prominent gap between knowledge and practices among the high-risk youth in universities and schools by up scaling sensitization campaigns on preventive practices against HBV and other related viruses.

BACKGROUND

Hepatitis B is a viral illness that targets the liver and causes both acute and chronic disease. Transmission occurs predominantly through contact with blood or body fluids of a person who is infected with the Hepatitis B virus (HBV). It also involves mother-to-child transmission (MTCT)) as well as sexual, sharing of sharp items and intravenous routes.[1-3] People who are chronically infected are often unaware and asymptomatic, making it easy for them to spread the disease.[4, 5] These patients are at a high risk of developing symptomatic liver disease, cirrhosis, and hepato-cellular carcinoma, all of which can lead to mortality.[6-9]

Hepatitis B is a serious public health problem with a global prevalence that varies greatly between countries. Africa has the second highest burden of chronic hepatitis B.[10, 11] Each year, almost 1.5 million people, predominantly young adults, become infected with the hepatitis B virus.[10] Tanzania is considered as the highly endemic area for HBV with a prevalence of 7.17%.[12] Sub-population studies in various sections of the country, however, revealed that the prevalence of HBV is 5.5-20%.[3] There is also a significant exposure risk among adults in Tanzania, with Hepatitis B prevalence of 5% among the adult population.[13-15]

Most of university students are at high risk in terms of hepatitis B virus infection since they are more likely to engage in activities that put them at risk of

hepatitis B infection,[6–9] Unprotected sexual contact, sharing razors or toothbrushes, using contaminated needles when tattooing or body piercing, and being exposed to the blood of HBV carriers during clinical practice among medical students are all risky activities.[16, 17] University students were previously reported to have inadequate knowledge and attitudes concerning HBV.[18-21] In efforts to eradicate HBV in Tanzania by 2030, scaling up of public knowledge about the viral infection has been identified as one of the most effective.[22-24] As a sexually transmitted infection, the young population from the start of puberty up to the age of marriage, remains the target group for prevention to maintain the initial success established in the management of HBV. Young people are also relatively easy to reach for preventive interventions via educational institutions where they spend many years of their early lives.

The practice of risky behaviours for contracting HBV among university students lags of knowledge and attitude about HBV awareness, knowledge and, consequently, prevention. Therefore, the purpose of this study was to understand how much the university community knew about HBV in relation to their preventive practices. This study was therefore designed to bridge this knowledge gap, using three Tanzanian universities in Moshi town of the northern Tanzanian region of Kilimanjaro.

METHODOLOGY

Study Setting

This study was conducted at three universities in Moshi, Tanzania namely Kilimanjaro Christian Medical University College (KCMUCo), Mwenge Catholic University (MWECAU), and Moshi Co-operative University (MOCU). This study location was chosen due to the reported increase in hepatitis B prevalence from 4.2% in 2016 to 5.7% in 2018.[25] According to the National Bureau of Statistics (NBS) predictions for 2019, Moshi Municipal is home to 225,225 people.[26] The main economic activities of locals are agriculture, business, and tourism.

Study Design, Duration, and Population

This was a descriptive cross-sectional survey conducted between May and October 2021. The survey included at least 92 students from each of the three purposively selected universities. Except for those who declined to participate, all students who were on campus at the time of data collection and who willingly agreed to engage in the study were included in the sampling frame which was used to sample the desired number of participants in each university.

Sample Size

Sample size was estimated by the "Epitools" online sample size (ss) calculator based on the formula $ss= Z^2(P)(1-P)/\varepsilon^2$, where 'Z' is the value (1.96 for 95% confidence level [CI]), 'P' represents prevalence (0.08),[27] and 'ε' is the minimal tolerable error at 95% CI, expressed as a decimal (0.05). These estimations gave a minimum sample size of 114. However, in order to accommodate sampling error inherent to conveniently selected participants, the sample was increased to 283 participants. This increase of sample size was also meant to increase the statistical power. Out these 95, 96 and 92 participants were obtained from MWECAU, KCMUCo and MOCU, respectively.

Sampling and Study Procedures

Purposive sampling of universities, followed by a random selection of participants was used to obtain study participants. The written consent form was presented to those students who were on campus when the data were being collected. The consent form was written in both English and Swahili and explained the study, its methods, and its advantages. Additionally, the research team made sure the participants were aware of the study's procedures. Before signing the consent, any queries from the participants were addressed. The consent form was signed by those who agreed to take part in the study and countersigned by the research team. A structured, self-administered questionnaire was then completed by the study participants who consented.

Variables and their Categorisation

In this study, knowledge, attitude, and preventive measures for Hepatitis B infection were the dependent variables whereas socio-demographic characteristics such as age, gender, marital status, education, and occupation were the independent variables. Throughout the responses, categories for knowledge, attitudes and practices were based on the Bloom's cut-off criteria. For knowledge assessment, each correct answer received a one point, while each erroneous response received a zero score. Using Bloom's cut-off criterion, participants' overall knowledge, attitude and practice were rated as excellent if they were between 80 and 100%, moderate if they were between 60 and 79% and low if they were less than 60%.

Quality Assurance

The reliability of the knowledge, attitude, and practice questionnaires was evaluated, and the Cronbach's alpha values were 0.71, 0.78, and 0.76, respectively, showing satisfactory internal consistency. Data was collected by four research scientists. Senior managers oversaw and regulated the entire data collection process. The supervisors examined the completed surveys for completeness and uniformity of responses. The questionnaires were changed as needed before data collection commenced.

Data Management

Data were initially transferred to Microsoft Excel 365 for cleaning and coding. STATA version 15.1 was used to analyse the cleaned data. Frequencies and proportions were used to summarize categorical data. Bloom's cut-off of 80% was used throughout to determine whether respondents had appropriate knowledge (80%), attitudes and practices. To examine association between dependent variables (knowledge, attitude and practice) and independent variables (socio-demographic characteristics), a Chi-squared test was used.

Ethical Consideration

Ethical clearance to carry out this study was obtained from the College Research Ethical Committee of Kilimanjaro Christian Medical University College (KCMUCo), ethical clearance #UG61/2022. Before taking part in the study, all participants were required to complete an informed consent form. Participants were able to refuse to

participate in the study without providing any reason. Individual information was not disclosed to any third party. To preserve anonymity, all questionnaires did not include any personal identifiers.

RESULTS

Social demographic characteristic

There were 283 university students that participated in this study. Of these, 153 (54.1%) students were male with majority aged 20-34 years (98.6%). Slightly over half of the respondents (51.2%) were students of Diploma education level (Table 1)

Source of Information

Almost all study participants 274 (96.8%) ever heard of Hepatitis B, of which 37.9% of these students had heard of Hepatitis B at their respective universities. Newspaper was the weakest source of information on HBV infection, informing only 14.8% of the participants as presented in Figure 1.

Knowledge of Hepatitis B

About one-fifth (22.3%) of the participants had good knowledge on Hepatitis B whereas 43.8% of the participants had poor knowledge on Hepatitis B (Figure 2)

Students' knowledge on HBV varied with marital status, level of education and university type (Table 3).

Attitude toward Hepatitis B

A high percentage of students showed a neutral attitude toward Hepatitis B (46.3%) with 29.3% of the students showing a positive attitude toward Hepatitis B (Figure 3).

FIGURE 1: Source of information on Hepatitis B among University students in Kilimanjaro (N=274)

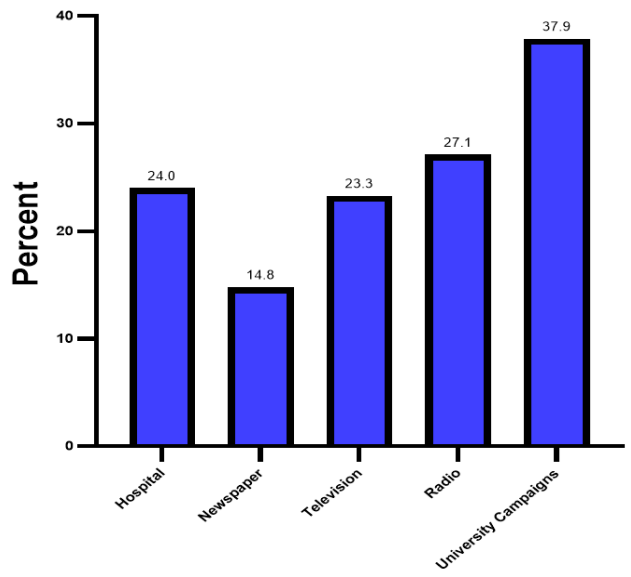

FIGURE 2: Knowledge Level on Hepatitis B among University students in Kilimanjaro (N=274)

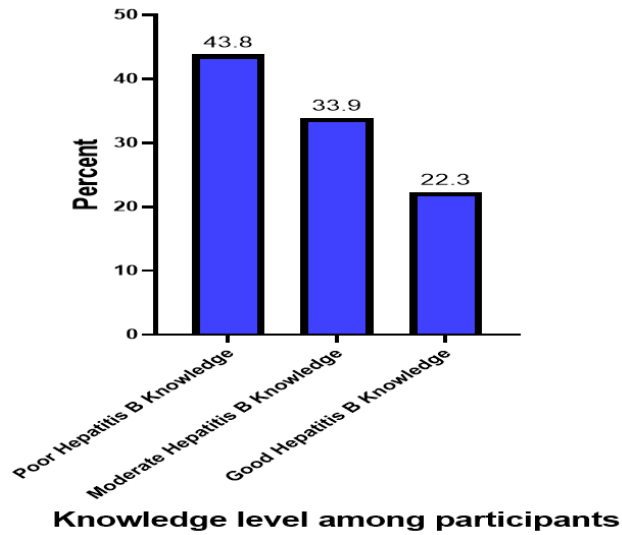

FIGURE 3: Attitudes toward Hepatitis B among University Students in Kilimanjaro, Tanzania (N=283)

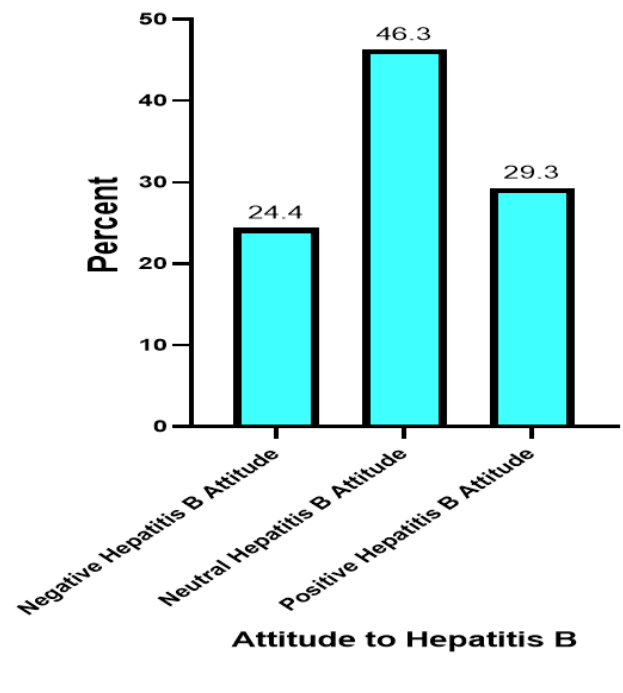

Table 4 summarises items used to assess the attitude toward Hepatitis B. Marital status and "university" differed significantly with knowledge of hepatitis B at *P*-value of < .05 as shown in Table 5.

TABLE 1: Socio-demographic Characteristics (N=283)

Variable	Frequency	Percentage
Sex		
Male	153	54.1
Female	130	45.9
Age in years		
< 19	2	0.7
20-34	279	98.6
> 35	2	0.7
Marital status		
Married	41	14.5
Cohabiting	44	15.6
Single/ Divorced / Separated	198	69.9
Education level		
Diploma level	145	51.2
Degree level	134	47.4
Masters level	4	1.4
University		
MWECAU	95	33.6
KCMUCo	96	33.9
MOCU	92	32.5

Prevention Practice against Hepatitis B

More than half of the participants had poor prevention practice against Hepatitis B (72.4%) Only 6% the students had good prevention practice against Hepatitis B (Figure 4). Items that were used to assess prevention practice against Hepatitis B are summarized in Table 6

Table 5 shows the proportional difference between social-demographic characteristics and prevention practices against Hepatitis B. None of the variables differed significantly with the prevention practices against Hepatitis B.

FIGURE 4: Overall Hepatitis B Prevention Practice among University Students in Kilimanjaro (N=283)

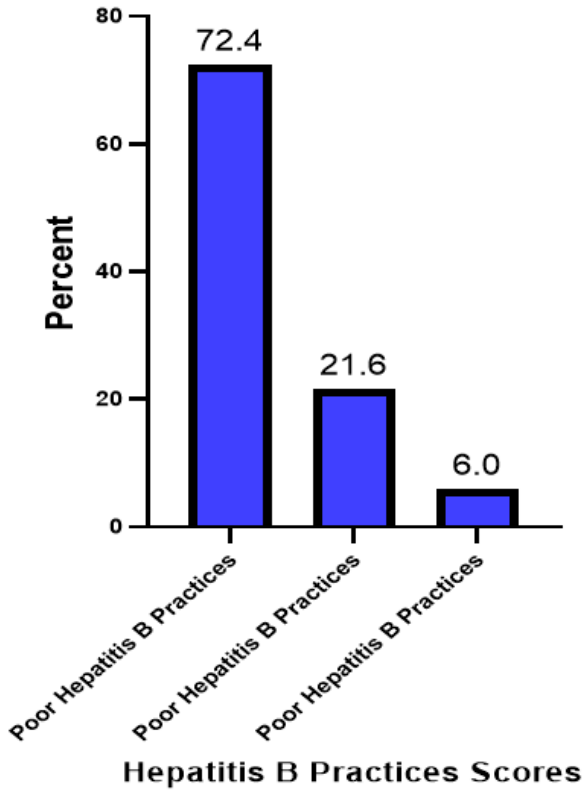

TABLE 1: Knowledge of hepatitis B virus (N =283)

Variable	Frequency	Percentage
Carriers of hepatitis B can spread the virus of disease to others		
Yes	195	68.9
No	64	22.6
I don't know	24	8.5
Hepatitis B can be spread through casual contact such as holding hands		
Yes	171	60.4
No	79	27.9
I don't know	33	11.7
Hepatitis B can be spread through contact with open wounds/cuts		
Yes	201	71.0
No	51	18.0
I don't know	31	11.0
Hepatitis B can be transmitted by contaminated blood and blood products		
Yes	201	73.9
No	35	12.4

Continue

TABLE 2: Continued

Variable	Frequency	Percentage
I don't know	39	13.7
Hepatitis B can be transmitted by un-sterilized syringes, needles, and surgical instruments		
Yes	176	62.2
No	68	24.0
I don't know	39	13.8
Hepatitis B Can be transmitted by unsafe sex		
Yes	198	70.0
No	62	21.9
I don't know	23	8.1
HBV has laboratory test		
Yes	236	84.3
No	23	8.2
I don't know	21	7.5
HBV vaccine prevent Hepatitis B		
Yes	233	83.2
No	22	7.9
I don't know	25	8.9
Hepatitis B virus causes liver cancer		
Yes	179	63.2
No	52	18.4
I don't know	52	18.4
Higher risk of living in the same house with someone infected with Hepatitis B		
Yes	178	62.9
No	73	25.8
I don't know	32	11.3
Suppose you are living in the same house with someone with Hepatitis B, what would you do to ensure you don't get infected		
Isolate infected person	32	11.3
Get vaccinated	228	80.6
Nothing	23	8.1

TABLE 3: Knowledge on HBV by Social-demographic Characteristics (N= 283)

Variable	Total n (%)	Poor knowledgen (%)	Moderate knowledgen (%)	Good knowledgen (%)	$\chi 2$	P value
Sex						
Male	153 (54.1)	64 (51.6)	57 (59.4)	32 (50.8)	1.66	.436
Female	130 (45.9)	60 (48.4)	39 (40.6)	31 (49.2)		
Age						
< 19	2 (0.7)	1 (50.0)	0 (0.0)	1 (50.0)	2.814	.589*
20-34	279 (98.6)	122 (43.7)	96 (34.4)	61 (21.9)		
> 35	2 (0.7)	1 (50.0)	0 (0.0)	1 (50.0)		
Marital status						
Married	41 (14.5)	26 (63.4)	9 (22.0)	6 (14.6)	14.033	.007
Cohabiting	44 (15.6)	22 (50.0)	18 (40.9)	4 (9.1)		
Single/ Divorced	198 (69.9)	76 (38.4)	69 (34.9)	53 (26.7)		
Education level						
Diploma level	145 (51.2)	60 (41.4)	47 (32.4)	38 (26.2)	10.630	.039*
Degree level	134 (47.35)	63 (47.0)	49 (36.6)	22 (16.4)		
Masters level	4 (1.4)	1 (25.0)	0 (0.0)	3 (75.0)		
University						
MWECAU	95 (33.6)	32 (33.7)	30 (31.6)	33 (34.7)	25.138	<.001
KCMUCo	96 (33.9)	41 (42.7)	30 (31.3)	25 (26.0)		
MOCU	92 (35.5)	51 (55.4)	36 (39.1)	5 (5.4)		

*P value by Fisher's exact estimation

TABLE 4: Attitude on Hepatitis B virus (N=283)

Variable	Yes n (%)	No n (%)	I don't know n (%)
Would you like to be given more information on Hepatitis B?	240 (84.8)	33 (11.7)	10 (3.5)
Do you think Hepatitis B is a curable disease?	187 (66.1)	73 (25.8)	23 (8.1)
Do you think Hepatitis B is a danger to your health?	242 (85.5)	29 (10.3)	12 (4.2)
Do you believe Hepatitis B infection is a serious health problem?	206 (72.8)	34 (12.0)	43(15.2)
Do you think taking the Hepatitis B vaccine is safe?	215 (76.0)	31 (10.9)	37 (13.1)
Are you at risk of getting Hepatitis B?	146 (51.6)	94 (33.2)	43 (15.2)
Do you believe in the Hepatitis B vaccine?	209 (73.8)	39 (13.8)	35 (12.4)
Should all patients be tested for Hepatitis B before they receive health care?	199 (70.3)	63 (22.3)	21 (7.4)
Following Hepatitis B health guidelines will protect me from being infected.	210 (74.2)	56 (19.8)	17 (6.0)

TABLE 5: University Students' Attitude Toward HBV by Social-demographic characteristics (N= 283)

Variable	Total n (%)	Negative attitude n (%)	Neutral attitude n (%)	Positive attitude n (%)	$\chi 2$	P value
Sex						
Male	153 (54.1)	34 (49.3)	78 (59.5)	41 (49.4)	2.948	.229
Female	130 (45.9)	35 (50.7)	53 (40.8)	42 (50.6)		
Age						
< 19	2 (0.7)	1 (50.0)	1 (50.0)	0 (0.0)	1.916	.926*
20-34	279 (98.6)	68 (24.4)	129 (46.2)	82 (29.4)		
> 35	2 (0.7)	0 (0.0)	1 (50.0)	1 (50.0)		
Marital status						
Married	41 (14.5)	11 (26.8)	25 (61.0)	5 (12.2)	22.530	<.001
Cohabiting	44 (15.6)	20 (45.5)	17 (36.6)	7 (15.9)		
Single/ Divorced	198 (69.9)	38 (19.2)	89 (44.9)	71 (35.9)		
Education level						
Diploma level	145 (51.2)	36 (24.8)	65 (44.8)	44 (30.4)	4.765	.429*
Degree level	134 (47.35)	33 (24.6)	65 (48.5)	38 (26.9)		
Masters level	4 (1.4)	0 (0.0)	1 (25.0)	3 (75.0)		
University						
MWECAU	95 (33.6)	14 (14.7)	42 (44.2)	39 (41.1)	29.425	<.001
KCMUCo	96 (33.9)	19 (19.8)	43 (44.8)	35 (35.4)		
MOCU	92 (35.5)	69 (24.4)	46 (50.0)	10 (10.9)		

*P value by Fisher's exact estimation

TABLE 6: Preventive practices against Hepatitis B virus (N=283)

Variable	Frequency	Percentage
Ever done the screening for Hepatitis B		
Yes	120	42.6
No	156	55.3
I don't know	6	2.1
Ever Vaccinated against Hepatitis B		
Yes	95	35.6
No	181	63.9
I don't know	7	2.5
Willingness to be vaccinated (n=188)		
Yes	122	64.9
No	57	30.3
I don't know	9	4.8
Number of doses (n=95)		
One dose	32	33.7
Two doses	31	32.6
Three doses	32	33.7
Ever done injections with drug users		
Yes	2	0.7
No	281	99.3

DISCUSSION

HBV infection remains a serious threat to the public in our country although vaccine is available against it. According to the findings of this survey, most respondents had a positive attitude and knowledge about hepatitis B virus infection. They did, however, have a poor level of preventive practice for Hepatitis B virus infection. According to the findings of this study, only 61.1% of survey participants were knowledgeable of HBV, its mechanism of transmission, and prevention. The knowledge levels in this study are much lower than in previous studies conducted in Iran (90%), Vietnam (79.3%), and western Ethiopia (86.2 %).[28-30] However, it was higher than reports from Ghana (63.9.5%) and Malaysia (50.3%).[31, 32] The inclusion of both medical and non-medical students in our current study, as well as differences in the knowledge evaluation questions, could explain the discrepancy. In the current study, despite having a moderate awareness of the method of transmission, nearly one-tenth of the participants had no idea of how to live with an infected individual in the same home. This demonstrates the need of closing this gap by raising public understanding about how to avoid and control the spread of HBV.

This study had revealed that most of interviewed students had an appropriate knowledge that vaccination can effectively prevent hepatitis B. Despite this awareness, only 35.6% of respondents had confirmed receiving a dose of the HBV vaccine. Whereas a positive attitude towards HBV was recorded among 59.7% of the participants, various levels of attitudes have been reported elsewhere.[28-33] Vaccines are known to be cost-effective in reducing the burden of several vaccine-preventable diseases, including HBV among high-risk and high-prevalence populations. The low vaccination rate reported in the current study is an alarm for increased efforts in sensitization of the highest risk youth in universities on the importance of vaccination against HBV. Moreover, most of the student participants were aware that HBV is serious disease with significant consequences and are more interested in learning more about it.

Health education through symposia and awareness campaigns has been shown to be an effective way to improve hepatitis B knowledge and attitude among university students.[32, 34, 35] Our study is in concordance with other studies that emphasize unawareness, ignorance and inaccessibility of these vaccines in rural or peri-urban areas as barriers to HBV control.[32, 34, 35] Despite the differences in study populations, our findings suggest that university students are receptive to hepatitis B health education. Although we observed a generally good attitude and level of awareness about HBV, our study participants' overall level of preventative practices was poor. In this example, less than half of the participants had ever been screened for HBV, typical evidence of poor practices. This is an obvious and worrisome gap between knowledge and practice regarding HBV.

Almost two-thirds (62.9%) of them would not want to live in the same house as HBV carriers. This discriminating rate is higher than predicted, which may be due to a lack of understanding of HBV transmission. This stigma can be eliminated by acquisition of appropriate knowledge about HBV and adopting a good attitude toward HBV infection. This urges universities and relevant government bodies such as the ministries of health and education to deliver positive guidance as soon as possible, to boost efforts to undertake peer education, and to promote relevant understanding the transmission pathways of HBV and other viruses to suppress the counterproductive stigma among university students.

Regarding hepatitis B practices among students, we report a poor level of preventive practices among students whereby 72.4%, 21.6% and 6% of the students had poor, moderate and good HBV practices respectively. This was a significant gap between knowledge and practices to HBV prevention. In terms of vaccination, 35.6% of research participants were immunized. However, out of the vaccinated students, just 33.7% (or only 11.3% of all students) received all three required dosages. Moreover, 42.6% of the participating students had ever screened for HBV.

CONCLUSION AND RECOMENDATIONS

In summary, our data show that the overall knowledge regarding HBV, based on its mode of transmission and prevention was good among the three universities involved in this study. The overall attitudes towards HBV were mainly neutral but characterized with potential stigma against HBV carriers. Despite the positive knowledge and the moderate attitude about HBV, there was extremely poor practice towards HBV prevention especially vaccination and screening. Based on the apparent disparity between observed good knowledge regarding hepatitis B and practices, we recommend the organization of regular university campaigns that disseminate information on hepatitis B and related diseases as a strong means to create awareness among university students. Such campaigns will have far reaching impacts in the community outside university

premises.

Study Limitations

Although our study might have been minimally limited by recall bias due to the tool used to collect data, our findings, underscores the need to bridge the conspicuous gap between knowledge and practices among the high-risk youth in universities and schools by escalating sensitization campaigns on preventive practices against HBV and other related viruses.

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ORIGINAL ARTICLE

Nasal Carriage of Methicillin-Resistant *Staphylococcus Sciuri* Group by Residents of an Urban Informal Settlement in Kenya

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ABSTRACT

Background: The *Staphylococcus sciuri* group constitutes animal-associated bacteria but can comprise up to 4% of coagulase-negative staphylococci isolated from human clinical samples. They are reservoirs of resistance genes that are transferable to *Staphylococcus aureus* but their distribution in communities in sub-Saharan Africa is unknown despite the clinical importance of methicillin-resistant *S. aureus*.

Objectives: We characterised methicillin-resistant *S. sciuri* group isolates from nasal swabs of presumably healthy people living in an informal settlement in Nairobi to identify their resistance patterns, and carriage of two methicillin resistance genes.

Method: Presumptive methicillin-resistant *S. sciuri* group were isolated from HardyCHROM™ methicillin-resistant *S. aureus* media. Isolate identification and antibiotic susceptibility testing were done using the VITEK®2 Compact. DNA was extracted using the ISOLATE II genomic kit and polymerase chain reaction used to detect *mecA* and *mecC* genes.

Results: Of 37 presumptive isolates, 43% (16/37) were methicillin-resistant including - *S. sciuri* (50%; 8/16), *S. lentus* (31%; 5/16) and *S. vitulinus* (19%; 3/16). All isolates were susceptible to ciprofloxacin, gentamycin, levofloxacin, moxifloxacin, nitrofurantoin and tigecycline. Resistance was observed to clindamycin (63%), tetracycline (56%), erythromycin (56%), sulfamethoxazole/trimethoprim (25%), daptomycin (19%), rifampicin (13%), doxycycline, linezolid, and vancomycin (each 6%). Most isolates (88%; 14/16) were resistant to at least 2 antibiotic combinations, including methicillin. The *mecA* and *mecC* genes were identified in 75% and 50% of isolates, respectively.

Conclusion: Colonizing *S. sciuri* group bacteria can carry resistance to methicillin and other therapeutic antibiotics. This highlights their potential to facilitate antimicrobial resistance transmission in community and hospital settings. Surveillance for emerging multidrug resistant strains should be considered in high transmission settings where human-animal interactions are prevalent. Our study scope precluded identifying other molecular determinants for all the observed resistance phenotypes. Larger studies that address the prevalence and risk factors for colonization with *S. sciuri* group and adopt a one health approach can complement the surveillance efforts.

INTRODUCTION

The *Staphylococcus sciuri* group (*S. sciuri*, *S. lentus*, and *S. vitulinus*) consists of coagulase-negative staphylococci that are distinguishable from other staphylococci by a positive oxidase test.[1] These bacteria can be isolated from the environment, animals, and dairy products. People may be colonized in the nasopharynx and skin[2] following repeated contact with colonized livestock and pets[2] or through contact with food animal products.[3] Nevertheless, human infection with the *S. sciuri* group does occur; they can constitute up to 4% of coagulase-negative staphylococci isolated from clinical samples, and can cause endocarditis, peritonitis, septic shock, urinary tract infections, pelvic inflammatory disease, and wound infections.[1] Over the last decade, oxacillin/methicillin-resistant staphylococcal strains have emerged, increasing the medical relevance of the *S. sciuri* group.[3] These bacteria can receive[5] and transfer resistance genes to human and animal pathogens such as *Staphylococcus aureus*[4] and can carry a *mecA* gene that is closely related to the methicillin-resistant *S. aureus* (MRSA) *mecA* gene.[4] The *mecA* gene encodes broad-spectrum beta-lactam resistance.[4] A novel *mecA* homolog – *mecC* – which also confers resistance to methicillin, has emerged in staphylococci isolated from animals, humans, and the environment.[6]

We characterised *S. sciuri* group isolates from nasal swabs collected from presumably healthy people to determine their antibiotic resistance profiles and the proportion harbouring *mecA* and *mecC* genes.

MATERIALS AND METHODS

During a 2019 population–based study on antimicrobial resistance in communities and hospitals in Kenya (KNH/UoN ERC# P164/03/2018), which targeted colonizing MRSA strains from presumably healthy people in Kibera—an informal settlement in Nairobi—we unexpectedly cultured *S. sciuri* group bacteria on HardyCHROM™ MRSA media (Hardy diagnostics, CA) - chromogenic media that can isolate and differentiate *S. aureus* and other staphylococci.[7] Nasal swabs were plated on HardyCHROM™ MRSA media, followed by incubation at 37°C overnight (18–24 hrs). After incubation, single small blue colonies, presumptively identified as methicillin-resistant *S. sciuri* group, were collected from each positive agar plate and sub-cultured on tryptic soy agar plates (KEMRI Production Department, Nairobi), then incubated overnight.

Species identification and antibiotic susceptibility testing (AST) of the purified (sub-cultured) isolates were done using the VITEK®2 Compact (Biomerieux, Marcy-l'Étoile). Isolates that were either oxacillin resistant and/or cefoxitin-screen positive were regarded as methicillin-resistant. Bacterial suspensions were prepared by adding discreet colonies into 3 mL of 0.5% (w/v) normal saline and adjusting turbidity to 0.5 McFarland. Isolate suspensions were tested against 15 antibiotics i.e., ciprofloxacin (≥4 mg/L), clindamycin (≥4 mg/L), daptomycin (8 mg/L), doxycycline (≥16 mg/L), erythromycin (≥8 mg/L), gentamycin (≥16 mg/L), levofloxacin (≥8 mg/L), linezolid (≥8 mg/L), moxifloxacin (≥2 mg/L), nitrofurantoin (≥128 mg/L), rifampicin (≥4 mg/L), sulfamethoxazole/ trimethoprim (≥4/76 mg/L), tetracycline (≥16 mg/L), tigecycline (2 mg/L) and vancomycin (≥32 mg/L). Minimum inhibitory concentration values were interpreted following the 2020 Clinical Laboratory Standards Institute standards.[8] Isolates with intermediate resistance were considered susceptible. We defined multidrug resistance as resistance to at least one antibiotic in three or more antibiotic classes.

DNA extraction from confirmed isolates was done using the ISOLATE II genomic kit (Bioline, FL) following manufacturer instructions, and stored at -20 °C until tested. The presence of *mecA* and *mecC* genes was determined using the *S. aureus mecA* and *mecC* primers on the VeritiPro Thermal Cycler (Thermo Fisher scientific, MA). Separate reaction mixes were prepared for **mecA** and *mecC*. Each 25 µL reaction mix consisted of 0.5 µL of each [0.2 µM] primer pair i.e., *mecA*F—5'GT AGA AAT GAC TGA ACG TCC GAT AA3', *mecA*R—5'CCA ATT CCA CAT TGT TTC GGT CTA A3' (310 bp), and *mecC*F—5'G CTC CTA ATG CTA ATG CA3', *mecC*R—5'TAA GCA ATA ATG ACT ACC3' (304 bp), respectively, 12.5 µL of 2X MyTaq™ Red Mix (Bioline, FL), 2 µL of DNA template and 9.5 µL of PCR-grade water. Thermocycling proceeded as follows: 95 °C, 1 min; 95 °C, 15 s; 51 °C, 15 s (30 cycles), 72 °C, 10 s. Amplified DNA (5 µL) was stained with 2 µL cyber-green dye and run in a 1% agarose gel alongside a 1 kB ladder. The gel was run in 5X Tris-acetate EDTA buffer (90 volts, 65mA and 6 watts) for 35 min. Two positive controls, ATCC 33591 (MRSA) and ATCC BAA 2312 (*S. aureus)* - were included to confirm *mecA* and *mecC* gene fragments. ATCC 25922 (*E. coli*) was used as the negative control. Bands corresponding to 310 bp and 304 bp under UV light confirmed the presence of *mecA* and *mecC* genes, respectively. The Qubit™ 4 Fluorometer was used to measure DNA concentration to ensure concentrations above 2.5 ng/µL. DNA quality was confirmed by the absence of extraneous bands during gel electrophoresis.

Ethical Approval

The isolates analysed in this study were identified during sample processing for the ARCH study. The ARCH study was approved by the KNH/UoN ERC (# P164/03/2018).

RESULTS

In total, 37 presumptive methicillin–resistant *S. sciuri* group isolates were collected from HardyCHROM™ MRSA plates. Of these, 43% (16/37) were positively identified by the Vitek2 as methicillin-resistant *S. sciuri* group i.e., *S. sciuri* (50%; 8/16), *S. lentus* (31%; 5/16) and *S. vitulinus* (19%; 3/16). All isolates were susceptible to ciprofloxacin, gentamycin, levofloxacin, moxifloxacin, nitrofurantoin and tigecycline. Conversely, more than half of all isolates were resistant to clindamycin (63%), erythromycin (56%), and tetracycline (56%), with less than one-third resistant to the remaining antibiotics (Table 1).

Most isolates (88%; 14/16) were resistant to several antibiotic combinations in addition to methicillin. Four (25%) were resistant to one antibiotic, four (25%) to two antibiotics, four (25%) to three antibiotics, one (6%) to five antibiotics and one (6%) to eight antibiotics. Clindamycin-daptomycin (CLI-DAP), clindamycin-erythromycin-tetracycline (CLI-ERY-TET) and erythromycin-tetracycline (ERY-TET) were common multidrug resistant phenotypes (Table 2).

The *mec*A gene was identified in 75% (12/16) of isolates, while *mecC* in 50% (8/16). Overall, 44% (7/16) of isolates carried the *mecA* gene only, 19% (3/16) carried *mecC* only, 31% (5/16) carried *mecA* and *mecC*, while 6% (1/16) had neither gene (Table 2).

TABLE 1: Antibiotic Resistance among Methicillin-Resistant S. Sciuri Group Isolates

Antibiotic tested	S. sciuri (n = 8)	S. lentus (n = 5)	S. vitulinus (n = 3)	S. sciuri gp (n = 16)
Clindamycin	6 (75%)	4 (80%)	0 (0%)	10 (63%)
Daptomycin	1 (13%)	2 (40%)	0 (0%)	3 (19%)
Doxycycline	1 (13%)	0 (0%)	0 (0%)	1 (6%)
Erythromycin	7 (88%)	0 (0%)	2 (67%)	9 (56%)
Linezolid	1 (13%)	0 (0%)	0 (0%)	1 (6%)
Rifampicin	2 (25%)	0 (0%)	0 (0%)	2 (13%)
Sulfamethoxazole-trimethoprim	3 (38%)	1 (20%)	0 (0%)	4 (25%)
Tetracycline	6 (75%)	0 (0%)	3 (100%)	9 (56%)
Vancomycin	1 (13%)	0 (0%)	0 (0%)	1 (6%)

TABLE 1: Distribution of Study Participants According to Age and Sex

Isolate	Species	mecA	mecC	CLI	DAP	DOX	ERY	LZD	RIF	SXT	TET	VAN	Resistance phenotype
1	S. sciuri	Y	Y	+	-	-	+	-	-	+	-	-	CLI-ERY-SXT
2	S. sciuri	N	Y	-	-	-	+	-	-	+	+	-	ERY-SXT-TET
3	S. sciuri	Y	N	+	+	+	+	+	+	-	+	+	CLI-DAP-DOX-ERY-LNZ-RIF-TET-VAN
4	S. sciuri	Y	Y	+	-	-	-	-	-	-	-	-	CLI
5	S. sciuri	Y	Y	+	-	-	+	-	-	-	+	-	CLI-ERY-TET
6	S. sciuri	Y	N	-	-	-	+	-	-	-	+	-	ERY-TET
7	S. sciuri	Y	Y	+	-	-	+	-	-	-	+	-	CLI-ERY-TET
8	S. lentus	Y	N	-	-	-	-	-	-	-	-	-	-
9	S. lentus	Y	N	+	+	-	-	-	-	-	-	-	CLI-DAP
10	S. lentus	N	N	+	+	-	-	-	-	-	-	-	CLI-DAP
11	S. lentus	N	Y	+	-	-	-	-	-	-	-	-	CLI
12	S. vitulinus	Y	N	-	-	-	-	-	-	-	+	-	TET
13	S. vitulinus	Y	N	-	-	-	+	-	-	-	+	-	ERY-TET
14	S. lentus	N	Y	-	-	-	-	-	-	-	-	-	-
15	S. vitulinus	Y	N	-	-	-	-	-	-	-	+	-	TET
16	S. sciuri	Y	Y	+	-	-	+	-	+	+	+	-	CLI-ERY-RIF-SXT-TET
	# R	-	-	10	3	1	9	1	2	4	10	1	
	% R	-	-	56	17	6	50	6	11	22	56	6	

CLI, clindamycin; DAP, daptomycin; DOX, doxycycline; ERY, erythromycin; LZD, linezolid; RIF, rifampicin; SXT, sulfamethoxazole-trimethoprim; TET, tetracycline; VAN, vancomycin. Resistant (+); Susceptible (-); Y, present; N, absent; R, Resistant.

DISCUSSION

Focus on the *S. sciuri* group bacteria has increased in recent years owing to their implication in opportunistic human and veterinary infections[9,10] food contamination,[11,12] and potential for zoonotic transmission.[13] These bacteria are natural reservoirs of methicillin resistance genes, which can be transferred to *S. aureus*—an important human and animal pathogen—and can carry virulence genes that promote pathogenicity in coagulase-negative staphylococci.[10,14]

Colonising strains of methicillin-resistant *S. sciuri* group in the nasal cavities of presumptively healthy individuals in sub-Saharan Africa have not widely been reported. Consequently, little is known about the distribution of these bacteria within communities, despite their potential to transfer resistance genes to pathogenic staphylococci. Previous studies have reported low prevalence (~5%) of *S. sciuri* infections in hospitals—presumably cross-transmitted between patients and healthcare workers[15]—and in communities, presumably transmitted via close contact with animals.[2] It is likely that colonizing strains, as those found in our study, are transmitted via bioaerosols, with dust mediating the transfer of environmental bacteria when inhaled.[16] Informal settlements are commonly characterized by poor environmental hygiene, which can facilitate the thriving of *S. sciuri* group bacteria. Data from the parent study indicate that 81% of sampled households keep domestic animals, the majority (76%) of which are dogs[17]—a known reservoir of *S. sciuri.*

The susceptibility of *S. sciuri* group isolates to ciprofloxacin, gentamycin, levofloxacin, moxifloxacin, nitrofurantoin and tigecycline is consistent with another study.[15] This suggests that these antibiotics can be used in the management of infections caused by *S. sciuri* group bacteria. Conversely, we identified an isolate that was resistant to eight antibiotics, including vancomycin—used to treat *S. sciuri* infections[16]—highlighting the potential public health threat that can arise if such strains become amplified in communities and hospitals. While the clinical significance of *S. sciuri* group may be unappreciated, the capacity of these bacteria to carry multidrug resistance is well established[2,18] and has been reported in clinical studies in Serbia[3,15] and Nigeria.[19]

The observed distribution of *mecA* and *mecC* genes in our sample is consistent with findings from a study in Tunisia.[13] Resistance to clindamycin can be mediated via the *erm* gene, which is located on transposon Tn554, which has insertion sites in the *Staphylococcus* spp. chromosome, where *mecA* and *mecC* genes are contained,[20] and may explain the observed resistance to clindamycin among the isolates with both *mecA* and *mecC* genes. Tetracycline resistance was common among isolates with the *mecA* gene, as demonstrated by other studies,[21] suggesting that *tet* and *mecA* genes may be located on the same genetic element. The absence of *mecA* and *mecC* genes in one isolate despite its resistance to clindamycin, daptomycin and methicillin suggests that other resistance elements mediate resistance to beta-lactams and other antibiotics within the group of bacteria.[13,22]

One limitation of this study was its limited scope which precluded identifying other molecular determinants for the observed resistance phenotypes. Larger studies that address the prevalence and risk factors for colonization with *S. sciuri* group and adopt a one health approach can complement surveillance efforts.

CONCLUSION

Nasal colonization with methicillin-resistant *S. sciuri* group bacteria appears low in the population studied and may not be mediated by companion animals (e.g., dogs) which were prevalent in this population. Nevertheless, these bacteria are resistant to medically important antibiotics and carry important resistance genes, presenting a potential AMR threat.

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ORIGINAL ARTICLE

Practice and Knowledge on Type 2 Diabetes Mellitus Risk Factors Among Office Workers in Mwanza City, Tanzania

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ABSTRACT

Background: Type 2 diabetes mellitus (T2DM) mostly occurs in adults when the body becomes resistant to insulin. Genetic predisposition, age, an unhealthy diet, and a sedentary lifestyle are key factors leading to T2DM. Office workers are one of the populations at greatest risk of developing T2DM. This study assessed the level of knowledge and risk factors for T2DM among office workers in Mwanza City, Tanzania.

Methods: A cross-sectional study was conducted among 309 office workers in public and private institutions in Mwanza City. A structured, pre-tested questionnaire was used to collect information from the participants. The coded data were analyzed using STATA Version 14. The associations between various risk factors for T2DM and knowledge on T2DM were determined using Chi-square or Fisher's exact tests.

Results: The level of knowledge was poor in 41.1%, moderate in 31.1%, and good in 27.8% of the study participants. Family history of T2DM showed a significant association with knowledge score (P=.001). Only 63 (20.4%) of respondents reported eating a healthy diet. Among the study participants, 154 (49.8%) had poor diabetes prevention practices, 82 (26.5%) had moderate practices, and 73 (23.7%) had good practices.

Conclusion: The majority of the office workers who participated in this study had limited knowledge regarding risk factors for T2DM and poor practices concerning the prevention of the disease. In order to reduce the burden of T2DM, there is a need for lifestyle modification, provision of education, and raising awareness about the risk factors of T2DM among office workers in Mwanza City.

BACKGROUND

Diabetes mellitus (DM) is one of the endocrine disorders that affect the body's capability to produce or use insulin. It is a chronic metabolic disease in which a person experiences high blood sugar, either because the pancreas does not produce enough insulin (Type 1 DM) or because the body cells do not efficiently utilize or respond to the insulin that is produced (Type 2 DM).[1] According to the 2021 International Diabetes Federation (IDF) report[2], 537 million adults aged between 20 to 79 years worldwide, are living with DM. This number is predicted to rise to 643 million by 2030. About 81% of adults with DM live in low and middle income countries (LMICs). In Africa, DM was responsible for 416,000 deaths in 2021. The IDF also reported that 11.6% of deaths in 2021 among people under the age of 60 years in Tanzania were diabetes related.

Type 2 DM (T2DM) mostly occurs in adults when the body becomes resistant to insulin.[3] Globally, economic growth and urbanization have led to an increasing burden of T2DM.[4] The disease is well known as a serious public health concern with a substantial effect on human life. Complications caused by T2DM include diabetic neuropathy, cardiovascular disease, cerebrovascular disease, and peripheral vascular disease.[5–7] Genetic predisposition, age, an unhealthy diet, and a sedentary lifestyle are key factors leading to T2DM.[8] Thus, lifestyle changes, including maintaining a healthy body weight, consuming a healthy diet, staying physically active, exercising, not smoking, and drinking alcohol in moderation, could decrease the risk of T2DM.[9,10]

Prevention of T2DM is very important and can be attained through lifestyle interventions, particularly among populations at great risk such as office workers.[11] Adequate knowledge is a major component in T2DM prevention. A previous study reported poor knowledge regarding T2DM in the general population.[12] Knowledge is paramount in the fight against T2DM, as it can help people assess their risk and inspire them to take responsibility for their health.[13] Most knowledge and practice studies in LMICs related to T2DM have focused on patients.[14–18] However, there

is a paucity of reports from the general community, particularly among office workers in Tanzania.

An approach targeting individuals at risk of T2DM with the aim of reducing concomitant risk factors in the community is necessary. Knowledge and practices as regards risk factors and prevention of any disease in the community augment the achievement of any disease control program.[19] This study assessed the level of knowledge and practice regarding risk factors for T2DM among office workers in Mwanza City, Tanzania.

METHODS

Study Setting and Design

A cross-sectional study was conducted in May 2021. The study was done in public and private institutions in Mwanza City, which is located on the shore of Lake Victoria in the north-western part of Tanzania. According to the 2022 census, the city's population was estimated to be 1,104,521.[20] Mwanza City was chosen as the study site because it is an urban area with a high prevalence of T2DM.[21]

Study population

The target study population was office workers aged 18 years and above. Office workers who were known to be diabetic or had a health professional background were excluded from this study.

Sample size and sampling procedure

The sample size for this study was calculated using the Kish Leslie formula.[22] Using the prevalence of the general population with good knowledge of T2DM from the Kenya study, which was 27.2%[23], the minimum sample size was determined to be 304.

Four offices in Mwanza City were purposively selected as sites for collecting data. These offices were the Tanzania Revenue Authority (TRA) regional office, the Cooperative and Rural Development Bank (CRDB), the National Bank of Commerce (NBC), and the Regional Commissioner's office. A convenient sampling technique was used to recruit office workers in these offices who voluntarily agreed to participate in this study.

Data collection

Two research assistants conducted face to face interviews with the study participants. A structured, pre-tested questionnaire developed in English and translated into the local language (Kiswahili) was used to collect information from respondents. The questionnaire was adopted from previous studies and modified to suit the current study population and objectives.[24,25] the questionnaire had two parts. The first part contained the respondent's demographic information, which included age, sex, marital status, level of education, and family history of diabetes. The second part included questions to assess knowledge, risk factors and practice of preventing T2DM. The knowledge scale required the respondents to rate each item as either "true", "false", or "don't know". A score of 1 was given for each right answer and 0 for each wrong answer. To evaluate the knowledge, we included 8 correct and 7 incorrect responses regarding risk factors for T2DM. The correct responses given were having a family history of diabetes, smoking cigarettes, being physically inactive, being 45 years of age or older, drinking too much alcohol, eating foods rich in carbohydrates, taking excessive sugary drinks, and being obese or overweight. Incorrect responses included eating food rich in fruits and vegetables, contact with a diabetic patient, infection with a virus or bacteria, drinking too much water, taking foods with too much salt, exposure to radiation or chemicals, and having high blood pressure. Score ranges of 0–5, 6–10, and 11–15 were considered poor, moderate, and good knowledge, respectively.[25]

To examine the practice, we assessed participants' lifestyles that promote T2DM prevention. We asked questions on eating a healthy diet, consistent physical activity, avoiding excessive use of alcohol and cigarettes, and regular blood glucose checkups. A score of 1 was given for each "yes" answer and 0 for each "no" answer. Score ranges of 0-2, 3, and 4-5 were categorized as having poor, moderate, and good practice, respectively. These practice scores of the respondents' lifestyles were adopted and modified from a prior study.[26]

Statistical Analysis

The coded data was entered into an Excel worksheet, cleaned, and then exported to STATA Version 14 for analysis. Categorical variables were described as frequencies and percentages. The associations between various factors and knowledge or practice on risk factors for T2DM were determined using Chi-square or Fisher's exact tests, where appropriate. The statistical significance level was set at $P<.05$.

Ethical Consideration

This study was approved by the Catholic University of Health and Allied Sciences and Bugando Medical Centre's Joint Ethics and Research Review Committee (IRB No. 1828/2021). Permission to conduct interviews was obtained from the directors and administrators of the respective institutions. Before the interview, written informed consent was obtained from the participants who voluntarily agreed to participate in the study. To ensure confidentiality, no participant's name was recorded.

RESULTS

Social Demographic Characteristics of Study Participants

We enrolled 309 (164 females and 145 males) office workers. Slightly over half of the participants, 163 (52.8%) aged between 18 and 32 years. Over 60% of the participants had at least college education and did not have a family history of T2DM (Table 1).

Knowledge on Risk Factors for Diabetes

Percentage of participants with knowledge on risk factors for T2DM ranged from 23.3% for smoking to 68% for physical inactivity T2DM (Table 2). For instance, over 60% of participants knew that taking excessive sugary food, drinks and alcohol is a risk for developing T2DM. Over half of the interviewed office workers knew that having a family member with diabetes, obesity and overweigh place a person at risk of T2DM.

Factors associated with knowledge regarding risk factors of diabetes

Only 27.8% of the participants demonstrated level of good knowledge on risk factors for diabetes. Of those,

high proportion of participants (53.2%) had family history of diabetes. Other socio-demographic factors did not vary with the level of knowledge on risk factors for diabetes (Table 3).

Practice towards Prevention of Diabetes

Although majority of study participants (75.1%) do not smoke and 60.5% claim to perform physical activity, less than half (42.1%) check their blood glucose levels at once a year and 20.4% eat healthy diet (Table 4).

Factors Associated with Practice towards Prevention of Diabetes

Generally, 154 (49.8%) study participants had poor diabetes prevention practices, 82 (26.5%) had moderate practices, and 73 (23.7%) had good practices. All socio-demographic characteristics did not associate with the practice of diabetes prevention (Table 5).

TABLE 1: Socio-demographic Characteristics of Study Participants

Variable	Categories	Frequency	Percentage
Age group	18-32	163	52.8
	33-41	82	26.5
	42-50	42	13.6
	>50	22	7.1
Sex	Male	145	46.9
	Female	164	53.1
Marital status	Married	145	46.9
	Single	127	41.1
	Separated	23	7.4
	Widowed	14	4.5
Level of education	Secondary	110	35.6
	College and above	199	64.4
Family history of diabetes	Yes	117	37.9
	No	192	62.1

TABLE 2: Study Participants' Knowledge on Diabetes Risk Factors

Risk factors	Response	Frequency	Percentage
Family history of diabetes	True	170	55.0
	False	137	44.3
	Don't know	2	0.6
Physical inactivity	True	210	68.0
	False	97	31.4
	Don't know	2	0.6
Taking excessive sugary foods and drinks	True	205	66.3
	False	100	32.4
	Don't know	4	1.3
Drinking too much alcohol	True	197	63.8
	False	110	35.6
	Don't know	2	0.6
Obesity and overweight	True	183	59.2
	False	123	39.8
	Don't know	3	1.0
Smoking	True	72	23.3
	False	235	76.1
	Don't know	2	0.6
Taking too much carbohydrates	True	149	48.2
	False	156	50.5
	Don't know	4	1.3
Increasing age	True	150	48.5
	False	151	48.9
	Don't know	8	2.6

TABLE 3: Factors Associated with Knowledge on Risk Factors of Diabetes

Variable	Knowledge			
	Good (N=86) %	Moderate (N=96) %	Poor (N=127) %	P value
Age group				
18-32	51.2	51.0	55.1	
33-41	24.4	28.1	26.8	.672
42-50	15.1	11.5	14.2	
>50	9.3	9.4	3.9	
Sex				
Male	52.3	46.9	43.3	.433
Female	47.7	53.1	56.7	
Marital status				
Single	38.4	41.7	42.5	
Married	50.0	41.7	48.8	.380
Separated	7.0	12.5	3.9	
Widowed	4.7	4.7	4.7	
Education level				
Secondary	27.9	37.5	39.4	.206
University	72.1	62.5	60.6	
Family history of diabetes				
Have family history	52.3	38.5	27.6	.001
No family history	47.7	61.5	72.4	

TABLE 4: Respondents' Healthy Style for Prevention of Diabetes

Variable	Response	Frequency	Percentage
Checking blood glucose level annually	Yes	130	42.1
	No	179	57.9
Smoke cigarette	Yes	77	24.9
	No	232	75.1
Eating healthy diet	Yes	63	20.4
	No	246	79.6
Drink alcohol	Yes	163	52.8
	No	146	47.2
Perform physical activity	Yes	187	60.5
	No	122	39.5

TABLE 5: Factors Associated with Practice of Preventing Diabetes

Variable	Practice			
	Good (N=73) %	Moderate (N=82) %	Poor (N=154) %	P value
Age group				
18-32	57.5	51.2	51.3	.816
33-41	20.5	26.8	29.2	
42-50	16.4	13.4	12.3	
>50	5.5	8.5	7.1	
Sex				
Male	45.2	41.5	50.6	.382
Female	54.8	58.5	49.4	

Continue

TABLE 5: Continued

Variable	Practice			
	Good (N=73) %	Moderate (N=82) %	Poor (N=154) %	P value
Marital status				
Single	38.4	47.6	39.0	.476
Married	52.1	39.0	48.7	
Separated	4.1	7.3	9.1	
Widowed	5.5	6.1	3.2	
Education level				
Secondary	45.2	26.8	35.7	.058
University	54.8	73.2	64.3	
Family history of diabetes				
Have family history	41.1	36.6	37.0	.807
No family history	58.9	63.4	63.0	

DISCUSSION

The present study reports a low level of knowledge regarding risk factors for T2DM among office workers in Mwanza City. We found that only 27.8% of participants had good knowledge, which was positively associated with a family history of DM. Although about 60% of the participants engaged in physical activity, about 50% had poor practices towards T2DM prevention in general.

The small proportion of participants with good knowledge regarding risk factors for T2DM observed in our study is consistent with previous reports from other East African countries. For instance, Maina et al[22] reported that only 27.2% of the community members in Kenya had good knowledge of TD2M. In the current study, a family history of T2DM was found to be associated with good level of knowledge, which is similar to the findings of several studies.[25,27,28] A previous study revealed that having a family history of T2DM increases daily consumption of fruits and vegetables and participation in diabetes screening.[27] However, non-diabetic people with a family history of T2DM who have low physical activity are at higher risk of developing diabetes because their beta cells are less likely to be able to compensate for the increased insulin resistance brought on by an increase in body mass index (BMI). [29]

The majority of the current study participants knew that a family history of diabetes, physical inactivity, excessive intake of sugary foods and fluids, drinking too much alcohol, obesity, and being overweight are risk factors for T2DM. These findings are consistent with previous studies that were conducted in different populations.[25,30] In the present study, only 23.3% of participants knew that smoking is a risk factor for T2DM. This is slightly lower than 28% reported in a Bangladesh study.[25] Thus, more awareness campaigns about the harmful effects of smoking are necessary. These findings highlight very essential aspects of education for the community and health promotion regarding T2DM. Community knowledge about T2DM is a prerequisite for people to take action to control the disease. Knowledge affects their attitude and uptake of health services, including health education.[31]

In the current study, findings revealed that minority of the participants eat healthy foods. Office workers spend a large part of their time at work. Research suggests that the workplace environment can affect eating behaviors, leading to several health consequences, such as T2DM.[32] The combination of a sedentary lifestyle and easy access to unhealthy foods increases the risk of being overweight or obese.[33] Globally, obesity is a major risk factor for T2DM, and its prevalence is growing rapidly in sub-Saharan Africa.[34] The previous study in Tanzania reported a significant association between obesity and glucose impairment in parts of the Kilimanjaro Region of Tanzania.[35] Unless urgent actions are established to minimize unhealthy eating and sedentary lifestyles, the burden of T2DM is expected to continue growing.[36] To encourage positive behavioural change, effective workplace health promotion that takes into account factors such as people, the environment, and policy is crucial.[37,38]

Strength and Limitations

Our study is the first community based study among office workers assessing knowledge and practice regarding risk factors for T2DM in Tanzania. However, there are also limitations to our study. First, given the cross-sectional design, causal relationships cannot be drawn. Second, the study did not include qualitative methods, which would have explored more knowledge and practices among study respondents. As respondents were only taken from four offices within one city, it is difficult to generalize the findings as a base for the entire country of Tanzania. There is a need for future research to replicate our study with a more diverse sample of offices to increase the external validity of our results.

CONCLUSION

The majority of the office workers who participated in this study had limited knowledge on risk factors for T2DM. Low proportion of participants demonstrated good practice for prevention of diabetes. The findings of this study suggest the need for lifestyle modification, the provision of education to the community, and raising their awareness about the risk factors for T2DM

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ORIGINAL ARTICLE

Gender-inclined Young Age Glycosuria: Contribution to Late Age Chronic Renal Diseases, Type 2 Diabetes Mellitus and Cardiovascular Diseases

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ABSTRACT

Background: Chronic kidney diseases (CKD), Type 2 Diabetes Mellitus (T2DM) and cardiovascular diseases (CVDs) are the recent worldwide late age chronic conditions that could be a consequence of renal glycosuria during childhood. This study aimed at determining the extent of glycosuria in secondary school students to obtain information that could be predictive of the situation in late age life of Tanzanians living in Mkuranga District.

Methodology: This was school-based cross-sectional study that was conducted in assenting and consenting 800 students from July to October 2019 in Mkuranga district, Pwani-Tanzania. Socio-demographic information was collected using well-structured questionnaires while weight and height were measured using beam balance and tape measure, respectively. Dipstick strip was used to determine urine glucose on clean catch mid-stream urine collected specimens.

Results: From a total of 800 enrolled students, 0.6% (5/800) had glycosuria from whom 80% were males and 20% (1/5) were females ($p = 0.37$). The proportion of glycosuric males was 4 folds higher than that found in females. While height, body mass index (BMI) and waist–hip circumference ratio were associated with renal glycosuria ($p < 0.05$), other factors showed no association ($p > 0.05$).

Conclusion: Despite the low proportion (0.6%) of glycosuria in this study, the contribution of young age renal glycosuria to old age CKD, T2DM and CVDs cannot be ruled out with males being more prone than females. Thus, it signals for consideration of regular screening for glycosuria in the school health programmes as an intervention strategy to prevent potential late age chronic disease complications.

BACKGROUND

Renal glycosuria is among conditions, usually asymptomatic, with consequences at a later age in life. The consequences may be huge and serious diseases that may include, chronic kidney disease (CKD) and type 2 diabetes mellitus (T2DM).[1,2] Renal glycosuria is not gender-biased, although males seem to be more prone to the condition than females.[3] It is suggested that the renal threshold falls with age in some individuals and rare in children; also infants have immature organs (kidney) such that it functions at low efficiency.[3] Renal glycosuria is a benign condition in which affected individuals may not have any complaints, but seldom may experience episodes of hypovolemia and hypoglycaemia.[4] In patients with renal glycosuria, blood sugar (glucose) is abnormally excreted in the urine due to inappropriate functioning of the renal tubules.[4] Renal tubules are primary components of the filtering units of the kidneys (nephrons). Glycosuria affected patients excrete glucose in urine while blood glucose concentrations remain normal or relatively low.[5]

Renal glycosuria affects individuals in various parts of the world, regardless of the age, sex or race. Glycosuria has been studied in non-white racial groups, South African, Indians, Malays, and Bantu. It has been found that glycosuria of any type is rare in children with non-diabetic glycosuria being more common in men than in women.[6,7] The overall prevalence of glycosuria among Indians and Africans is 8.6% and 8.0%, respectively. Factors such as kidney disorders, high intake of carbohydrate feeding, body mass index, waist-hip circumference ratio, genetic, family history of diabetes, lack of body physical exercise, and age are the risk factors for renal glycosuria.[4,5,7] In Tanzania there are no currently reported studies providing information on the prevalence of renal glycosuria particularly in non-diabetic children, but there are few studies that relate diabetes and glycosuria.[8] With no doubt, data on the prevalence of glycosuria and its associated factors in non-diabetic secondary school students is limited. This study therefore, aimed to determine the prevalence of renal glycosuria and its associated factors among secondary school age students with the view of obtaining information that could be predictive of the

CKD, T2DM and CVCs in late age life of Tanzanians.

MATERIALS AND METHODS

Study Area

This was a school-based cross-sectional study conducted from July to October 2019 at Mkuranga district in Pwani, Tanzania. Mkuranga district is one of the six districts of Pwani region in Tanzania located between 7° 16′ 12″ south and 39° 12′ east with an elevation of 88 metres (289 feet). It is bordered to the north by Temeke district of Dar es Salaam, to the east by the Indian Ocean, to the south by Rufiji District, and to the west by Kisarawe District. Mkuranga districts is administratively divided into 18 wards with a population of approximately more than 187,428. The district possesses 41 secondary schools.

Sample Size, Study Population and Sampling Procedure

The sample size was calculated using the Kish Leslie formula, $n = z^2p(1-p)/e^2$, where 'n' stands for sample size, 'z' stands for the level of confidence (1.96) at 95% confidence interval, '*p*' is the proportion of glycosuria estimated at 8.0% [7] and ''the margin of error 'e' was taken at 1.88%. Based on these calculations, the minimum required sample size was thus estimated to be 800 subjects, the number that was believed to provide sufficient and reliable information.

After knowing the sample size, in July to October 2019, a school-based cross-sectional study of 800 students from 10 out of 41 randomly selected secondary schools (included are: Dundani, Kiimbwanindi, Kiparang'anda, Kisiju Pwani, Lukanga, Mkamba, Mwarusembe, Mwinyi, Vianzi and Vikindu secondary schools) at Mkuranga district in Pwani, Tanzania was carried out. A total of 80 students which were obtained by dividing a total sample size (800) to the number of secondary schools (10) and subjects purposively included in the study. Thus 80 (800/10) subjects were recruited from each secondary school, each class level (I-IV) generating 20 students for enrolment. Through simple random sampling 10 males and 10 female students were then selected from a group of males and females students per class level for inclusion.

Data Collection

To collect socio-demographic information that included age, sex, weight and height, waist and hip circumferences, carbohydrate feeding habit, physical body exercise and genetic family history of diabetes mellitus, well-structured questionnaires were used. A measuring tape was used to measure height, waist and hip circumferences while a calibrated beam balance was used to measure weight from 609 assented students whose parents/guardians consented for the participation in the study and 191 consented students (older or equal to 18 years old). Both measuring tape and beam balance were tested for accuracy and validity before using for taking measurement from the students. Dipstick strip was used to determine urine glucose on clean catch mid-stream urine collected specimens.

Quality Control

All strips and urine containers were stored at room temperature and dry place as per manufacturer's recommendation. To ensure the validity of the test strips, a strip was dipped into 100g/dl glucose solution and sterile water, then the readings were justified as expected.

Statistical Analysis

STATA version 15.1 software was used to enter data, clean and for statistical analysis. Continuous variables (such as age, weight, height, body mass index, waist-hip circumference ratio and waist height ratio) were summarized as mean and standard deviations. Categorical variables such as sex, carbohydrate feeding habit, physical body exercise and genetic family history of diabetes mellitus were described as proportions. Univariate analysis was performed to determine factors associated with glycosuria by using Fisher's exact test for categorical variables and student's t-test for continuous variables. A p-value <0.05 was considered significant.

Ethics Approval and Consent to Participate

Ethical clearance with Ref. No. DA.287/298/01A/ was obtained from MUHAS Research Ethics Sub-Committee of the Senate's Research and Publications Committee of the Muhimbili University of Health and Allied Sciences (MUHAS). Permission to conduct the study was obtained from Director of Mkuranga District Council after explaining the purpose of the study and having common understanding. Confidentiality of the study participants was ensured using codes instead of participant's names. Participants were given feedback on the urinary test results and those who were found to have abnormal glucose presentation in the urine (glycosuria) were advised accordingly, to prevent progress of the condition and the measure for rectification to normal urine glucose.

RESULTS

General Characteristics of Study Population

A total of 800 school students with a mean age (years), body mass index (kg/m2), weight (kg), height (m), waist-hip circumference ratio and waist-height ratio of 16.3±1.6, 21.4±5.0, 49.1±7.9, 1.5±0.1, 0.76±0.03, and 46.3±4.8, respectively (Table 1) were enrolled in the study. In this study equal proportion of males 400 (50%) and females 400 (50%) were recruited. High proportion of the study participants were using carbohydrate (77.1%) and most of them were practicing physical body exercise (52.7%). Out of 800 study participants, 2 (0.3%) had family history of diabetes mellitus (Table 2).

TABLE 1: Mean Distribution of Continuous Independent Factors Among Secondary School Students (N = 800)

Variable	Mean ±SD
Age (Years)	16.3±1.6
Weight (Kg)	49.1±7.9
Height (m)	1.5±0.1
Body Mass Index	21.4±5.0
Waist-hip circumference ratio	0.76±0.03
Waist Height ratio	0.46±0.48

Glycosuria among Secondary School Students

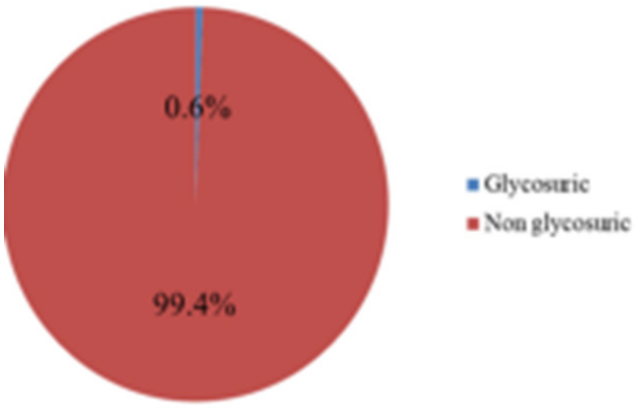
Screening for glycosuria among secondary school students revealed an overall prevalence of 0.6% (5/800)

(Figure 1). Out of 5 glycosuric students 4 (80%) were males and 1 (20%) was a female (Table 4). Therefore, the proportion of glycosuric males was 4 folds higher than that found in females.

Predictors of Glycosuria among Secondary School Students

In this population, the mean height (p = 0.002), BMI (p < 0.001) and waist–hip circumference (p < 0.001) seemed to be the factors significantly associated with glycosuria (Table 3). The urinalysis results showed that 250 mg/dl of glucose were contained in urine sample of three subjects amongst four males with glycosuria with one male having as much as double the concentration (500 mg/dl) compared to others. The only female with glycosuria had urine glucose concentration of 250 mg/dl.

FIGURE 1: Proportion of Positive Reactor Students for Glycosuria



Smaller Number of Students Reacted to Glycosuria Test

TABLE 2: Distribution of Categorical Independent Factors Among Secondary School Students (N = 800)

Variable	Total participant	Proportion (%)
Sex		
Female	400	50
Male	400	50
Quantity of carbohydrate feeding		
Low	183	22.9
High	617	77.1
Physical body exercise		
Low	422	52.7
High	378	47.3
Genetic family history of Diabetes Mellitus		
No	798	99.7
Yes	2	0.3

TABLE 4: Predisposing Categorical Independent Factors Associated with Glycosuria

Variable	Total N (%)	Glycosuric n(%)	Non glycosuric n(%)	P-value
Sex				
Female	400 (50.0)	1 (0.2)	399 (50.2)	0.37
Male	400 (50.0)	4 (0.8)	396 (49.8)	
Quantity of carbohydrate feeding				
Low	183 (22.9)	0 (0.0)	183 (23.0)	0.59
High	617 (77.1)	5 (100.0)	612 (77.0)	
Physical body exercise				
Low	422 (52.7)	3 (0.6)	419 (52.7)	1.00
High	378 (47.3)	2 (0.4)	376 (47.3)	
Genetic family history of Diabetes Mellitus				
No	798 (99.7)	5 (100.0)	793 (99.7)	1.00
Yes	2 (0.3)	0 (0.0)	2 (0.3)	
Overall	800 (100)	5 (0.6)	795 (99.4)	

P-value of less than 0.05 that indicates statistically significant association (Fisher's exact test)

TABLE 3: Predisposing Continuous Independent Factors Associated with Glycosuria

Variable	Total (Mean±SD) N = 800	Glycosuric(Mean±SD) n=5	Non glycosuric (Mean±SD) n=795	P-value
Age (Years)	16.3±1.6	16.2±1.5	16.3±1.6	0.87
Weight (Kg)	49.1±7.9	53.2±13.2	49.0±7.9	0.24
Height (m)	1.5±0.1	1.3±0.2	1.5±0.1	0.002
BMI	21.4±5.0	29.8±4.1	21.4±5.0	<0.001
Waist-hip ratio	0.76±0.03	0.90±0.04	0.76±0.03	<0.001
Waist Height ratio	0.46±0.48	0.50±0.47	0.46±0.48	0.07

p-value of less than 0.05 that indicates statistically significant association (student's t test)

DISCUSSION

This study explored the prevalence of renal glycosuria in potentially prone population of Secondary School students from 10 schools, in Mkuranga district. In principle, the results revealed presence, although in small proportion, of glycosuria in the study population with 0.6% of subjects having the condition. The proportion of subjects with glycosuria in the studied population, despite being small, provides an alert of prevailing situation in the area. The prevalence of glycosuria obtained in this study does not differ much from what was reported in a stuy conducted in Nigeria[3] which revealed a prevalence of 0.7%. However, in their study, Bassey and his colleague enrolled a large group of adolescents (1008 students) with different standard of living of whom some were in private and others in public schools. But in our study, the subjects had relatively similar standard of living and life style. The result does not seem to differ much as both studies recruited subjects with similar age ranges. In another study conducted on glycosuria and diabetes mellitus, A study conducted in South India[12] reported lower prevalence of glycosuria of 0.038% among 10,513 Indians children aged between 3 and 20 years. As compared to the current prevalence of 0.6%, a higher prevalence of 8.0% was reported in Cape Town South Africa.[7] The difference could be due to the difference in lifestyle between the South African and Tanzanian populations. The difference in prevalence could also be due to the larger sample size studied with age groups including children below 5 years who are less likely to develop diabetes unlike in the present study that involved only adolescents. Difference in geographical location of the study participants might be a cause of the difference in the prevalence of glycosuria noted in the Indian and Tanzanian studies. A prevalence of 0.8% was reported in 2004 in China among women aged 40-70 years.[13] The slight difference between the prevalence might be attributed to the difference in participants enrolled, because the previous study involved only females who are older with potential for developing pre-diabetic or T2DM than the subjects in the current study whose focus was the group of school children aged below 18 years old. The larger sample size in the previous study might have contributed to the increase in chances of finding the subjects with a condition compared to the current study. In addition, the difference in nutritional intake in Mkuranga indigenous (which is mostly sugar containing food like cassava, potatoes, bananas and maize) and other parts of the world may lead to variation of prevalence between this study and others.

This study found the mean BMI of 29.8±4.1 in subjects with glycosuria the value which is relatively higher than those without glycosuria 21.4±5.0. This finding is similar to studies conducted elsewhere[14, 15] which found a higher prevalence of hyperglycaemia, glycosuria and diabetes among those with higher BMI. It is known that BMI is directly related to obesity which is a major risk factor for glycosuria and T2DM, because obesity influences insulin resistance leading to hyperinsulinaemia and finally to T2DM.[16] The mean Waist Hip Ratio (WHCR, 0.90±0.04) of all the subjects with glycosuria was higher than WHCR (0.76±0.03) of those without glycosuria. These findings compare with those of the study conducted elsewhere.[17] The variable WHCR resembles the BMI which is also directly related to obesity, which is a major risk factor for T2DM and glycosuria.[18] The findings are also supported by a study done elswhere.[19] Our study revealed significant association between glycosuria and BMI (p = .001). However, might happen that BMI and WHCR to be insignificant risk factors for glycosuria, that may result due to delayed development of insulin resistance (in the presence of adequate beta cell function) which can manifest later in adult life if appropriate measures to control obesity are not instituted. Since may result into significant association between glycosuria and obesity, this indicates that although BMI and obesity is a risk factors for glycosuria and DM, not all obese children may develop glycosuria and DM.[20] Height is associated with glycosuria (p = 0.002) in that, it can affect the body mass index and the obesity. Shorter individuals are more prone to high BMI that may lead to glycosuria. A study conducted in Sub Saharan Africa[19] suggested that obesity and high BMI which is affected by height of an individual is much contributing to DM and glycosuria.

CONCLUSION AND RECOMMENDATIONS

The study demonstrated prevalence of renal glycosuria of 0.6% among secondary school students with male (80%) being more prone to the condition than female (20%).

We observed the factors such as height, BMI and WHCR as the risk factors for renal glycosuria among secondary school students. The findings showed gender-influence as regards to glycosuria, inclining more to males than females. These findings provide an insight for future regular screening and checkup for glycosuria in children at lower age and adolescence to serve as an early potential preventive measure for metabolic syndromes. The findings obtained could influence the reported findings as they are important determinants for external validity to this study. Further studies particularly including more diverse clustering of participants from young age to elders of 50 years of age are needed to further explore the factor-condition association. This can provide reliable information for future strategic prevention and control of potential etiology, consequently limiting future occurrence of glycosuria and other chronic complications. The study however, has provided clues on the prevalence of the condition with gender-bias, something that could be closely watched in future interventions.

Limitation of the study

One of the limitations of this scholarly study is that it was a cross-sectional study that aimed to screen for glycosuria as a potential contributor to late age chronic renal diseases, type 2 diabetes mellitus and cardiovascular diseases. In this context the study did not dig up on other factors that could contribute to the condition including measurement of blood glucose levels (both glycated and random indicative of poor blood glucose control) and renal function tests to check for potential nephropathies that might contribute to renal damages. Nevertheless, the dipstick strip measurement for urine glucose on clean catch mid-stream urine collected specimens was deemed sufficient to provide at least a picture on glucose levels per individual.

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ORIGINAL ARTICLE

Pattern, Management, and Outcomes of Chest Injury At Kilimanjaro Christian Medical Centre

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ABSTRACT

Background: Chest trauma is a major cause of morbidity and mortality in the region. Lacking data in our environment has been a challenging part of knowing the burden of the problem. Long hospital stays and associated injuries are an essential measure of morbidity. The study results will provide a basis for planning prevention strategies and establishment of treatment protocols.

Objectives: To determine the prevalence, pattern, and management outcomes of chest injury patients at Kilimanjaro Christian Medical Center (KCMC), a Tertiary Hospital in Northern zone Tanzania from October 2021 to April 2022.

Methodology: A hospital-based cross-sectional study was conducted among patients with chest injuries who were admitted and managed at Tertiary Hospital Northern Zone (Kilimanjaro Christian Medical Center-KCMC) in the Emergency medicine and General Surgery departments. Using a designated data collection tool, details of the mechanism of injury, radiological and laboratory investigations, management, and outcomes were recorded.

Results: A total of 114 chest injury patients were studied. Males outnumbered females by a ratio of 7.14:1. Their ages ranged from 2 to 83 years (mean = 36.18 years). The Majority of patients (95.58%) sustained blunt injuries. Road traffic crush was the most common cause of injuries affecting 65.79% of patients. Lung contusion, hemothorax, and rib fractures were the most common type of injuries accounting for 54.4%, 27.2%, and 21.1%, respectively. Associated injuries were noted in 85.7% of patients, and head injury (60.5%) was found in most patients. The Majority of patients (60.5%) were treated successfully with a non-operative approach. Underwater seal drainage was performed at (38.9%). One Patient (0.9%) underwent a thoracotomy. 14% of patients had complications of surgical site infection, and 69% were found in the Majority of patients. The median length of hospital stay was 4.5 days. The mortality rate was 21%

Conclusion: Motor traffic crash was the principal cause of chest trauma. Young male patients were most affected by chest trauma and the majority of patients were treated conservatively. Chest X-ray remains to be the main imaging modality for diagnosing thoracic trauma lesions. Associated injuries such as head injuries, were found to contribute to a high mortality rate.

BACKGROUND

Injury is a major public health problem in both developed and developing countries and is responsible for about 5.8 million deaths per year worldwide[1]. Road traffic crash (RTC), is the leading cause of traumatic deaths, and they are responsible for approximately more than 2.7 million injuries related per annum. Out of this, 91% of injury-related deaths occurred in developing countries.[2]

Chest trauma is responsible for 10% of all trauma admissions and 25% of trauma-related death globally.[3] Several studies in Africa showed that chest trauma is a major cause of morbidity and mortality in the region.[4] In Tanzania, it has been reported to be one of the leading causes of morbidity among polytrauma patients.[4]

The pattern of chest injuries varies widely and essentially depends on the environment or the kinematics and severity of the accidents in the diverse geographical regions worldwide.[2] The commonest cause of blunt chest injury has been reported to be road traffic crashes, although the incidence of penetrating chest injuries has also increased in civil society due to increasing the use of firearms, and other traditional weapons.[5] Associated injuries play an important role in determining the outcome of a chest injury patient especially when a head injury is associated.[6]

The management has several essential elements, such as adequate prehospital care, rapid transport to a specialized center, complex in-hospital care, and rehabilitation. The prehospital phase is vital in determining treatment outcomes appropriately and

contributes significantly to reducing morbidity and mortality.[7] Few thoracic trauma patients require a surgical operation, and a majority of patients can be treated with simple methods such as appropriate airway maneuvers, oxygen support, fluid therapy, and tube thoracostomy.[8]

The mortality rate of patients may not entirely result from the distortion of chest wall architecture and abnormal mechanics of breathing but may also result from bilateral impact and pulmonary contusion translating to a worsened degree of hypoxemia.[9] Long hospital stay has been a major problem in patients with penetrating chest injuries and those with associated extra thoracic injuries and is an essential measure of morbidity.[4]Lacking data in our environment has been a challenging part of knowing the burden of the problem. This study aimed to know the burden of chest injury-related disorders in our region so that to describe our own experience in the management of chest injuries, outlining the cause spectrum, injury patterns, and outcome in the management of chest injuries in our local setting. The study results provides a basis for developing prevention strategies and establishment of treatment protocols.

PATIENTS AND METHODS

Study design and Study site

A hospital-based descriptive cross-sectional study was conducted at the Emergency Medicine Department and General Surgery wards in Kilimanjaro Christian Medical Center, from October 2021 to March 2022. The facility also serves as a teaching hospital for the Kilimanjaro Christian Medical University College (KCMUco).

Sample Size and Sampling Technique

The sample size was estimated by the Kish Leslie formula, (1965) for cross-sectional studies. Thus, considering the proportion of chest trauma of 6% (Dogrul et al.,2020), assuming a confidence level of 95% and a margin of error of 5%, the calculated sample size was 86. Accounting for a non-response of 10%, the sample size was increased to 95. C

Study Participants

All individuals with chest trauma who were admitted, managed, and discharged during the study period.

Data Collection and Analysis

Data was collected using a well-structured electronic questionnaire The collected information included demographic profile, mode of injury, types of chest injuries, management, and outcome.

Descriptive analysis was performed using EPI-INFO 7 (Version 7.2.5.0 of March 2022). A chi-square ($\chi 2$) test was performed to compare experience of chest trauma between groups. Multivariate logistic regression analysis was used to determine predictor variables that are associated with outcome. A P-value of less than 0.05 was considered statistically significant.

Ethical Consideration

Ethical approval to conduct the study was obtained from the Research and Ethics Committee of KCMUCo, Tumaini University Makumira(Reference Number PG89/2022). Informed consent was sought from each patient before recruitment into the study. And for those under 18 years of age; when the child was able to understand the study both his assent and the parent's or/and caretaker's consent were sought. For young children, unable to understand the study, the consent of the parent or/and caretaker was sufficient to be enrolled. The study observed the confidentiality and privacy of the subjects

RESULTS

Our study enrolled 588 traumatized patients admitted to the EMD of KCMC, of which 114 cases (19.4%.) were thoracic trauma. The mean age of 114 patients with chest trauma was 36 ± 16 (range from 2 years to 83 years) and 72.8% belonged to the age group of 20–60 years. The male-to-female ratio was 7: 1 and the majority of the patients were not insured (93%) and 86.84% had no previous history of injury (Table 1)

The most common mode of injury was motor traffic crashes (MTC) in 75 (65.79 %) patients. Among patients of MTC, 28.1% of cases were involved in motorized two or three-wheeler crashes, 16.7% of patients had four-wheeler-related injuries, and the remaining 21%were pedestrians hit by moving vehicles(Table 2).

The majority (96.5%) of the individuals who experienced thoracic trauma were involved in severe accidents, of which 26.5% were seen at the hospital during the six first hours post-accident, and 42.5% were admitted 24 hours post the accident. Isolated chest injuries were present in 16 (14.3%) patients and the remaining 98 (85.7%) patients were diagnosed as polytrauma cases. Even if 83.2% of patients used an ambulance to go to the hospital, no adequate resuscitation was performed, no IV line and no IV fluid was given (Table 3).

The most used imaging modality was the e-FAST (114 patients) followed by a chest X-ray (113 patients). The chest X-rays showed positive findings in 84.9% of cases and negative findings in 6.2% of cases. While e-FAST showed positive findings in 18.42% and negative findings in 68.42%. Chest X-ray was more accurate in diagnosing traumatic chest injury than e-FAST(Figure 1).

At presentation, lung contusion 54.4% was the most frequent injury, either as an isolated injury or associated with other thoracic or extrathoracic injuries. The following common injuries were rib fractures with or without flail chest and hemothorax 27.2% (Figure 2).

Conservative management was performed in 40.4% of patients and the most common surgical procedure was chest tube insertion, carried out in 44 (38.9%) patients of which 79.2% was unilateral tube insertion and 20.9% bilateral. The mean duration of the chest tube was 6.8 ± 3.9 days with a median of 6 days (range 1–20 days). The chest tube was inserted in 53.5% of patients for hemothorax, 34.9% for hemopneumothorax, and 11.6% for pneumothorax (Table 4).

Mortality rates did not vary between blunt and penetrating injury groups.The majority of patients (66. 7%) were hospitalized for less than one week. The median length of hospital stay was 4.5 days, ranging from 1 to 49 days. A chest trauma patient with a severe TBI component is 12 times more likely to die. (Table 5).

TABLE 1: Characteristics of Study Participants

Characteristic	Male (%)	Female(%)	Total (%)
Age			
1-19	9 (7.89)	4 (3.51)	13 (11.40)
20-39	51 (35.41)	4 (3.51)	55 (38.19)
40-59	32 (22.22)	4 (3.51)	36 (25)
60-79	7 (6.14)	2 (1.39)	9 (7.89)
80-99	1 (0.69)	0 (0.00)	1 (0.69)
Total	100 (69.44)	14 (9.72)	114 (100)
Mean age		36.16 ± 16.69 years	
Insured			
Yes	6 (5.26)	2 (1.39)	8 (7.02)
No	94 (82.46)	12 (10.53)	106 (92.98)
Toxic habit and medical history			
Smoking	0 (0.00)	12 (10.53)	12 (10.53)
Alcoholic	72 (63.16)	5 (4.38)	77 (67.54)
Surgical history	1 (0.69)	10 (8.77)	11 (9.64)
Hypertension	0 (0.00)	9 (7.89)	9 (7.89)
Diabetes	0 (0.00)	1 (0.69)	1 (0.69)
Type of Trauma			
Blunt	14 (9.72)	94 (82.46)	108 (94.73)
Penetrating	0 (0.00)	6 (5.26)	6 (5.26)

TABLE 2: Cause of Trauma

Variable	Frequency	Percent (%)
MTC (total)	**75**	**65.79**
- *Car driver*	*2*	*1.4*
- *Motorcyclist/BAJAJ*	*32*	*28.1*
- *Passenger on board a vehicle*	*17*	*14.9*
- *Pedestrian*	*24*	*21.1*
Accident at work	**5**	**4.4**
Sports accident	**1**	**0.9**

Continue

TABLE 2: Continued

Fall	**23**	**20.3**
Assault	**10**	**8.9**
- *Animal attack*	*1*	*0.9*
- *Blunt weapon*	*5*	*4.4*
- *Sharp Object*	*4*	*3.5*

TABLE 3: Severity, Type and Associated Injuries of Chest Injury

Characteristic	Frequency	Percent
Time between trauma and admission		
- Less than 6 hours	30	26.6%
- 6 hours to 24 hours	35	30.9%
- More than 24 hours	49	42.5%
Transport		
- By the family /Good Samaritan	19	16.8%
- Medicalized (ambulance)	04	83.2%
Severity of the accident		
- Yes	110	96.5%
Type of lesions		
- Isolated Chest trauma	16	14.3%
- Polytrauma	08	85.7%
Associated injury in polytrauma		
- Neck	2	1.8%
- Head	69	60.5%
- Lumbar spine	2	21.15%
- Abdominal 10 8.77%	10	8.8%
- Pelvic	55	48.2%
- Limbs	55	48.2%

TABLE 4: Management of Chest Injury

Characteristic	Frequency	Percent (%)
Urgent Management		
Transfusion	34	29.8
Vasopressor drugs	21	18.4
Intubation	23	20.2
Analgesics	114	100.0
Antibiotic	109	96.5
Fluid	108	94.7
Oxygen support (nasal/facial mask)	63	55.3
Management of chest trauma		
Chest drainage	44	38.9
Mean duration of drainage	6.78 days ± 3.95 days	
Conservative Management	69	60.5
Thoracotomy	1	0.9
Treatment of associated injury		
Surgical debridement	9	7.9
Laparotomy	9	7.9
Assisted ventilation	19	16.7
Burr hole/Craniotomy	5	4.4
Open/closed fracture reduction	55	48.5

TABLE 5: Multivariate Logistic Regression Analysis of Outcome Among Chest Trauma Patients

OUTCOME			OR	Sig.	95% Confidence Lower Bound	95% Confidence Upper Bound
	GCS	***SEVERE TBI***	***12.4***	***.006***	***2.058***	***74.659***
		MODERATE TBI	1.2	.866	.267	4.798

Continue

TABLE 5: Continued

OUTCOME			OR	Sig.	95% Confidence Lower Bound	95% Confidence Upper Bound
DEATH	GCS	***SEVERE TBI***	***12.4***	***.006***	***2.058***	***74.659***
		MODERATE TBI	1.2	.866	.267	4.798
		MILD TBI		.	.	.
	RESP RATE	BRADYPNEA	2.2	.845	.026	86.570
		TACHYPNEA	2.1	.620	.191	16.106
		EUPNEA		.	.	.
	HEAD INJURY	YES	2.1	.131	.731	11.186
		NO		.	.	.

The Reference Category is: ALIVE

FIGURE 1: Types of Imaging Tools Used to Diagnose Chest Injury

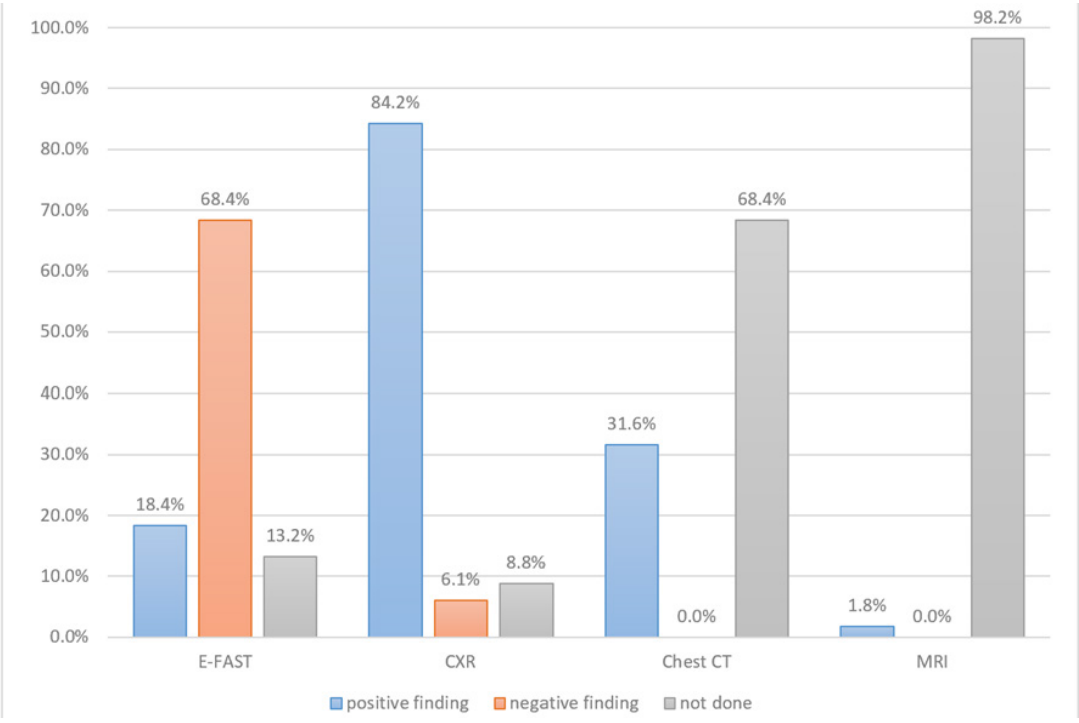


FIGURE 2: Type of Lesion

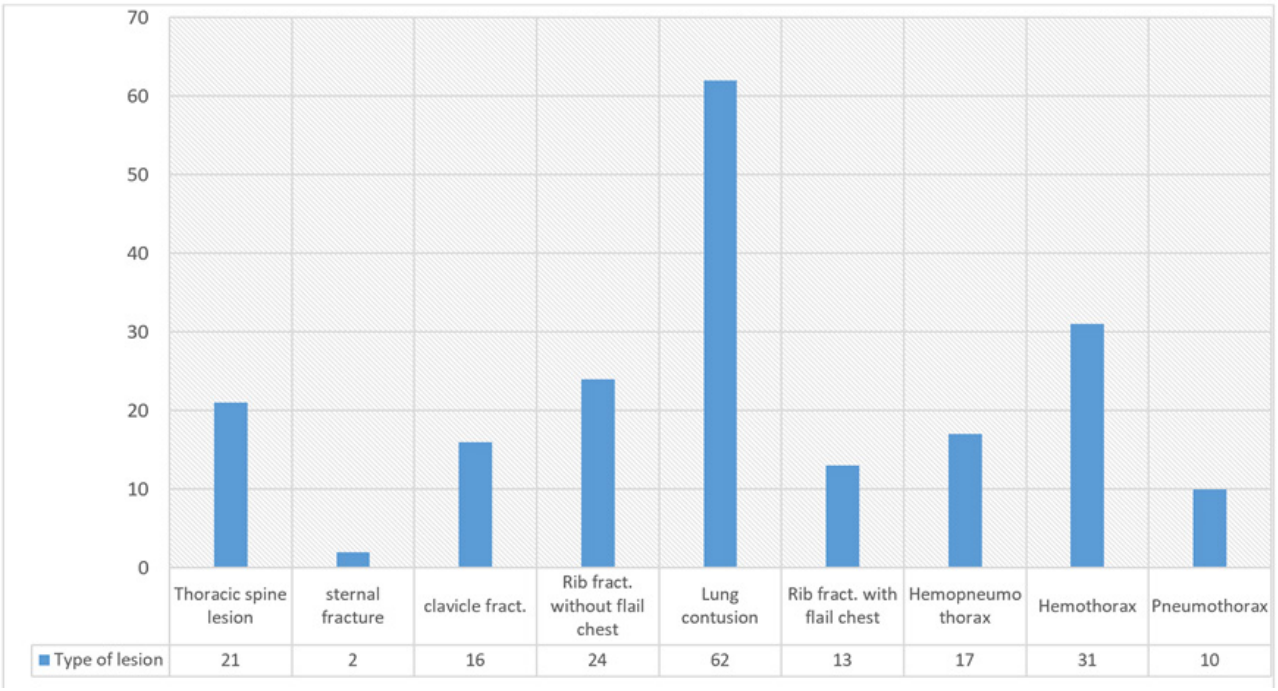
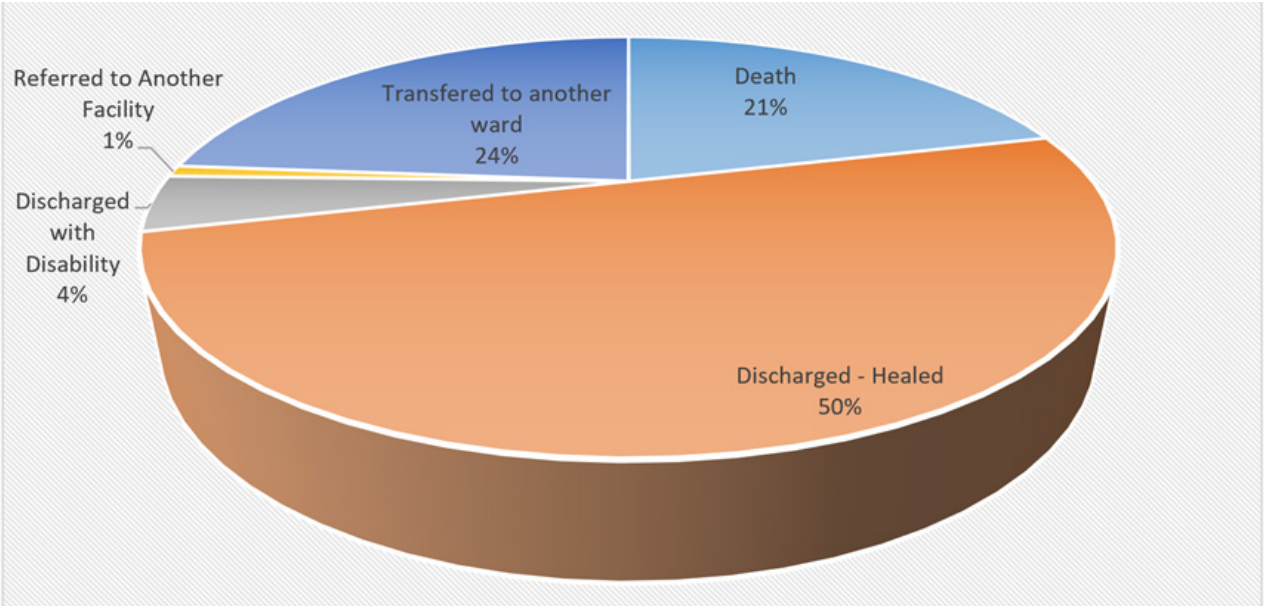


FIGURE 3: Outcome



DISCUSSION

The proportion of traumatized patients with chest injuries was 19.4% which is lower than the proportions reported in other studies.[10-12 101112] The difference can be explained by the fact that our study essentially took place during the rainy season. season in which the motorcycle, the main means of transport for the population and the main contributor to motor traffic crash (MTC) cases, is underused. In line with the findings of other studies,[10-12] most of the patients were males aged 20 to 40 years. Young males are involved in high-risk-taking daily activities and outdoor activities like driving and other hazardous occupations. Similar findings were obtained from studies done by Lema et al who noticed a predominance of the male sex (sex ratio 3.8:1) and 61% of patients aged 21-40.[4]

The most common mode of injury was motor traffic crash (MTC) involving motorized two or three-wheeler crashes and minority of patients had four-wheeler-related injuries, the remaining victims were pedestrians hit by moving vehicles. This finding was consistent with the results of studies conducted in Tanzania.[4,1313] Motorcyclists were mostly affected due to their occupational exposure. Challenges of infrastructures, overcrowded by pedestrians and petty traders made them to be in a high risk of being knocked by moving vehicles.

The majority of patients in this study arrived in the hospital 24 hours post-injury, similar to the study done by Lema et al.[4], and Baru et al.[14], which showed the same results. The late presentation is due to a delayed decision in seeking medical attention after injury, and once the decision is made, patients first pass through lower health centers before being referred to the higher specialized centers. Knowing the time of injury in trauma patients is essential for prevention strategies and has an impact on the outcome. Baru et al[14] in Ethiopia reported that one-third of the victims reached healthcare facilities within a golden hour and had good outcomes, while the late presentation was highly associated with bad outcomes.

In this study, a significant number of patients were declared severely injured due to a high mechanism of injury, in contrast to the study done by Lema et al.[4], where the majority of patients were not severely injured. Despite the fact of patients were transported by ambulance, there was inadequate resuscitation of the patients as a majority were brought unstable.Blunt injuries represent the majority of chest trauma patients encountered. The findings are similar to other studies conducted in different parts of the world.[4,15-17] In this study, most of the patients suffered motor traffic crush with direct injury to the chest. However, in Nigeria, the[18] majority of patients experienced a penetrating injury that was due to the high rate of crime that existed in that region. In our area, a small number of penetrated injuries were due to violence and assaults.

Similar to the findings reported by Huber et al,[10] lung contusion was found in a majority of a patient as an isolated injury or associated with other thoracic or extrathoracic injuries. But these findings were different from what has been reported in studies conducted in the same geographical locations,[4,13,17] which reported different types of chest injury such as chest wall wounds, and rib fractures. Most lesions occurred on the right side, probably due to the dominancy of the right side by many patients, and during the mechanism of injury, people tend to resist by using the strongest side of the body parts.

The presence of associated injuries was found in the majority of the patients, predominantly head injuries. Similarly, Lema et al[4] reported that head injury tends to be a significant associated injury and it plays an important role in determining the outcome of a chest injury patient.[13,18] Chest X-ray has been reported to be an important diagnostic tool in the diagnosis of Lung contusion, rib fractures, and hemopneumothorax.[8] However, another study[4] acknowledged that ultrasound is the best diagnostic tool for hemopneumothorax. Like in other studies,[18] chest radiography was done on all patients.[18] The current study found that 60.5% of patients were managed conservatively, and 39.8% were managed with surgical interventions such as chest tube thoracostomy and thoracotomy (38.9% and 0.9%, respectively). The findings were similar to those reported by Lema et al[4] but in contrast to those reported by Massaga et al,[13] where a majority of patients were treated by surgical intervention. The chest tube was inserted in the Majority (53.5%) of patients with hemothorax and 34.9% for hemopneumothorax, and the findings were almost similar to other studies.[11,18] The mortality rate was 21.1%, which was high compared to the rates reported by other studies conducted in the country.[4,1313]. The majority of patients in this study experienced a severe form of injuries, chest injury associated with other injuries, and presented at the hospital 24 hours post-injury. Associated injuries, particularly head injuries, impacted negatively the mortality rate. This is in line with the findings of other studies.[17] The instability of the patient and respiratory rates were predictors of poor outcomes.

The current study found a complication rate of 14% of all managed chest trauma patients which is lower than the rates reported by other studies.[13,17] While the current study revealed that surgical site infection/wound infection was the common complication, pneumonia[17] and non-functional tubes[13] were reported by other studies[1713]. The median length of hospital stay was 4.5 days, different from other studies which reported a median of more than 5 days.[4,13]The GCS less than 8 was positively associated with the death. For lema, Masuma and Lema report also, respectively, a positive association of Associated injuries with death in patient with cest trauma.[19, 4]

CONCLUSION

Chest injury is common in motor traffic accidents seen at KCMC. Commonly affected victims are young adult males in their productive and reproductive age group. However, most of the individuals who sustain injuries are first kept in a peripheral center with inadequate treatement and then present at KCMC 24 hours post-injury. Associated head injury increased the risk of poor outcomes for chest injury patients. Chest x-ray remains to be an imaging modality for diagnosing thoracic trauma lesions.

Recommendation

Preventive measures targeting reducing the occurrence of MTCs are necessary further to reduce the prevalence of chest injuries in this region.

Lower health centers should be given continuous training on trauma management especially chest trauma, and emphasize early referral.

Management protocol or guideline review is suggested to have better and early intervention.

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ORIGINAL ARTICLE

Factors Influencing Participation of Adults in Voluntary Medical Male Circumcision in Lindi Region, Tanzania

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ABSTRACT

Background: Voluntary Medical Male Circumcision (VMMC) is a surgical procedure done by a qualified medical personnel using anesthesia. In Tanzania, there is a gap between adult men who are not circumcised and adolescents. This calls for a review of the current situation of VMMC services in the community at large in order to inform policymakers and stakeholders involved in the fight against HIV and other sexually transmitted diseases. The present study explored the factors influencing utilisation of VMMC services among adult males in Lindi Region, Tanzania.

Materials and methods: A cross-sectional study was conducted among adults male (15-49 years). Data were collected by using a structured modified measure evaluation quantitative Version 2 questionnaire using a Tablet/Android device with an Open Data Kit (ODK) application (Google Inc. California, USA).

Results: The socio-demographic set up of the study participants was mainly composed of males less than 30yrs, single, unemployed, with primary education as the highest level of study and of a Muslim faith. Majority of the respondents (92%) recommended circumcision to a male family member who is not yet circumcised. The study showed that improved sexual performance (81%), penile hygiene (97%) and circumcision as a modern civilization (96%) to be the key factors that motivated respondents' utilisation of VMMC services. However, only 20.6% of the respondents could barely say that VMMC is a surgical procedure done by qualified medical personnel under anaesthesia. The major reasons for recommending the utilisation of VMMC services to their family members were the VMMC usefulness in preventing STIs (48.9%), cultural practices and norms (31.5%), improved penile hygiene (17.4%) and religious reasons (2.2%).

Conclusion: VMMC is positively favoured by the local coastal communities of the Lindi region of Tanzania Mainland. Our findings may be inferred to reflect on the other neighbouring regions with similar sociocultural set ups such as Mtwara, Pwani, Rural Dar es Salaam and Tanga and the isles of Unguja and Pemba. Programs addressing VMMC may be well instituted in these local communities with high degree of favourability and success.

BACKGROUND

Unlike the traditional circumcision practices, Voluntary Medical Male Circumcision (VMMC) is a surgical procedure done by qualified medical personnel under anaesthesia to consenting male adult. It is referred to Medical male circumcision when circumcision is performed for medical indication.[1,2] Circumcision is one of the oldest surgical procedure performed by humans; it dates back to the prehistoric era and it is still one of the most performed surgical procedure in the world today;[3] and it has been performed throughout history due to social, cultural, religious and medical reasons. The prevalence of VMMC has been ever changing due to advances in socio-cultural and technological factors. The key motivator for VMMC is prevention against HIV/AIDs.[4] However, the society may also be motivated by other reasons including prevention against sexually transmitted infections (STIs), and cervical cancer; improved penile hygiene, and social acceptance; peer pressure from friends, family or partners; and perceived improved sexual performance in circumcised men.[5] Physiologically the skin beneath prepuce (which covers the glans penis in uncircumcised individuals) is so soft that it poses no sufficient barrier to HIV virus. Its removal helps in prevention of female to male vaginal transmission.[6,7] And the in the same manner it helps in the prevention of other STIs such as Human Papilloma Virus (HPV)- the leading cause of cervical cancer in women in developing countries. The major STIs including Gonorrhoea, Chlamydia and Syphilis, which also increase the HIV infectivity, are substantially reduced by VMMC institution.[8]

It is estimated that worldwide, one in three males is

circumcised with almost universal a coverage in some countries.[9] Voluntary medical male circumcision was launched in 2010 in the fourteen African countries with low circumcision rate and high HIV prevalence which included Ethiopia, Kenya, Uganda, Rwanda, Tanzania, Mozambique, Zambia, Zimbabwe, Malawi, Botswana, Namibia, Lesotho, Swaziland and South Africa.[10,11] Some of these countries have overall low circumcision rates; for instance, Rwanda has 9%, while other countries have areas with both higher and lower circumcision rates such as Kenya and Tanzania due to socio-cultural, ethnicity and religious differences.[12]WHO recommends medical male circumcision to be integrated in the programs for reducing HIV/AIDS infection rates in high disease burden and low circumcision areas. This is evidenced by clinical trials done in Rakai (Uganda)[13] Kisumu-Kenya[14] and Orange Farm (South Africa), which have shown that VMMC reduces the risk of new HIV/AIDS among heterosexual transmission risk by 60%; as well as cervical and penile cancer.[15.] Free VMMC in Tanzania was launched in 2010 in some regions such as Tabora and Njombe; then it was extended to Shinyanga, Simiyu, Mwanza, Mara, Geita, Kagera, Kigoma, Iringa, Mbeya, Ruvuma, Katavi, Singida and Mtwara. Over a decade later, the male circumcision coverage has substantially improved despite some spots where it is in still in low proportions.[16, 17.]

In the years that ensued after the introduction of expanded national VMMC programmes in some regions of mainland Tanzania in 2010, the estimated national prevalence of circumcision among men aged 15-49 has been 67% with Shinyanga region leading at 89% coverage, Njombe (67.3%), Mwanza (66%) and Tabora (62.2%). The regions with lowest circumcision prevalence in Tanzania include Katavi 52.7% Geita(52%), Rukwa (34%) and Simiyu (21%).[18] The Overall prevalence of HIV in Tanzania is 4.7%, but in some areas with low prevalence of circumcision it is higher than the national average; and male circumcision, particularly VMMC is considered a promising long term approach in the quest to combat the burden of HIV/AIDS.[19] In some recent campaigns, the Government through President's Office– Ministry of Regional Administration and Local Government (PO-RALG) had aimed to strengthen and scale-up a comprehensive package of quality, safe VMMC services among adolescents and adult men age 10 to 29 years to reach 80% prevalence by 2020 and to integrate Early Infant Male Circumcision (EIMC) services in reproductive and child health (RCH) clinics for sustainability. The present work aimed at exploring factors influencing VMMC utilisation in Lindi region of the coastal regions where traditional and religious circumcisions are practiced alongside limited to no Voluntary Medical Male Circumcision services.[16]Data from this study may help to scale up various VMMC campaigns

MATERIALS AND METHODS

Study Design and Setting

A mixed descriptive cross sectional study was conducted with the aim to find out factors influencing utilisation of VMMC services among adult males in Lindi community in Tanzania Mainland.

Study Population and Sample Size

A quantitative questionnaire was administered to 100 conveniently selected sexually active males in the community due to the limited resources and funding. The participants filled in a written informed consent as per requirement of the study IRB ethical clauses.

Sampling Technique

Multistage random sampling technique was employed in order to reach geographically dispersed and smaller population and cost and time effectiveness. Simple random sampling was conducted at all levels starting from wards and household level where two individual per household was selected by lottery method. Furthermore, participants were identified at home or at working site.

Inclusion Criteria

A resident who had stayed in the study area 6 months or more was eligible for the study. Males 15 to 49yrs with full sanity and who consented for the study were enrolled.

Exclusion Criteria

All those who refused to participate, mentally handicapped individuals and under or over the selected age range were excluded from the study.

Data Collection Process

Data collection was done electronically using tables/ Android devices. Prior to downloading the data from the cloud server, all Android devices were checked to ensure that all completed questionnaires had been uploaded to the server. The consented participants were interviewed using a questionnaire with structured questions based on study objectives. We adopted questionnaire with structured questions to collect information from Men aged 15-49 yrs and above 50yrs. In addition, we used structured questionnaire with open questions to conduct interviews. Each question was addressed accordingly. To eliminate interpretation problems and to maintain precision, the questionnaire was pretested and reviewed accordingly. Interviewers were emphasized on use of simple, clear and understandable Swahili questions and the response was saved in Swahili language. Interviewees were visited in the selected houses/VMMC sites and the process of data collection was done face to face.

Validity

In order to ensure that data collected for the study were of good quality, the researcher carried out a pretest of the questionnaires and interview guide on a small number of respondents with similar characteristics as that targeted in the study. This helped to identify questions that cannot be answered or those might have ambiguity in the meaning to respondents. Such questions were eliminated or corrected prior to field data collection.

Reliability

Reliability of instruments was ensured through clear instructions and questions that were asked during the study. The research tools were appraised through triangulation. Different respondents were asked the same question by using different instruments so as to allow the researcher to get information on factors influencing adults' participation in VMMC in Lindi Municipal district, Questionnaires produced the same results on repeated trial, a cut-off point for having knowledge reached by

choosing the correct answer and not having knowledge by incorrect response.

Data Acquisition and Management

Tablets/android devices with an (ODK) Open Data Kit and super recorder application for qualitative data recording, software was installed successfully in the same tablet/android for quantitative data collection, informed consents, question papers, Pen, notebooks, laptops, router/modems for local internet. Quantitative questionnaire was administered to the participants after a written informed consent.

Data Analysis

Data was entered and analysed by using SPSS software. Data analysed according to each specific objective by computing frequencies, mean, percentages, standard deviation and proportion. Chi-square test was used for categorical data and a *P-value ≤0.01*/ taken as statistically significant.

Ethical Consideration

The ethical clearance was obtained from National Research Committee NIMR/HQ/R.8a/Bollix/3562. A written consent of the participants was sough before enrolment into the research. Furthermore, no invasive procedure or breach of personal privacy was exercised in this questionnaire based research.

RESULTS

Table 1 shows the socio-demographic characteristics of the 100 study participants aged 16 years and above who participated in the study. Over 50% (n=55) were aged 16 to 29 years, and 7% (n=7) were aged 50 years and above. More than half of the participants 54% (n=54) were single, 38% (n=38) were married. Concerning their highest level of education, 45% (n=45) had attained primary education, 36% (n=36) secondary education and 18% (n=18) beyond secondary education level. The Muslims were 80 % (n=80) and about 71% (n=71) were not employed, while 39% (n=39) were engaged in business and 20% in farming.

The socio-demographic distribution show that majority of the participants had the age range 16-29 (55%), were single 54%), of Muslim faith (80%), attained primary education as the highest educational level (45%), were engaged in small business for a living (38%) and not in formal employment (71%). The Pearson Chi square test showed the association between VMMC knowledge and the highest education level for the study participants with primary education at 32.4% (n=11), secondary education at 44.1% (n=15) and above secondary education at 23.5% (n=8). Regarding the basic knowledge of the meaning of VMMC, the proportion who correctly describe it as a surgical procedure done by witch doctor using anaesthesia was 76.5 percent (n=26) and proportion who said it is a surgical procedure done by qualified medical personnel using anaesthesia is 20.6 percent (n=7). The fact whether VMMC reduces the risk of new HIV infection could be stated by 61.8% (n=21) whereas 32.4% (n=11) could not tell.

The results in Table 2 above were obtained by analysing data from a structured a questionnaire administered to the participants during the study. A Pearson Chi-Square test was used to test significance of the proportions of the associations in favour of the most frequent response. These findings indicate that men do not think that VMMC may be useful in the prevention of HIV/AIDS (p=0.914). However, there were many positive findings including VMMC as preventative to other STIs (*p=.41*), improve sexual performance (p=.005), sex enjoyment in men (*p=.35*), improvement of penile hygiene (*p<.001*) and circumcision as an indicator of a civilised person (*p<.001*). There was less knowledge to the participants in respect of the importance of VMMC to the female partner. Majority of men had no idea regarding VMMC a prevention of cervical cancer due to human papilloma virus usually harboured in the male penile prepuce (44%) although not statistically significant; *p=.76*). Further, a substantial number proportion of participants knew nothing about the importance of VMMC in respect of female preference of circumcised men (28%) and female sexual pleasure (25%) although both variables were statistically insignificant at *p=0.62* respectively.

Table 3 shows the utilisation of VMMC services regarding to age groups. The findings show that, the study participants who recommend circumcision to a male family member who is not yet circumcised under age group 16-49 years is 54.4 percent (n=50), 30-39 years is 29.4 (n=27), 40-49 years is 7.6 percent (n=7), and 50 years and above is 8.7 percent (n=8). Furthermore, with consideration of age groups of study participants, the reasons for recommending circumcision to a male family member who is not yet circumcised, the findings revealed that for prevention of STI's reason 16-29 years is 55.6 percent (n=25), 30-39 years is 33.3 percent (n=15), 40-49 years is 6.7 percent (n=3), and 50 years and above is 4.4 percent (n=2). Community culture and customs reason 16-29 years is 62.1 percent (n=18), 30-39 years is 27.6 percent (n=8), 40-49 years is 6.9 percent (n=2), and 50 years and above is 3.5 percent (n=1). Reason for Improved penile hygiene 16-29 years is 37.5 percent (n=6), 30-39 years is 25.0 percent (n=4), 40-49 years is 6.3 percent (n=1), and 50 years and above is 3.3 percent (n=5). Religious reason 16-29 years is 50 percent (n=1), and 40-49 years is 6.3 percent (n=1).

TABLE 1: Socio-Demographic Characteristics of the Study Participants

	Percent (%)
Age	
16-29 years	55.0
30-39years	30.0
40-49 years	7.0
50 years and above	8.0
Marital status	
Married	38.0
Single	54.0
Separated	2.0
Cohabiting	6.0
What is your religion?	
Roman Catholic	9.0
Lutheran	3.0
Anglican	2.0
Muslim	80.0
Other	6.0
What is your level of education?	
Beyond secondary education	18.0
Secondary education	36.0
Primary education	45.0
No formal education	1.0
What is your occupation? (Main activity)	
Farming	20.0
Business	39.0
Fishing	1.0
Employed	12.0
Other (specify)	28.0
Employment status	
Student	4.0
Employed	25.0
Unemployed	71.0

TABLE 2: Proportion (%) and Association between Voluntary Medical Male Circumcision with VMMC Perception and Practices

Perception/Practice of VMMC	Yes (%)	No (%)	Don't Know (%)	P-value#
Prevents HIV/AIDS	62.0	36.0	2.0	0.914
Prevention of other STIs	51.0	47.0	2.0	0.410
Prevents cervical cancer to a female partner	28.0	28.0	44.0	0.760
Improved sexual performance	81.0	15.0	4.0	0.005
Circumcised men enjoy sex more	83.0	13.0	4.0	0.350
Circumcision improves penile hygiene	97.0	2.0	1.0	<0.001
Circumcised men are favored by women	70.0	2.0	28.0	0.620
Increase Female sexual pleasure	66.0	1.0	25.0	0.620
Circumcision is an indicator of civilization	96.0	4.0	0.0	<0.001

#In favour of the most frequent response.

TABLE 3: Utilisation of VMMC Services Among Adult Males (15-49) Years Old

Variable	Age Group in Years				
	16-29 n (%)	30-39 n (%)	40-49 n (%)	≥50 n (%)	Total n (%)
Would you do/or recommend circumcision to a male family member?					
No	5 (62.5)	3 (37.5)	0 (0.0)	0 (0.0)	8 (100.0)
Yes	50 (54.4)	27 (29.4)	7 (7.6)	8 (8.7)	92 (100.0)
If yes, explain the reason					
Prevention of STI's	25(55.6)	15(33.3)	3(6.7)	2(4.4)	45 (48.9%)
Community culture and customs	18 (62.1)	8 (27.6)	2(6.9)	1 (3.5)	29 (31.5%)
Improved penile hygiene	6 (37.5)	4 (25.0)	1 (6.3)	5 (3.3)	16 (17.4%)
Religious reason	1 (50.0)	0 (0)	1 (6.3)	0 (0)	2 (2.2%)

DISCUSSION

In these study males (15-49 years) in Lindi region were assessed in regard to knowledge, perception, practice, utilisation of VMMC services and determination of factors associated with VMMC utilisation among adult males. These data suggested that the factors associated with knowledge in respect with uptake of VMMC included highest education level attained, being able to define VMMC and if VMMC reduce the risk of new HIV infections. These results are consistent with previous findings in which a large number of the respondents underwent circumcision as a motivator for them to prevent HIV, STIs and maintenance of hygiene. Similarly, the same study found that having a higher level of education facilitated the uptake of VMMC entailing the education level was a factor likely to encourage the uptake of VMMC. Being able to define VMMC also was positively associated with uptake of VMMC as evidenced in the same study.[20] The association between VMMC with perception and practice, the analysis revealed that prevention of STIs, improved sexual performance, circumcised men enjoy sex more than uncircumcised men, circumcision is modern civilization and improved penile hygiene were the factors significantly associated with the uptake of VMMC in the present study. These findings are in agreement with previous studies. In these studies male participants' attitudes were generally positive toward VMMC due to peer pressure, women partners' preferences, STIs prevention and cleanliness as key motivating factors in seeking VMMC.[21, 22]

The majority of the respondents (92%) recommended circumcision to a male family member who is not yet circumcised. The participants expressed the reasons for the recommendation of the utilisation of VMMC services to their family member as due to the prevention of STIs (48.9%), community traditions and customs (31.5%), improved penile hygiene (17.4%) and religious reasons (2.2%). Improved sexual performance, circumcision as an indicator of civilization and penile hygiene were the main factors which determined the utilisation of VMMC services. These finding were consistent with one study based in Malawi in which enhanced sexual pleasure, religious beliefs, proven safety, affordability, confidentiality and being hygienic prompted participants to go for circumcision.[23]

CONCLUSION

VMMC is positively favoured by the local coastal communities of the Lindi region of Tanzania Mainland. Our findings may be inferred to reflect on the other neighbouring regions with similar sociocultural set ups such as Mtwara, Pwani, Rural Dar es Salaam, Tanga, the isles of Unguja,Pemba and Lakezone regions; Mara, Mwanza,Shinyanga,Simiyu,Geita,Kagera and Kigoma. Programs addressing VMMC may be well instituted in these local communities with high degree of favourability and success.

Recommendation

Universal VMMC programs need to be initiated in the quest to combat HIV and STIs transmission coupled with VMMC awareness campaigns in some local communities.

Study Limitations

Funding insufficiency limited our study to one costal region of Lindi, Tanzania. Future studies need to expand to other coastal regions with lower VVMC programs.

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ORIGINAL ARTICLE

Factors Linked to Female Genital Mutilation Practice Among Women Living In Alungu Village of Mandera County, Kenya

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ABSTRACT

Background: Female Genital Mutilation/Cutting (FGM/C) is a harmful traditional practice with severe health complications, deeply rooted in many sub-Saharan African countries. In Kenya, the prevalence of FGM/C is 15% in women aged between 15 and 49 years. The Kenyan Somalis practice FGM/C with a prevalence above 90%. FGM/C practice continues to persist in Alungu village, Mandera County in the North Eastern of Kenya despite efforts by anti-FGM programs. However, the underlying factors behind FGM practice in the area have not been explored.
Objective: To assess factors contributing to female genital mutilation practice among women living in Alungu village of Mandera County, Kenya.
Methods and materials: This study utilised a descriptive cross sectional design. The study population was women of reproductive age (from 18 to 49 years) who resided in Alungu village in Mandera County, Kenya. A study sample of 98 women was selected using simple random sampling technique. Data was collected using a researcher-administered questionnaire and analysed using the Statistical Package for Social Science (SPSS).
Results: Most of the respondents were aged 35 – 44 (45.8%), married (100%), had no formal education (74.7%) and had no formal employment (89.2%). All participants agreed that traditional beliefs, customs and rite of passage to womanhood contributed to FGM, 90.4% of the participants acknowledged that FGM is a symbol of ethnic identity and inclusivity. Factors affecting prevention of and response to FGM were low involvement of women in anti-FGM programs (91.6%); support for FGM by local leaders and elders (100%); failure by authorities to take action against those perpetuating FGM (100%); indifference to FGM practice continuation among local religious and political leaders (96.4%) and poor enforcement of existing laws against FGM (100%).
Conclusion: A wide range of socio-cultural factors did contribute to FGM practice among women living in Alungu village, Mandera County.

BACKGROUND

Female genital mutilation (FGM) also known as female genital cutting (FGC) or female circumcision (FC) refers to the partial or full removal of external female genitalia or other intentional injury to the female genitals for non-medical reasons.[1] The World Health Organization (WHO) estimates that more than 200 million women and girls alive today around the world have undergone female genital mutilation and/or cutting. It is further estimated that, globally, more than three million girls are at risk of undergoing FGM every year.[1] The practice is mainly concentrated in the Western, Eastern, and North-Eastern regions of Africa, in some countries in the Middle East and Asia, as well as among migrants from these areas.[1] FGM is highly prevalent in Africa with data from WHO and UNICEF indicating that over 90% of the 30 FGM high prevalence countries were in the African region. FGM prevalence rate in Africa range from 35 to 40 percent is way above the global prevalence rate of below 10%. Worse still, in some African communities, the prevalence of FGM was as high as over 90% denoting a concern that required urgent.[1,2]

Data from censuses, household and hospital records indicate that FGM constitutes a massive global health challenge particularly in light of the high burden of FGM in Africa, the Middle East and Asia where the practice is concentrated.[1] In Africa, more than 33 percent of girls undergo FGM yearly in majority of African countries. The practice of FGM is strongly bound by cultural norms and traditions, such as the rite of passage into womanhood.[2,3] The removal of parts of female genitalia is an ancient tradition in many parts of Africa and its practice world over has persisted despite existing political and legal penalties.[4]

FGM practice has been linked to adverse physical and psychological consequences like post-traumatic stress disorder and affective disorders.[5] The physical consequences can be short term for example bleeding, pain, acute urine retention or long term for example

keloids, epidermal cysts and chronic urinary tract infections.[6] Women who have undergone FGM have experienced obstetric complications for example obstructed labour, extensive perineal tears and operative births.[7,8] FGM also leads to sexual complications.[9–11]

In sub-Saharan Africa (SSA), majority of the countries still practice FGM which is marked with rituals and celebrations and is regarded as being an integral part of girls' social development. In addition, FGM practice in SSA is deeply embedded largely on account of cultural and social norms of communities and there is immense social pressure on all young girls to conform to this practice.[2] Studies done in SSA indicate that girls who fail to undergo FGM are likely to be punished or penalized while others are isolated, stigmatized and despised by not being married by men from their communities. This forces them to leave their communities or they are forced by their parents to undergo the practice.[12]

Ignorance of sexual and reproductive health, particularly inadequate knowledge on the negative health impacts of the practice greatly contributes to the persistent practice of FGM among different communities in SSA, the East Africa region included. Studies conducted in Uganda, Tanzania and Kenya showed that remote communities still believed that FGM promoted health and personal hygiene. In addition, the smooth surface was said to be pleasing for both the man and the woman.[4,13,14] Among factors cited to contribute to this harmful practice in the East African region include its social acceptance, low level of awareness about its harmful impact on the health of women and girls, cultural beliefs and traditions, ignorance on women's reproductive health issues among local communities and beliefs that FGM leads to increased pleasure for male partners, enhanced fertility and improved marriage prospects.[4,15,16]

The prevalence of FGM in Kenya among women of reproductive age is at 15 percent with the highest prevalence in the northern part of Kenya at 43 percent among girls aged 10 to 14 years.[17,18] FGM rates in Kenya vary considerably by location from rates of less than 20% in Central, Coast, Nairobi and Western regions to rates of 20% to 60% in Rift Valley, Nyanza and Eastern regions to as high as over 95% in North Eastern. More than 80 per cent of the FGM are performed by traditional excisors.[18] Despite the general decline of female genital mutilation, the prevalence of FGM remains high in Kenya's North Eastern communities such as the Somali at 94% and Samburu at 86%. This has been attributed to low levels of knowledge on the adverse effects and impact of FGM on women and girls.[2] Despite laws in place prohibiting FGM in Kenya, evidence from Alungu village in Mandera County showed that the community still practiced FGM among girls aged 7 to 15 years.[19] The evidence indicated that one in every three girls from the village had either undergone the cut or was waiting to undergo the cut. In light of this serious situation, the current study sought to explore the factors linked to female genital mutilation practice among women living in Alungu village of Mandera County, Kenya. Elimination of FGM incidences is an important strategy towards the achievement of Sustainable Development Goals (SDGs) on health.

The fight against FGM also contributes to international-community's efforts towards achieving gender equality and empowering all women and girls by eliminating all harmful practices such as child marriages, early or forced marriages and FGM.

METHODOLOGY

Study design

The study utilised a community based cross-sectional descriptive research design which employed quantitative approach through the use of interviewer administered questionnaire.

Study Site

The study was carried out in Alungu village in Mandera County in the North Eastern Part of Kenya. Mandera County borders Ethiopia to the North, Somalia to the East and Wajir County to the South and South West and is characterized by low lying rocky hills located on the plains that rise gradually from 400 meters above sea level. The rest of topography is low lying, characterized by dense vegetation with thorny shrubs of savannah type found along foots of isolated hills. The major economic activity in Mandera County is pastoral with farming activities being undertaken along Daua River. The County has a population of 1,025,756 people according to the 2009 census (KNBS, 2016). Alungu village lies within Lafey Sub-County of Mandera County, Kenya.

Study population

The study targeted women of reproductive aged between 18 and 49 years who resided in Alungu village in Mandera County and consented to the study.

Sample size and sampling procedure

The study sample size was calculated using Yamane's formula.

$n=N/1+N(e)^2$

$150/1+150(0.05)^2$

$150/1+150(0.0025)$

$150/1+0.375$

$150/1.375$

$n = 109$

Where;
N is the estimated population size =150 (Number of women of reproductive age in Alungu village).

E is the margin error which is 0.05

Hence, the study sample size comprised of 109 women who live in Alungu village, Mandera County.

To obtain the study sample, simple random sampling technique was employed, where a random number generator was used to generate 109 numbers. This ensured that all the participants had an equal chance of participating in the study. This sampling was done during meeting breaks and the interviews were carried out after the meeting. The list of women was made and each woman was allocated a number. Using the random number generator, a respondent who had the number was picked.

Data Collection Procedure

Researcher approached the women residing in Alungu

village, individually, during their weekly women group meetings that occurred at Mama Yarey's Meeting Room within the village to request for their participation in the study. The researcher targeted the women during their meetings' break intervals. The brief encounters did not last for more than 5 minutes. During these brief encounters, the researcher highlighted important points about the study; emphasized the study's selection criteria and disclosed that he and the lady chaperone were available at the local health facility's Counselling Room for further details about the study. The inclusion criteria was women of reproductive age who had resided in the study site for not less than one year and those who consented to the study. Women who met the inclusion criteria met the principal researcher and the lady Chaperone in the specified area at their convenience for in-depth information and procedure of participation.

Data Quality Assurance

A pre-test was carried out to ensure the validity and reliability of the research tool. The data collection exercise entailed the researcher asking the respondents the questions as contained in the research tool and noting down their responses. Ethics were observed throughout the process of research to avoid introduction of biases. Once the study participants responded to the questionnaires, the researcher scrutinized them for completeness before receiving them. Data analysis process was conducted systematically to avoid any alterations.

Data Analysis, Presentation and Storage

The filled-in questionnaires were then stored safely under lock and key in readiness for data entry and analysis. The data collection exercise took three weeks.

The quantitative data generated from the closed ended questions were analysed through descriptive statistics using the Statistical Package for Social Science (SPSS, version 24) and presented through percentages and frequencies. The study results were presented in tables, graphs and charts, as appropriate.

Ethical Approval

Ethical approval was sought from the Kenyatta National Hospital - University of Nairobi Ethics Research Committee (ERC), ethical approval number UP618/07/2021 and permission was sought from relevant authorities at the Mandera County Offices and the local authority.

Given the cultural sensitivity of the study subject and the fact that it was culturally inappropriate for the principal researcher (being a man) to interview the respondents (who were women) by himself, the principal researcher utilized a lady chaperone during the data collection process. The lady chaperone was a reproductive health counsellor at the local health facility from where the data collection exercise was carried out.

RESULTS

Response Rate

From the interviews held, adequate responses from 83 respondents were obtained, translating into a response rate of 76.1%

Respondents' Profile

From the findings, 45.8% (n=38) of the respondents were aged 35-44 years. Most (74.7%, n=62) of the respondents had no formal education and majority (89.2%, n=74) were unemployed. All the respondents were married, from Muslim religion and from Somali ethnicity. Most (81.9%, n = 68) of the respondents had 5 - 8 children. (Table 1).

Majority of the respondents (96.4%, n=80) had undergone female genital mutilation. The results also revealed that the respondents underwent the "cut" at ages between 7 and 15 years, and in 86.7% of respondents said that FGM was performed by traditional practitioners.

Socio-cultural factors and FGM practice

All the respondents unanimously agreed that traditional beliefs and customs did influence the practice of FGM in their community. To them, FGM practice was a traditional cultural event held in high regard among community members. This implied that traditional beliefs and customs were a leading factor that contributed to the FGM practice in the respondents' community. All the respondents concurred that indeed there was immense social pressure to conform to traditional values that supported FGM as a social norm in their community. The social pressure took the form of social isolation or exclusion, discrimination and not being perceived as a "complete" woman for those adolescent girls and women who refused to undergo FGM. This denoted that social pressure to conform to traditional values that supported FGM as a social norm in the respondents' community played a significant role in the perpetuation of the FGM practice among women residents of Alungu village.

Most of the study participants strongly agreed with the views that traditional beliefs and customs were the main drivers of FGM in their community. FGM was performed because it was considered an important part of their culture as cited by 96.4% (n=80) of the respondents. All respondents reported that FGM was considered a rite of passage for girls in their community and marked transition to womanhood. Among the respondents, 86.7% (n=72) said that FGM was done for beauty, hygiene and cleanliness with uncircumcised girls being considered unclean and unfeminine. Majority of respondents (89.2% (n = 74)) believed that FGM was an integral part of a woman's social status in their community.

Further, most of the respondents (94%) strongly agreed with the views that girls who refused to undergo FGM were likely to be socially isolated, penalized and excluded from the society. Nearly all respondents (97.6%) said that FGM was linked with increased chastity and marriageability enabling women to avoid promiscuity before and during marriage. All respondents agreed that religious beliefs played an important role in perpetuation of FGM. Over 90% of respondents said that female circumcision create a sense of attachment and identity and that males' support for FGM played an important role in its perpetuation.

Factors Affecting Prevention and Response to FGM

Respondents (91.6%: n=76) said that lack of or low involvement of women in anti-FGM programs compromised the fight against the practice. All respondent

s viewed that the overt or covert support for FGM by local leaders and elders, and failure by authorities to take action against perpetrators contribute to perpetuation of FGM in their community. Majority of the respondents (96.4%: n=80) said that the indifference to the continued practice of FGM among local religious and political leaders helped perpetuate the practice (Table 2).

TABLE 1: Demographic Characteristics of Respondents

Variable	Frequency (n)	Percentage (%)
Age group		
18 – 24	8	9.6
25 – 34	25	30.1
35 – 44	38	45.8
45 - 49	12	9.6
Education level		
No formal education	62	74.7
Primary	17	20.5
Secondary	4	4.8
Marital status		
Married	83	100
Occupation		
Formal employment	2	2.4
Self -Employed	7	8.4
Not employed	74	89.2
Number of children		
1 – 4	5	6.1
5 – 8	68	81.9
More than 8	10	12
Household monthly income		
< Kshs. 5,000	21	25.3
Kshs. 5,000 - Kshs. 20,000	57	68.7
Above Kshs 20,000	5	6.0
Religion		
Muslim	83	100
Ethnicity		
Somali	81	97.6
Others	2	2.4

TABLE 2: Factors Affecting FGM Response and Prevention

Statements on factors affecting FGM response and prevention	Disagree		Agree	
	Freq.	%	Freq.	%
Lack of or low involvement of women in anti-FGM programs compromises the fight against the practice	7	8.4	76	91.6
The overt or covert support for FGM by local leaders and elders contributes to perpetuation of FGM in our community	0	0.0	83	100.0
Failure by authorities to take action against those perpetuating the FGM practice compromises existing anti-FGM efforts	0	0.0	83	100.0
The indifference to the continued practice of FGM among local religious and political leaders helps perpetuate the practice	3	3.6	80	96.4

Continue

TABLE 2: Continued

Statements on factors affecting FGM response and prevention	Disagree Freq.	%	Agree Freq.	%
Lack of or low involvement of women in anti-FGM programs compromises the fight against the practice	7	8.4	76	91.6
The overt or covert support for FGM by local leaders and elders contributes to perpetuation of FGM in our community	0	0.0	83	100.0
Failure by authorities to take action against those perpetuating the FGM practice compromises existing anti-FGM efforts	0	0.0	83	100.0
The indifference to the continued practice of FGM among local religious and political leaders helps perpetuate the practice	3	3.6	80	96.4
Women's general lack of voice and autonomy in their own reproductive health matters in our community also fosters the FGM practice	5	6.0	78	94.0
Patriarchal authority structures that permeate our community are also to blame for the continued perpetuation of FGM	2	2.4	81	97.6
Poor enforcement of existing laws against FGM also contributes to its continued practice	0	0.0	83	100.0
Failure by local leaders to perceive FGM as a women's rights issues and not a cultural one helps perpetuate the practice	9	10.8	74	89.2
Lack of support for efforts to fight the FGM practice among community leaders significantly impedes the eradication of FGM	1	1.2	82	98.8

DISCUSSION

The findings this study are in line with what have been reported by other studies which observed that FGM was largely practiced in communities for conformity to cultural and traditional beliefs, and norms including FGM being perceived as rite of passage for girls to womanhood and that it enhance chastity and purity making girls more marriageable.[20,16,21] Similar to the findings of this study, Reig Alcaraz et al[22] and Ogoe[4] also noted that the need to conform to traditional cultural beliefs that supported FGM remained a leading reason for the continued practice of FGM in many settings across the globe. The findings of this study support the observations made by Moranga[15] which attributed the persistence of FGM practice in one of Kenya's communities to FGM being used as a symbol of ethnic identity, a community mobilization tool and it being associated with feminine beauty and cleanliness. Several other studies found that traditions, cultural beliefs and social norms are the leading driving forces behind continued prevalence of FGM.[23–25]

Factors Affecting FGM Response and Prevention

The results of this study are in agreement with those of Abebe et al[25] and Gele et al[26] who identified lack of local women's involvement in anti-FGC programs, lack of suitable legal penalties for those who practiced FGC exacerbated the problem and support of FGM by community elders and persons in positions of authority as significant factors behind FGM's continuance. Similarly, Mohamud et al[27] and Andarge[28] cited unsupportive legal framework, lack of action from administrative officers against persons perpetuating the FGM practice and indifference to the continued practice of FGM among local administrative, religious and political figures as major contributors behind the perpetuation of the FGM practice. Studies by Channel et al., Muteshi and Omolase et al[12,29,30] also attributed the continued practice of FGM in many jurisdictions to weak legal and administrative frameworks and reluctance of local authorities to cramp the practice.

CONCLUSION

A wide range of socio-cultural factors contributed to FGM practice among women living in Alungu village, Mandera County including FGM being part of their traditional cultural beliefs, customs and social norms, a rite of passage to womanhood associated with chastity, purity and cleanliness among women, and FGM being a symbol of ethnic identity and inclusivity and women's lack of voice in their own reproductive health matters as dictated by culture.

Low involvement of women in anti-FGM programs, failure by authorities to take action against those perpetuating FGM, poor enforcement of existing laws against FGM, and presence of patriarchal authority structures pose a barrier to FGM response and prevention efforts.

RECOMMENDATIONS

The households and community should have concerted efforts, at household and community levels by all parties concerned, to address socio-cultural barriers to eradication of FGM practice. The County government should increase efforts to secure full enforcement of existing laws against FGM practice and all parties aiding the perpetuation of the practice should be brought to book in line with the law of the land. Through local organization. It is paramount that anti-FGM initiatives pay due consideration to targeted communities' religious and cultural beliefs and seek to find an amicable way of addressing the FGM problem while respecting the concerned people's religious and

cultural orientations.

Future studies are recommended on male partners within the Community to be interviewed about their views regarding FGM practice. In addition, elder Women at Menopausal age to also be interviewed. A qualitative study could be done to get a deeper understanding of why the practice is still going on despite its negative effects.

Limitation

The study gathered data from a single village in Mandera County, Kenya. Thus, the findings may not be generalized to all other regions in the country. In addition, the small sample size may not be representative to allow for generalization of findings.

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ORIGINAL ARTICLE

The Time Preferred by Patients to Undergo Surgery: What Proportion Would Accept Day-Case Versus Overnight Tonsillectomy/Adenotonsillectomy?

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ABSTRACT

Background: Day-case tonsillectomy is becoming popular with varying patients' satisfaction. Whether day-case or overnight tonsillectomy is safe and preferred by patients has been debatable among otorhinolaryngologists. To date, majority of otorhinolaryngologists in Tanzania are practicing overnight tonsillectomy unlike what is being practiced in other parts of the world. There is scarce literature regarding whether day-case or overnight surgical option is preferred by patients.

Objective: To assess the time preferred by patients to undergo surgery by ascertaining the proportion of patients who would prefer day-case to overnight tonsillectomy or adenotonsillectomy.

Methods: We conducted a hospital based cross sectional study at Ekenywa Specialised Hospital from January to December 2021. The study recruited 200 patients who underwent elective tonsillectomy or adenotonsillectomy. A structured questionnaire adopted from previously published studies and thereafter modified accordingly to fit the current study was used to collect relevant data. Data were analysed using Statistical Package for Social Sciences (SPSS) version 21

Results: The study had more male participants 104(52%) than females, 96 (48%) with a male to female ratio of 1.1:1. Majority of the study participants were aged below 5 years. Male participants aged below 5 years accounted for 50% while females aged <5 years accounted for 65.6%. Of the 200 (100%) patients who returned the questionnaires, 135(67.5%) preferred discharge on the 1st day post surgery while 65 (32.5%) preferred discharge on the 2nd postoperative day or later. Similarly, five (2.5%) would have wished day-case tonsillectomy/adenotonsillectomy while 195(97.5%) preferred an overnight surgery. Patients with postoperative pyrexia, older patients and those discharged on the 2nd day post surgery or later were more likely to prefer a longer postoperative hospital stay.

Conclusion: Day-case surgery seems feasible due to less risk of postoperative complications such as haemorrhage and fever. Majority of the participants in this study preferred overnight tonsillectomy/adenotonsillectomy.

INTRODUCTION

Day-case tonsillectomy/adenotonsillectomy is becoming increasingly popular worldwide. Published studies elsewhere are reporting day-case tonsillectomy/adenotonsillectomy to be safe in both adults and children.[1,2] However, observations carried out in various public and private health facilities in Tanzania report that most otorhinolaryngologists practice overnight tonsillectomies and adenotonsillectomies. Although patient selection in day-case surgery is based on strict and relatively uniform criteria, patient satisfaction with same-day discharge tend to vary. In a study conducted in Portugal, overall satisfaction following day surgery was at least 95% at discharge and at 30 days. However, complete satisfaction was present only in 75% at discharge and it reduced to 62% at 30 days.[3] Controversies on whether to adopt day-case or overnight tonsillectomy/adenotonsillectomy have necessitated studies to determine acceptability and safety of the two. A study conducted in Jordan involving 419 paediatric patients, 103 inpatients and 316 day-case group reported that only one patient (0.32%) among the day-case patients had secondary post-tonsillectomy bleeding. Similarly, there was only one case of this reported for the inpatient group (1%), and with none reactionary hemorrhage reported in either groups. The study found no significant association between the inpatient and day-case surgery groups in terms of post-tonsillectomy bleeding.[4] Another study conducted in England to assess the safety of day-case paediatric tonsillectomy found the rates of adverse postoperative outcomes to be similar for those who discharged >70% children the day-case post tonsillectomy compared with those who discharged <50% children the day-case post ton-

sillectomy and therefore no consistent evidence that day-case tonsillectomy is associated with poor outcomes.[5] A study conducted in France to audit changes in practice following the opening up of a day-surgery unit with dedicated operating room found that the opening of the day-surgery unit led to changes in practice, with most tonsillectomies being performed on an outpatient basis, without increased complications, and notably immediate complications.[6] Similarly, day-case tonsillectomy in children showed a 30-day complications rate comparable to those reported in the literature (8.3% postoperative hemorrhage), with a higher rate in adults (35.3%).[6] A systematic review of outpatient tonsillectomy in children aiming at determining the level of evidence regarding the safety of outpatient paediatric tonsillectomy having pooled 17 articles found that the current level of evidence supports the practice of outpatient tonsillectomy in properly selected children.[7]

A study that was conducted in Finland to determine patients' preferences for length of hospital stay post adenotonsillectomy found 39.8% of the study participants to have preferred discharge on the first day, while 59.7% preferred discharge on the second postoperative day or later, and only one patient (0.4%) wished for day-case tonsillectomy.[2]

There is scarce literature on the same topic in Africa. A study conducted in Tanzania on the survey of tonsillectomy care patterns reported 34.6% of the otorhinolaryngologists to have never performed day-case tonsillectomy while 65.4% sometimes performed day-case tonsillectomy.[8] Whether the day-case tonsillectomy and adenotonsillectomy being reported by otorhinolaryngologists is preferred by patients or not, has not been assessed. Our study aims to address this existing knowledge gap.

To address this gap, this study evaluated patients undergoing elective tonsillectomy and adenotonsillectomy over 12 months and their opinion as to whether they would prefer day case or overnight tonsillectomy/adenotonsillectomy. This is the first study in our country to assess the time preferred by patients to undergo the mentioned surgery with emphasis on what proportion would accept day-case or overnight tonsillectomy/adenotonsillectomy.

METHODS

Study Area and Population

The study was conducted at Ekenywa Specialised Hospital, Department of Otorhinolaryngology from January to December 2021. The study recruited 200 patients that were undergoing elective tonsillectomy or adenotonsillectomy. The department of otorhinolaryngology attends to about 200 outpatients on daily basis and performs an average of 6 elective surgeries per day.

Study Design

A hospital based cross sectional study was conducted to determine the time preferred by patients to undergo tonsillectomy/adenotonsillectomy by ascertaining the proportion of patients who prefer a day-case or an overnight option for the scheduled surgery.

Inclusion Criteria

Healthy patients who underwent elective bilateral tonsillectomy with or without adenoidectomy upon obtaining their consent to participate were included in the study.

Exclusion Criteria

Patients who underwent elective bilateral tonsillectomy with or without adenoidectomy and were unwilling to participate were excluded. Also patients who were mentally unfit to consent to participate were also excluded.

Sample Size and Sampling Technique

Data was collected using convenient sampling technique. Study participants were recruited on convenient basis until the desired sample size was achieved. Moreover, the sample size for this study was calculated using the formula below;

$$N = \frac{Z^2 P(1-P)}{E^2}$$

Where;

n = sample size

z= standard normal deviate=1.96 for 95% confidence level

p = proportion, P=75.4%, proportion of day-case tonsillectomy/adenotonsillectomy.[4]

E= margin of error which is 5%

Therefore, $N=1.96^2 \times 75.4(10075.4)/5^2 = 285$

The minimum estimated sample size was 285 study participants; however, only 200 participants were recruited.

Data Collection Tool

A structured questionnaire adopted from previously published studies and thereafter modified accordingly to fit the current study's goal and objectives was used to collect data.[2,6,9] The first version of the questionnaire was prepared in English and the final draft was translated to Swahili since the study participants attending the health facility were more conversant with Kiswahili. The questionnaire comprised of 2 main parts with sub-sections: (i) Age and sex distribution of the study participants (ii) Clinical profile of the study participants and this included; (a) Indications for tonsillectomy/adenotonsillectomy (b) Discharge summary of the study participants particularly the specific day of discharge post surgery (whether first day or second day post surgery) (c) their preference on when they should be discharged post surgery (d) Postoperative outcomes such as postoperative pyrexia, postoperative haemorrhage. The questionnaires comprised of closed ended questions and were self-administered. The procedure included self-introduction by the principal researcher, introduction of the topic and purpose of the study. Participants were assured of their free participation and withdrawal will from the study at any time if they wish to do so. Tool validity was assessed by reviewing the literature as well as pilot testing the instrument prior to the study by involving 10% of the actual sample size from the specialised hospital and these were excluded from the actual study.

Recruitment Strategy

Patients were mandated to report at the hospital one (1) day before surgery and on admission each patient

received details of the anticipated procedure including the course of recovery and possible postoperative complications and for those under the age of 18 years, same information was conveyed to them and to their respective parents/caretakers. Tonsillectomy was performed under general anaesthesia with a bipolar electro dissection technique.

An otorhinolaryngologist at the ear, nose and throat (ENT) department discharged all patients at the earliest 1st day post surgery and provided them with verbal information on the course of recovery. Prolonged hospital stay was considered if the patient had a medical reason such as post-tonsillectomy haemorrhage or pyrexia (body temperature higher than 37.5 degree Celsius). Each patient received a prescription for non-steroidal anti-inflammatory analgesic and an oral antibiotic post tonsillectomy/adenotonsillectomy and for those who underwent adenotonsillectomy, were prescribed with a nasal decongestant (ephedrine nasal drops). All patients and, in the case of those under the age of 18 years had their parents/caretakers providing a written informed consent for the planned surgery.

Statistical Analysis

The collected data were cleaned and analysed using SPSS version 21 software package. Descriptive statistics were performed to present frequency distribution for demographic characteristics and clinical profile of the study participants.
Chi-square test was performed to establish the relationship between the selected independent and dependent variables. All the independent variables with p-value <.05 were regarded to be statistically significant. Statistical limits were set at a 95% confidence interval and a 5% significance level.

Ethical Considerations

A written informed consent was obtained from all participants. For participants below 18 years, written informed consent was obtained from their respective parents/guardians. The aim of the study was explained to patients, parents and caretakers. Ethical approval from the hospital ethics committee was granted on 10th December 2020 with number Ref: *ESH/2020/12*. Participants were assured of their privacy and confidentiality. Anonymity was maintained by the use of code number on the questionnaire instead of the participant's name and the participant had an absolute freedom and right to withdraw from the study at any time without any compromise of the medical care they were receiving at the hospital.

RESULTS

Age and sex distribution of study participants, discharge pattern from the hospital and postoperative outcomes after elective tonsillectomy/adenotonsillectomy

In this study, there were more males, 104(52%) than female, 96 (48%) participants. Male to female ratio was recorded at 1.1:1. Majority of the study participants were aged below 5 years, where males aged below 5 years accounted for 50% while females aged below 5 years accounted for 65.6% of the respective gender. (Table 1)

TABLE 1: Distribution of Study Participants According to Age and Sex

Sex	Age groups (years) (%)							Total (%)
	<5(%)	6-10 (%)	11-15 (%)	16-20 (%)	21-25 (%)	26-30(%)	31+	
Male	52 (50.0)	26 (25.0)	11 (10.6)	9 (8.7)	1 (0.9)	3(2.9)	2(1.9)	104(52)
Female	63 (65.6)	7 (7.3)	11(11.4)	4 (4.2)	3 (3.1)	4(4.2)	4(4.2)	96(48)
Total	115 (57.5)	33(16.5)	22 (11)	13 (6.5)	4 (2)	7(3.5)	6(3)	200(100)

On the other hand, of all the 200 surgical patients, 188 (94%) patients underwent adenotonsillectomy but 12(6%) underwent tonsillectomy. The indication was obstructive tonsillitis in 6 patients (50%), recurrent acute tonsillitis in 2 (16.7%), and chronic tonsillitis in 4 (33.3%). Obstructive adenotonsillitis was the commonest indication in younger age groups and obstructive tonsillitis in those aged 11+ years. Majority of patients across all age groups in this study were discharged on the first day postoperatively. 1 patient (0.5%) had primary post-tonsillectomy hemorrhage and 2 patients (1%) had primary post-adenotonsillectomy hemorrhage and all the 3 patients were aged <5years. Similarly, 3 patients had secondary post adenotonsillectomy hemorrhage (1.5%). No hemorrhage post adenoidectomy was encountered in this study. Postoperative fever was encountered in 7(3.5%) patients and all were aged <5 years. (Table 2)

Regarding patients' discharge preference after elective surgery, majority 135(67.5%) preferred discharge to happen 1st day after surgery. Similarly, those patients who had 2 nights hospital stay post surgery and those with postoperative fever preferred discharge to happen longer (2nd day or thereafter post surgery) (*p-value=.001*). (Table 3)

TABLE 2: Age of Study Participants and Discharge Pattern from the Hospital after Elective Tonsillectomy/ Adenotonsillectomy

Age (years)	Discharge from the hospital, n(%)		Total n(%)
	1st postoperative day	2nd postoperative day	
<5	105(91.3	10(8.7)	115(100)
6-10	30(90.9)	3(9.1)	33(100)
11-15	15(68.2)	7(31.8)	22(100)
16-20	12(92.3)	1(7.7)	13(100)
21-25	3(75)	1(25)	4(100)
26-30	5(71.4)	2(28.6)	7(100)
31+	5(83.3)	1(16.7)	6(100)
Total, n(%)	175(87.5)	25(12.5)	200(100)

TABLE 3: Patients' Discharge Preference after Undergoing Elective Tonsillectomy/Adenotonsillectomy

When discharge should have occurred after surgery	Frequency, n(%)
1st day postoperative	135(67.5)
2nd day postoperative or longer	65(32.5)
Total, n(%)	200(100)

DISCUSSION

Tonsillectomy being one of the commonest surgery in otorhinolaryngology has been performed invariably in different parts of the world with other surgeons preferring patients to be admitted a day before surgery (overnight) and other being admitted on the same day when surgery has to be performed. Whether patients prefer day-case tonsillectomy/adenotonsillectomy or an overnight surgical option remains to be unknown in Tanzania and this study aimed at addressing such gap. Regarding patients' views on whether they would prefer overnight or day-case tonsillectomy, majority (97.5%) reported preference of overnight surgery and thus day-case surgery to patients was found to be undesirable.

This finding appears to be similar to what was established in a study that was conducted in Finland. [2] On the other hand, since our patients had no systemic illnesses (ASA class 1), majority of them would have been suitable for day-case surgery but because in the private health facility where the study was conducted day-case surgery was not an option to be considered but rather all patients have to be admitted a day before adenotonsillectomy/ tonsillectomy and this might have probably influenced patients' attitudes on discharge preference. Patients' acceptability of day-case adenotonsillectomy is higher in a study that was conducted in a day-surgery unit in the United States [10], than involving in-patient operations in a study that was conducted in the United Kingdom. [11]

Regarding patients' discharge preference after elective surgery, majority, (67.5%) preferred discharge to happen 1st day after surgery. Such finding appear to correlate with what was found in studies done elsewhere. [2,12] In our study, those patients who had 2 nights hospital stay post surgery and those with postoperative fever preferred discharge to happen longer (2nd day or thereafter post surgery) (p-value=0.001)

Pertaining patients' and suitability for day-case adenotonsillectomy, our study found children aged <5 years unsuitable for day-case surgery since both children who suffered from postoperative hemorrhage were aged <5years and similarly all the seven children who developed postoperative fever were aged <5 years. Such findings appears to be dissimilar to those found in a study which was conducted in Finland where children younger than 10 years seemed to be the best group for day-case tonsillectomy because they were the least likely to suffer from postoperative fever or primary postoperative hemorrhage. [2]

Regarding whether day-case adenotonsillectomy/ tonsillectomy should be adopted or not from our findings where majority of the study participants found overnight surgery to be the preferred choice should be taken with caution since these are findings from a single health facility and therefore multi-centered studies should be conducted on the same topic and this must be coupled with adequate preparations if at all day-case surgery has to be adopted in our country. Preparations should include preparedness of health workers in accepting the new treatment policy and also make meticulous preoperative preparations to patients' who are to undergo day-case adenotonsillectomy/tonsillectomy. Pilot health facilities to perform day-case surgery may be designed countrywide to check feasibility of such surgical strategy

CONCLUSION

Overnight tonsillectomy/adenotonsillectomy has been the preferred surgery in this study and on the other hand day case tonsillectomy/adenotonsillectomy from our findings seems feasible due to less risk of postoperative complications such as postoperative hemorrhage and fever. Large multicentric studies should be designed to

validate these findings and ascertain on the possibility of implementing day-case surgery in our settings.

Study Limitations

The study was conducted in a single health facility and considered a limited sample size. Thus, the results from the study cannot be generalised. Larger multicentric studies incorporating relevant socio-demographic information like residence, level of education and profession should be designed so as to assess their influence on patients' discharge and type of surgery opted for.

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ORIGINAL ARTICLE

Factors Influencing the Health-Related Quality of Life Among Lower Limb Amputees: A Two-Center Cross-Sectional Study

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ABSTRACT

Background: Limb amputation is among the commonly performed surgical procedures known to have a significant impact on health-related quality of life (HRQoL). Nonetheless, factors influencing the HRQoL among amputees have not been extensively explored. We therefore conducted a study aiming at determining factors influencing the HRQoL among lower limb amputees.

Methods: A cross-sectional study was conducted from May 2021 to December 2021 in two specialized hospitals located in Dar es Salaam, Tanzania. A total of 160 participants who exclusively underwent lower limb amputation(s) were recruited. Data was collected using a checklist incorporating the 36-Item Short Form Survey (SF-36) questionnaire. Multivariable linear regression analysis was performed to identify factors influencing the HRQoL.

Results: The mean age of the study participants was 53.8 (±15.44) years; with males constituting 68.7%. The mean duration since amputation was 19.84 (±12.44) months. A relatively poor physical component summary score (PCS), as opposed to the mental component summary score (MCS) of the SF-36 was observed among the participants (42.0 vs. 59.3, respectively). Factors that positively influenced the PCS included achieving a college/university level of education, absence of stump pain, and the use of a prosthetic device or crutches. Conversely, factors that negatively influenced the PCS included increasing age and the absence of associated comorbid conditions. These factors accounted for 34.1% of the variance in the PCS. With reference to the MCS, post-amputation employment, longer durations since amputation, and the use of prostheses or crutches had a positive influence. However, having no associated comorbidity negatively influenced the MCS. These factors explained 26.5% of the variances in the MCS.

Conclusion and Recommendations: The aforementioned factors should be addressed accordingly in order to ensure a holistic approach in the management of lower limb amputees. Moreover, longitudinal studies are recommended to systematically study the change in HRQoL over time and to assess its determinants.

INTRODUCTION

Limb amputation has been a commonly performed surgical procedure since its first description by Hippocrates in 460 to 377 BC.[1] Despite the therapeutic intent of undertaking this procedure, the morbidity associated with limb loss is shown to have a significant social, economic, and psychological impact not only on the affected individuals but also on the community.[2]

Timely and comprehensive rehabilitation services are pointed out to be pivotal in facilitating adjustment/coping with limb loss, social integration, duty independence, and return to productive life; all of which have a profound influence on the Quality of Life (QoL).[3–6] Several sociodemographic and amputation-related factors are reported to influence QoL among amputees. Some of these factors include; age, level of education, time since amputation, level of amputation, level of physical activity, associated comorbidities, use of prostheses/assistive devices as well as the duration and severity of stump/phantom pain.[7,8]

The QoL among lower limb amputees in Tanzania and equally so in most developing countries is reported to be poor.[9] Furthermore, studies examining factors that influence the QoL among amputees in low-income settings are scarce.[10] With such apprehension, this study was conducted to determine factors that influence Health-Related Quality of Life (HRQoL) among Lower Limb Amputees (LLAs) in Tanzania. The identification of these factors will contribute to the development of comprehensive strategies for managing LLAs, thereby improving their QoL.

METHODS

Design and Settings

This was a cross-sectional study conducted at Muhimbili National Hospital and Muhimbili Orthopedic Institute from May 2021 to December 2021. The 2 tertiary referral hospitals located in Dar es Salaam, Tanzania provide specialised care to patients from across the country and from neighboring East and Central African countries.

Participant Selection and Sample Size

To maximise the precision of the study findings and eliminate sampling variability, the study included all patients aged 18 years and above who underwent lower limb amputation(s) between January 2018 and July 2021. However, patients with concurrent upper extremity amputation, hearing or speech impairments, and mental incapacitation were excluded from the study.

A multiple regression power analysis was performed, utilising the methods described by Cohen (1988).[11] The analysis aimed to determine the appropriate sample size so as to achieve a high level of statistical power. It was determined that a sample size between 80 and 160 participants would yield a statistical power ranging from 81% to 100%. This level of power would enable the detection of coefficient of determination (R^2) values ranging from 0.16 to 0.46 which can be attributed to 6 independent variables.[7] The statistical test employed in this analysis was an F-Test, with a significance level (alpha) set at 0.05.

Data Collection

Data was collected using a checklist that incorporated the 36-Item Short Form Survey (SF-36) questionnaire (English and Swahili versions). Clinical information was retrieved from the medical records whereas socio-demographic information, symptomatology, and the HRQoL were assessed via over-the-phone interviews.

The SF-36 questionnaire was used to evaluate the post-amputation HRQoL. The questionnaire is categorised into 8 domains (35 items); assessing physical function (10 items), role limitations due to physical health problems (4 items), bodily pain (2 items), general health (5 items), vitality (4 items), social functioning (2 items), role limitations due to emotional problems (3 items) and emotional well-being (5 items). The 8 domains are aggregated into 2 summary measures; the Physical Component Summary (PCS) and Mental Component Summary (MCS) scores.[12,13]

The PCS and MCS were treated independently as the outcome variables. The predictor variables included the socio-demographic characteristics and amputation-related characteristics of the participants.

Statistical Analysis

Cross-checking of the filled checklists for data completeness was performed for quality control. Data was entered and analysed using IBM SPSS Statistics, Version 26.0. Armonk, NY. The descriptive demographic and amputation-related characteristics were presented as frequencies, proportions, and means (standard deviation [SD]). The PCS and MCS scores derived from the 8 scales of SF-36 were obtained by re-coding the specific composite 'items' to create a summative score with a scale ranging from 0 to 100 for both component summary scores (PCS and MCS). Low scores indicated more disability whereas high scores indicated less disability. Forward stepwise multivariable linear regression was performed to assess for factors influencing PCS and MCS. The statistical significance was set at $p<.05$.

Ethical Consideration

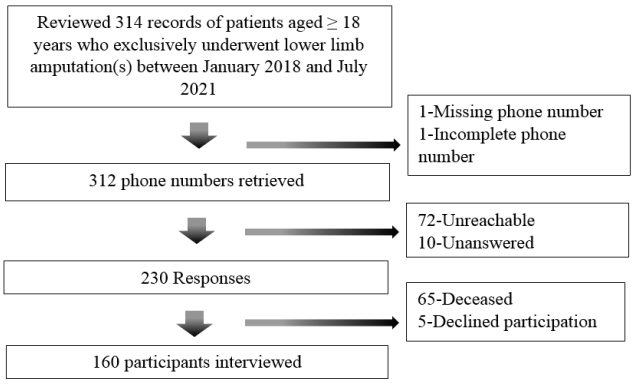
Ethical clearance was obtained from the Institutional Review Board of the Muhimbili University of Health and Allied Sciences (Ref. No.DA.282/298/01.C/). A verbal informed consent was sought from the participants prior to commencing the over-the-phone interviews and the consent process was documented for each participant. The study was performed in accordance with the ethical standards laid by the 1964 Helsinki Declaration and its later amendments on comparable ethical standards.

RESULTS

Socio-Demographic Characteristics

The socio-demographic characteristics of the study participants are presented in Table 1. The flow of selection of 160 LLAs included in the study is depicted in Figure 1. Of the 160 participants, males (68.7%) accounted for more than two-thirds of the participants. The mean age of the sample population was 53.8 (±15.4) years. Majority of the participants were married (81.2%) and resided in urban areas (76.9%). Over 90% of the participants had formal education. A relative decline (46.8%) in the proportion of employed participants was observed in the post-amputation period.

FIGURE 1: Recruitment Flowchart



Amputation-Related Characteristics

The amputation-related characteristics of the study participants are presented in Table 2. The mean duration since amputation was 19.84 (± 12.44) months. Diabetes Mellitus was the most commonly reported comorbid condition, with diabetic foot ulcers accounting for about two-thirds of the indications of amputation. Over 95% of the amputations were unilateral, with trans-tibial (46.3%) and trans-femoral (47.5%) accounting for the majority. Ninety-one percent of the participants underwent

postoperative physiotherapy. Stump skin complications, stump pain, and phantom limb sensation were reported in 10.0%, 43.1%, and 37.5% of the amputees respectively. Only 21.9% of the participants used a prosthetic device; whereas, over 90% used assistive devices.

TABLE 1: Socio-Demographic Characteristics (n=160)

Variables	Frequency (%) / Mean (±SD)
Age (years)	53.8 (± 15.4)
Sex	
Male	110 (68.7%)
Female	50 (31.3%)
Marital status	
Single	16 (10.0%)
Married	130 (81.2%)
Divorced	8 (5.0%)
Widow or Widower	6 (3.8%)
Residence	
Urban	123 (76.9%)
Rural	37 (23.1%)
Level of education	
No formal education	15 (9.4%)
Primary education	81 (50.6%)
Secondary education	51 (31.9%)
College/University	13 (8.1%)
Pre-amputation employment status	
Unemployed	39 (24.4%)
Employed	121(75.6%)
Post-amputation employment status	
Unemployed	114 (71.2%)
Employed	46 (28.8%)

Key: SD, Standard deviation

TABLE 2: Amputation-Related Characteristics (n=160)

Variables	Frequency (%) / Mean (±SD)
Duration since amputation (months)	19.84(± 12.44)
Associated comorbid conditions	
None	47 (29.3%)
Diabetic Mellitus	62(38.8%)
Hypertension	14 (8.8%)
Diabetic Mellitus and Hypertension	36 (22.5%)
Chronic kidney disease	1(0.6%)
Indication for amputation	
Trauma	16 (10.0%)
Diabetic foot ulcer	103 (64.4%)
Non-diabetic foot infections	17(10.6%)
Wet/dry gangrene secondary to Peripheral vascular disease	13(8.1%)
Malignancy	11 (6.9%)
Type of amputation	
Unilateral	156 (97.5%)
Bilateral	4 (2.5%)
Level of amputation	
Trans-tibial	74 (46.3%)
Trans-femoral	76 (47.5%)
Knee disarticulation	1 (0.6%)
Syme	7 (4.4%)
Hip disarticulation	1 (0.6%)
Chopart	1 (0.6%)
Post–amputation physiotherapy (Yes)	48 (91.2%)
Stump skin complications (Yes)	16 (10.0%)
Stump pain (Yes)	69 (43.1%)
Phantom limb sensation (Yes)	60 (37.5%)
Use of prosthesis (Yes)	35 (21.9%)
Use of assistive devices	
None	14 (8.8%)
Wheel-chair	21 (13.1%)
Crutches	125 (78.1%)

Continue

TABLE 2: Continued

Key: SD, Standard deviation

TABLE 3: Stratification of the SF-36 Domains and Component Scores of the Amputees (n=160)

SF-36 domains	Mean (±SD)
Physical functioning[a]	30.34 (21.39)
Role limitations due to physical problems[a]	4.88 (11.01)
Bodily pain[a]	81.23 (18.80)
General health[a]	51.65 (19.18)
Vitality[b]	56.14 (22.32)
Social functioning[b]	54.85 (40.45)
Role limitations due to emotional problems[b]	60.23 (47.95)
Mental health[b]	66.27 (15.80)
Component scores	
Physical component summary score (PCS)[c]	42.03 (11.68)
Mental component summary score (MCS)[c]	59.37 (23.60)

Key: SD, Standard deviation; n, sample size
[a]Domains contributing to the PCS; [b]Domains contributing to MCS;
[c] Scores range from 0-100

Description of the SF-36 Domains and Component Summaries

Table 3 summarises the mean scores of the SF-36 domains and component scores attained by the study participants. The overall mean PCS was below average (<50). Low domain scores attained in physical functioning (30.34), and role limitations due to physical problems (4.88) contributed to the overall low PCS (42.03). However, above-average scores (>50) attained in all respective domains resulted in a relatively high MCS (59.37).

Factors Influencing Health-Related Quality of Life

The final linear regression model of the factors influencing HRQoL among the LLAs is presented in Table 4. Several factors were found to have a positive impact on the PCS of HRQoL. These factors included; achieving a higher education level, absence of stump pain, and utilisation of a prosthetic device or crutches. On the other hand, increasing age and absence of associated comorbid conditions were identified as factors that negatively influenced PCS. Collectively, these predictors explained 34.1% of the variance in PCS.

Regarding the mental component of the HRQoL, employment during the post-amputation period, longer duration since amputation, and the use of prostheses or crutches had a positive influence on MCS. However, the absence of associated comorbidities had a negative influence on MCS. These predictors explained 26.5% of the variances in MCS.

TABLE 4: Multivariate Linear Regression Model of Factors Influencing the Health-Related Quality of Life (n=160)

Outcome variables	Predictors	β	SE	R^2	p-value
SF-36 PCS	Model Summary		9.663	0.341	<.001
	Constant	39.683	4.257		
	Age	-0.133	0.057	0.023	.022
	College/University education level	7.237	2.922	0.032	.014
	No comorbidity	-5.515	1.856	0.021	.003
	No stump pain	7.680	1.568	0.126	<.001
	Use of prosthesis	7.098	1.902	0.083	<.001
	Use of crutches	5.194	1.946	0.056	.003
SF-36 MCS	Model Summary		20.563	0.265	<.001
	Constant	40.397	4.758		
	Employed (post-amputation)	10.545	3.797	0.061	.006
	No comorbidity	-9.752	3.659	0.029	.009
	Duration since amputation	0.500	0.139	0.132	<.001
	Use of prosthesis	8.621	4.021	0.022	.034
	Use of crutches	8.958	4.011	0.021	.027

Key: β, Unstandadised beta coefficient; MCS, Mental component summary score; PCS, Physical component summary score; R^2, Coefficient of determination; SE, Standard error

DISCUSSION

We presented the findings of 160 patients who underwent lower limb amputation(s) in 2 tertiary referral hospitals located in Dar es Salaam, Tanzania. The mean age (middle-aged adults) and gender distribution (males > females) of the study participants were in keeping with findings from previous studies.[7,9,14] The performance of the physical (PCS) and mental (MCS) health dimensions of the HRQoL were scored 42.03 and 59.37 out of 100, respectively. When compared to the general population, the PCS scores were relatively low (42.03 vs. 54.7); whereas, the MCS scores remained more or less unaffected (59.37 vs. 55.5).[15] This indicated that lower limb amputation had a major impact on the physical domain of health as opposed to the mental domain. However, dissimilarities in the studies' methodological approaches might also account for these variations.

Results from this study also provide evidence of factors that influence HRQoL among LLAs. Findings suggest that the status of associated comorbid conditions and the use of prosthetics or assistive devices have a significant influence on both the physical (PCS) and mental (MCS) aspects of health. However, age, level of education, and stump pain only influenced the PCS; whereas the post-amputation employment status, and duration since amputation exclusively influenced the MCS.

Advancing age has been associated with an increased risk of diseases and disabling conditions, both of which are proven to have a negative influence on the QoL.[16,17] However, when examined independently, advancing age and the absence of comorbid conditions exhibited a synergistic influence on the HRQoL among the LLAs. The absence of comorbid conditions had a negative influence on both aspects (PCS and MCS) of HRQoL; while advancing age had a negative influence, particularly on the physical aspect of health (PCS). The earlier finding could most likely be pronounced among patients who were apparently well and underwent amputation secondary to an acute event i.e. trauma. For the later finding regarding advancing age, a negative impact has also been observed in previous studies.[18–20] This might be explained by the presence of other comorbid conditions that further impair mobility with subsequent impairment of physical health.

Prostheses and assistive devices play an integral role in post-amputation rehabilitation. The use of prosthetic devices has been reported in various studies to have a positive impact on QoL.[10,18] Notwithstanding, a significant difference in occupational performance and satisfaction among lower limb amputees has been observed with the

use of different types of assistive devices.[21] In this study, both prostheses and assistive devices, particularly axillary crutches had a positive impact on HRQoL. The maintenance, restoration, and improvement of function aided by these devices could explain the findings. Nonetheless, several amputation-related complications including stump skin complications (10.0%) and residual stump pain (43.1%) reported among the study's participants could have limited the use of prostheses with subsequent impairment of HRQoL. Supporting this argument, the absence of stump pain was found to have a positive influence on the physical health domain among the study participants. Similar findings are also reported in previous studies.[7,22]

The level of education as part of a broad and complex socio-economic domain may significantly influence post-amputation rehabilitation and long-term care of amputees.[23] High levels of education have been linked to better levels of HRQoL, with the biggest impact observed on the mental health dimension.[24] However, in this study, a positive impact was observed on the physical health dimension. Findings also revealed that only 8.1% of the study participants had achieved a university/college level of education, suggesting that majority of the rest might have been engaging in physically demanding activities prior to amputation. This might explain the high rate of loss of employment observed among the study participants during the post-amputation period as retaining a physically demanding job following amputation is challenging.[5,7] An alternative explanation for the fall in the levels of employment could be based on the average time taken to Return to Work (RTW) following amputation. Previous studies have described a 2-year mean duration of the time taken to RTW[5,25,26], which on average is longer than the 'duration since amputation' of the study participants. Nonetheless, independent of the duration taken to RTW, post-amputation employment had a positive influence on the mental aspect of health.

A longer duration since amputation was also observed to positively influence the mental health of the study participants. This can be linked to the RTW concept discussed earlier or explained by the fact that longer post-amputation duration brings about better adjustments to the post-amputation condition.[14,27,28]

CONCLUSION AND RECOMMENDATIONS

The findings revealed that LLAs had a lower PCS compared to MCS score. This signifies marked limitations in physical activities among LLAs. Our study also showed that having completed university/college education, securing an employment post-amputation, experiencing no stump pain, and longer time since amputation had a positive effect on the HRQoL. Conversely, older age and the absence of comorbidities were associated with a negative impact on the HRQoL.

Enhancing the HRQoL for LLAs requires a comprehensive and holistic approach that involves healthcare providers with expertise in rehabilitation, psychology, social work, and other relevant fields. This multidisciplinary approach should be implemented throughout all phases of care provision and should be integrated into standard care protocols. To be effective, the approach should address physical, psychological, and social factors that impact the HRQoL. Moreover, Longitudinal studies are recommended to systematically study the change in QoL over time and to assess its determinants.

Study Limitations

Some of the inherent limitations of the study design include failure to assess the pre- vs. post-amputation change in the HRQoL or compare the HRQoL between the participants and the general population. Additionally, the design could not demonstrate the temporal relationship between the dependent and independent variables.

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