

## A Longitudinal Study on Women's Knowledge of Male Circumcision, and its Influencing Factors in Zambia

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### Abstract

**Aim:** The aim of this study was to investigate Women's Knowledge of Male Circumcision and its influencing factors between 2011 and 2013.

**Methods:** The study was a prospective cohort study of post-Male Circumcision sexual behavior in Zambia and sampled a total of 1350 women aged 15-29 years. The study followed up women and collected data in three rounds using a self-administered structured questionnaire. The type of analysis involved univariate, bivariate and multivariate.

**Results:** Close to three-quarters (72.5%) of the respondents had heard or were aware of male circumcision before it was described to them. Less than one third (29%) had average knowledge at baseline. The odds of having good and average knowledge versus poor knowledge was greater for following women; single women with circumcised primary sex partners (OR: 2.1,  $P < 0.001$ , CI: 1.39-3.21); women who talked to a circumcised partner about male circumcision (OR: 2.12,  $P < 0.001$ , CI: 1.93-2.31); women aged 20 to 29 years; women who had some education; women who were aware about male circumcision and had talked to a family member about male circumcision.

**Conclusion:** It is evident from the findings that male circumcision campaigns might have failed to correctly educate women on the male circumcision and its protection.

**Keywords:** Factors, Knowledge, Male circumcision, Human Immunodeficiency Virus (HIV), Women

### Introduction

Male circumcision (MC) is the surgical removal of some or all of the foreskin (or prepuce) from the penis and is one of the most common medical procedures in the world [1]. The determinants of Male Circumcision (MC) include; ethnicity, supposed benefits, and socio-cultural norms. As a result, estimates in 2006 suggested that 30% of men were circumcised [2]. Male circumcision is practiced in many African countries mainly as a religious or cultural practice. The practice of Male Circumcision (MC) is more pronounced in northern and western parts of Africa but is less common in southern Africa [2]. In Zambia, Male Circumcision (MC) is known to be practised in some parts of the country for traditional, health, and other reasons and often serves as a rite of passage to adulthood [3].

Zambia is among the Southern African countries severely hit by the HIV/AIDS epidemic with HIV prevalence of 13 percent among all

women and men aged 15-49 and HIV primarily being transmitted through heterosexual transmission [4]. Precisely, the HIV prevalence among women aged 15-49 is 15 percent as compared to 11 percent among men in the same age group. The Ministry of Health with the support of cooperating partners such as Centre for Disease Control and Prevention (CDC), Society for Family Health (SFH), Johns Hopkins Program for International Education in Gynaecology and Obstetrics (JHPIEGO), Marie Stopes International (MSI), and Zambia Prevention Care and Treatment (ZPCTII) embarked on mass campaigns to inform and educate Zambians on male circumcision. Various methods were used to educate the masses and some of these included; television and radio programmes, fliers, posters, community shows, phone messages, website and social media. It is imperative to emphasize that male circumcision only provides partial protection against Human Immunodeficiency Virus (HIV). In view of this, there are concerns regarding male circumcision for HIV prevention and its implications for women. The concerns include both men and women risk compensation, shared sexual decision making, misconceptions about the level of protection, spending allocations for women-focused

Human Immunodeficiency Virus (HIV) prevention, difficulties for women to negotiate safe sex or insist on condom use, particularly with a circumcised man, and stigma and blame directed at Human Immunodeficiency Virus (HIV) positive women. Considering these concerns in an attempt to introduce or scale up male circumcision for Human Immunodeficiency Virus (HIV) prevention is key and beneficial. Women are not only more vulnerable to contracting the Human Immunodeficiency Virus (HIV) virus than men but are also faced with the challenge of having limited access to, and availability of, women-controlled Human Immunodeficiency Virus (HIV) prevention options. Only 36 percent of women and 39 percent of men have what can be considered comprehensive knowledge about the modes of Human Immunodeficiency Virus (HIV) transmission and prevention in Zambia. It is uncertain as to the extent and impact of the rolled out education campaigns on male circumcision. Especially, hearing of medical male circumcision (MMC) for Human Immunodeficiency Virus (HIV) prevention does not necessarily translate into having “factual knowledge” about Medical Male Circumcision (MMC), such as that Medical Male Circumcision (MMC) is only partially protective against Human Immunodeficiency Virus (HIV) risk, the need for condom use after Medical Male Circumcision (MMC), and the need to abstain from sex during the period of wound healing. Misconception about male circumcision’s level of protection against sexually transmitted diseases has implications on risky sexual behaviour.

## Methods

### Study setting

Zambia is administratively divided into ten provinces with each province subdivided into districts. Further, each district is subdivided into constituencies, and each constituency into wards. In addition to these administrative units, during the 2000 population census, each ward was subdivided into convenient areas called census supervisory areas (CSAs), and in turn each CSA into standard enumeration areas (SEAs). This study was conducted in seven provinces of Zambia out of ten provinces. These seven provinces include Central, Copper belt, Lusaka, Southern, Eastern, Luapula and Northern Provinces. Two provinces, North-Western and Western were excluded in the sampling frame, because a significant percentage of the population 71% and 40% respectively (CSO, 2009) were already circumcised due to male circumcision being an integral part of tradition in this region. Muchinga province was created by getting a portion from Northern and Eastern Provinces hence included in the two Provinces. It was a longitudinal study on Sexual Behaviour Post Male Circumcision in Zambia.

### Data source

This paper used data from a prospective cohort study of post-MC sexual behavior in Zambia that was conducted by Population Council. The study adopted a prospective cohort study design owing to the fact that the parent study was a longitudinal study. The sample for this study was women aged 15-29 who lived in a subset of areas where MC services were being offered and were followed-up. Data was collected at three points in time or three stages (initial stage (stage 1), 1st follow-up (stage 2) and 2nd follow-up (stage 3)).

A sample of females aged 15-29 who lived in subset areas where Male Circumcision (MC) services was accessible were selected. The sample was drawn to represent the population in which the Zambian male circumcision program was expected to be scaled up. Four of the seven provinces sampled (Central, Copper belt, Lusaka, Southern), the cohort was drawn from all standard enumeration

areas (SEAs), stratified by urban and rural areas as designed by the Zambian Central Statistics Office in the 2000 census. For the remaining three provinces (Eastern, Northern, Luapula), the cohort was sampled from standard enumeration areas that were located within 50 kilo meters of a provincial town as, at the time, it was not expected that circumcision services would reach areas outside of the provincial towns. A two-stage sampling procedure was used. SEAs were randomly sampled proportional to size and a consent sampling proportion of men and women was obtained from each SEA. The list of enumeration areas (EAs) was used as a sampling frame for the survey. The frame comprised 25,631 EAs and 2,815,897 households. An EA is a convenient geographical area with an average size of 130 households or 600 people. Each EA has a cartographical map with delimited boundaries and main landmarks of the area. A house hold listing was conducted in each EA to identify eligible participants and proportional random sampling of selected households with eligible participants was drawn. All women aged 15-29 who were permanent residents of the households were eligible to be interviewed hence interviews were conducted at the respondents house hold. The sample size was stratified by age for representation of those aged 15-24 (higher risk group) and those aged 25-29 years. Therefore the sample had about two thirds of the adolescents aged between 15-24 years.

The study sampled 1350 women at baseline. Using the 2007 Zambia Demographic Health Survey (ZDHS) estimates of baseline behaviors and STATA’s sample size algorithm for repeated observations of continuous outcomes, a sample size estimate was obtained to detect a 20% increase in two indicators of risk behavior over the course of the study period. The first indicator was an index constructed from a selection of HIV risk behaviors: (1) paid for sex in the last 12 months, (2) >1 sexual partner in the last 12 months, (3) had an STD in the last 12 months, (4) did not use a condom at last sex, and (5) alcohol use at last sex. The HIV risk index for women used the same questions, except the first indicator for men was replaced by whether the woman had a partner who was 10 or more years older. The second indicator was the average number of sexual partners in the previous 12 months. The baseline sample size was adjusted to account for (1) the larger number of cases required for propensity score matching approaches (50%), (2) estimates of attrition from the study (35% men, 30% females); and (3) clustering in the sample design (10% inflation), and (4) existing prevalence of male circumcision in the population (estimated at 10% in the provinces sampled). The Zambia Demographic and Health Survey (ZDHS) is a national sample survey designed to provide up-to-date information on background characteristics of the respondents, fertility levels, nuptiality, sexual activity, fertility preferences, awareness and use of family planning methods, breastfeeding practices, nutritional status of mothers and young children, early childhood mortality and maternal mortality, maternal and child health, awareness and behaviours regarding HIV/AIDS and other sexually transmitted infections (STIs), and prevalence and incidence of HIV/AIDS and other STIs.

Data was collected progressively. After the interview was conducted, about 60% of the sample was randomly given information packages on male circumcision and the availability of male circumcision services in their respective areas. They were also provided with an opportunity to review the materials and ask questions if they had concerns as the interviewers were trained to address any concerns [5]. The data collection tools were formulated by population council. The survey employed computer-assisted personal interview (CAPI)

electronic data capture for non-sensitive questions. For sensitive survey questions the study used custom audio computer-assisted self-interview (ACASI) software. ACASI allowed the respondent to answer questions without the involvement of an interviewer. The ACASI program was designed so that the respondent heard both the question and the response categories through headphones and entered his/her answer by touching an appropriate indicator on the computer screen. ACASI maximizes the privacy of the interview and has been shown to produce higher reporting of sexual behaviors as compared to face-to-face interviews [5].

### Data analysis

The data collected was survey weighted in STATA version 12 owing to the fact that a random sample was representative of the entire population. Univariate analysis was used to describe the characteristics of the study participants and variable outputs. Bivariate analysis was used to test for association between independent variables and the dependent variable at 95% confidence level. Ordered logistic regression or proportional odds model (POM) was fitted and multiple ordered logistic regression analysis was done to measure the relationship between the independent variables and the dependent variable. Given that the outcome variable is ordered, an ordered logistic regression or proportional odds model (POM) was fitted taking into account of the longitudinal nature of the data using the cluster option or approach and robust standard errors. The analysis involved a complete case type of analysis. For the ordered logistic regression, ap-value of 0.05 at 95 % CI and odds ratio were used to ascertain statistical significance. The predictors or independent variables included all the background variables, awareness and source of information on male circumcision. The predictor variables that were statistically significant at 95 % CI at bivariate analysis were included in the multivariate ordered logistic model. The dependent variable was women’s knowledge about male circumcision.

### Definition of outcome (Dependent variable)

#### Women’s Knowledge

A knowledge variable was generated by aggregating those that correctly responded to the five general knowledge and fact questions on male circumcision. Respondent’s knowledge was thus rated at a maximum score of five. Respondents who scored four and above out of five were rated to have had good knowledge, those that scored three out of five were rated as having had average knowledge and all those that scored

between zero and two were rated to have had poor knowledge about male circumcision. Knowledge is thus defined as knowing that (a) Male circumcision reduces a man’s risk of getting HIV; (b) Male circumcision reduces a man’s risk of getting sexually transmitted diseases other than HIV; (c) Male circumcision has no effect on a woman’s risk of getting HIV if she has sex with a man who is circumcised; (d) Male circumcision improves a man’s hygiene or cleanliness; and (e) male circumcision is not fully protective against HIV.

### Ethical considerations

The study sought ethical approval from ERES CONVERGE research ethics committee and approval was given (Protocol Assurance number: F.W.A. No. 00011697, I.R.B. No.00005948). Permission to use the data for this study was sought from Population Council authority. Population Council sought ethical approval from University of Zambia’s (UNZA) Biomedical Research Ethics Committee (UNZABREC) (Protocol Assurance number: FWA00000338, IRB00001131 of IORG0000774) to conduct the longitudinal study. Therefore, all procedures were in accordance with the ethical standards of the institutional research committee and with the 1964 Helsinki Declaration and its later amendments.

### Informed consent

The study obtained informed consent from all participants that were included in the study. All participants were informed comprehensively about the study. Participation was voluntary and participants were free not to answer questions or withdraw from the study.

### Study limitation

The study was using secondary data and was confined to the available information. The data was skewed towards quantitative data and did not collect in detail women’s views and opinions. Therefore, this study is purely quantitative. The study was conducted in seven out of the nine provinces (Muchinga was sampled as part of Northern Province). This is because some parts in Western and North-Western Provinces are known to practice male circumcision. Therefore, despite the study representing the whole Zambia, Western and North-Western were putatively included. At baseline, about 60% of the sample was randomly given information packages on male circumcision and the availability of male circumcision services in their respective areas. This might have created a bias towards women who accessed information packages.

## Results

### Participant characteristics

The demographic characteristics of the respondents reveal that about two thirds were in the age range 15 -19 with a mean age of 21.8 years. Almost half (48.6%) of the respondents were married and over three quarters (79.4%) of the married women and cohabiting women had partners that were not circumcised. Copper belt Province had the majority of respondents (31.1%) and over two thirds (67.76%) of the respondents were in urban areas. Over three quarters (79.5%) of respondents were Christians from some denominations other than Catholic. The study population had a high proportion of unemployed women 91%. (See Table1)

**Table 1: Baseline socio-demographic characteristics of the study population (Independent Variables)**

Characteristics	Study Sample (n= 1,064)	Percentage n (%)
<b>Age group</b>		
15-19	378	35.5
20-24	354	33.3
25-29	332	31.2
Mean age	21.8	
<b>Marital Status</b>		

Never Married	481	45.2
Married	520	48.9
Cohabiting	9	0.9
Widowed	8	0.8
Divorced	22	2.1
Separated	24	2.3
<b>Primary Sex Partner (Never Married)</b>		
No	318	66.1
Yes	163	33.9
<b>Primary Sex Partner (Widowed, Divorced, Separated)</b>		
No	40	74.1
Yes	14	25.9
<b>Circumcision status of spouse (Married &amp; cohabiting)</b>		
No	414	79.6
Yes	108	20.2
Don't know	1	0.2
<b>Circumcision status of Primary Sex Partner (Never Married)</b>		
No	107	65.6
Yes	35	21.5
Don't know	21	12.9
<b>Province</b>		
Province Central	170	16.0
Copperbelt	331	31.1
Eastern	40	3.7
Luapula	32	3.0
Lusaka	269	25.3
Northern	27	2.5
Southern	195	18.3
<b>Region</b>		
Rural	343	32.2
Urban	721	67.8
<b>Religion</b>		
Catholic	207	19.5
Other Christian	845	79.3
Muslim	3	0.3
No religion	6	0.6
Other	3	0.3
<b>Education</b>		
Primary	378	35.5
Secondary	592	55.6
Trade school/College	10	0.9
University/College	40	3.8
No primary education	44	4.2
<b>Ethnicity</b>		
Lozi	46	4.3
Nyanja	226	21.2
Tonga	276	25.9
Lunda	20	1.9

Bemba	341	32.1
Kaonde	76	7.2
Luvale	16	1.5
Non-Zambian	13	1.2
Other	50	4.7
<b>Occupation</b>		
Working	92	8.7
Not working	972	91.3
Mean income (earned in Kwacha)	635.1	

### Awareness and sources of knowledge on male circumcision

The study findings indicate that respondents had heard of male circumcision. The study revealed that respondents were aware of male circumcision from the following source; advertisement on male circumcision; health promotion materials on male circumcision; church or group meeting on male circumcision; medical professional; husband, boyfriend or sex partner; family member and lastly from a health centre. The percentage of women who were aware of male circumcision increased from first stage-baseline to the third stage of follow-up (stage 3). However, advertisements on male circumcision was the most reported source of information on male circumcision. (See table 2)

**Table 2: Sources of knowledge and information on Male Circumcision (MC)**

Responses	Stage 1 % N	Stage 2 % N	Stage 3 % N
<b>Heard of MC before/Awareness:</b>			
Yes	72.5 (656)	84.7 (453)	no obs
No	27.5 (249)	15.3 (82)	
<b>Heard or seen an advertisement on MC:</b>			
Yes	62.6 (518)	75.3 (662)	86.7 (371)
No	37.4 (310)	24.7 (217)	13.3 (57)
<b>Seen promotional materials on MC:</b>			
Yes	37.1 (306)	57.7 (507)	65.9 (282)
No	62.9 (518)	42.3 (371)	34.1 (146)
<b>Heard of MC at church or group meeting:</b>			
Yes	48.3 (398)	44.3 (388)	42.1 (180)
No	51.7 (426)	55.7 (488)	57.9 (248)
<b>Talked about MC with a circumcised person:</b>			
Yes	21.1 (173)	28.9 (253)	35.5 (152)
No	78.9 (646)	71.1 (621)	64.5 (276)
<b>Talked to a medical professional about MC:</b>			
Yes	11.4 (93)	19.8 (173)	25.7 (110)
No	88.6 (726)	80.2 (701)	74.3 (318)
<b>Talked to a husband, boyfriend or sex partner about MC:</b>			
Yes	34.2 (280)	39.8 (348)	54.7 (234)
No	65.8 (539)	60.2 (526)	45.3 (194)
<b>Talked with another family member about MC:</b>			
Yes	23.8 (195)	27.0 (236)	31.5 (135)
No	76.2 (624)	73.0 (638)	68.5 (293)
<b>Visited a health centre to learn about MC:</b>			
Yes	07.9 (65)	16.7 (146)	25.9 (111)
No	92.1 (754)	83.0 (728)	74.1 (317)

### Women's implicit knowledge of male circumcision

Women were asked five fact questions on male circumcision. Finding indicate that women correctly reported that; male circumcision reduces a man's risk of getting HIV (first stage-baseline 82.6%, stage two 88% and stage three 92.8% of follow-up); male circumcision reduces a man's risk of getting Sexually Transmitted Diseases (STDs) (first stage-baseline 84.8%, stage two 88.9% and stage three 93.2% of follow-up); and male circumcision improves a man's hygiene or cleanliness (first stage-baseline 82.6%, stage two 82.5% and stage three 92.8% of follow-up).

However, misconceptions on the protection that male circumcision offers to women was reported and the misconception increased with increase in follow-up. Women reported that male circumcision had an effect on a woman's risk of getting HIV if she had sex with a man who was circumcised regardless of the HIV status (first stage-baseline 85%, stage two 91.7% and stage three 84.5% of follow-up). Additionally, women reported that male circumcision is fully protective against HIV (first stage-baseline 52.1%, stage two 54.9% and stage three 61.2% of follow-up). (See table 3)

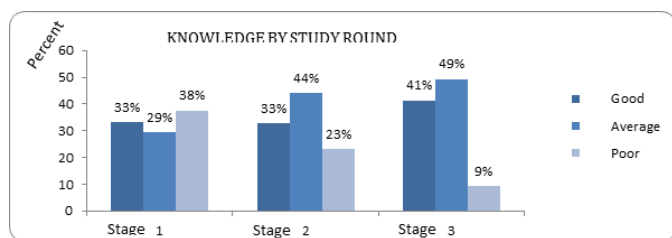
**Table 3: Male circumcision risk related knowledge by study round**

Responses	Stage 1 N=820 %	Stage 2 N=875 %	Stage 3 N=428 %
<b>Effect of male circumcision on a man's risk of getting HIV:</b>			
Increases risk	0.6	0.7	0.2
Reduces risk	82.6	88.0	92.8
Has no effect	4.5	2.9	3.0
Don't know	12.3	8.5	4.0
<b>Effect of male circumcision on a man's risk of getting STI's other than HIV:</b>			
Increases risk	0.6	0.6	0.00
Reduces risk	84.8	88.9	93.2
Has no effect	2.4	1.7	2.6
Don't know	12.2	8.8	4.2
<b>Effect of male circumcision on a woman's risk of getting HIV:</b>			
Increases risk	1.6	0.9	0.9
Reduces risk	63.7	75.9	75.0
Has no effect	15.0	8.3	15.9
Don't know	19.7	8.2	92.8
<b>Effect of male circumcision on a man's hygiene or cleanliness:</b>			
Improves hygiene	82.5	82.5	92.8
Worsens hygiene	0.7	1.2	0.2
Has no effect	2.0	2.4	3.3
Don't know	14.8	13.9	3.7
<b>Male circumcision is fully protective of HIV:</b>			
Agree	37.97	44.6	57.2
No opinion	14.2	10.3	4.0
Disagree	47.8	45.1	38.8

**Note:** The number of respondents is higher in Round one (R1) compared to Round two (R2) due to high non response in Round one (R1).

### Women's knowledge of male circumcision

Close to 4 in 10 (38%) had poor knowledge at baseline. However, in stage 2 and in stage 3 the majority 44% and 49% respectively had average knowledge. The relationship between women's knowledge of male circumcision and study time (follow-ups) was statistically significant with p-value <0.001. The study, therefore, confidently concludes that women's knowledge of male circumcision changed overtime or during the study period



**Figure 1:** Women's knowledge of male circumcision by study round

### Predictors of women's knowledge of male circumcision

Using stepwise backward elimination method and adjusting for other variables to explain variations in the women's knowledge of male circumcision, the study revealed that women's knowledge was influenced by factors such as; a woman's age, a woman's education level, ethnicity, region, marital status (widowed, divorced and separated) of women with primary sex partners, hearing of male circumcision from church, talking to a spouse, boyfriend or sex partner and lastly, talking to a family member on male circumcision.

It follows that the odds for all the background characteristics were greater (POM>1) except for region and some categories in marital status, province, religion, education and ethnicity. Similarly, the odds of having good and average knowledge versus poor knowledge was greater (POM>1) among women who had acquired or sourced information on male circumcision compared to those who did not.

The odds of having good and average knowledge versus poor knowledge was greater (17 and 20 time greater) for women aged 20 to 29 years compared to women aged 15 to 19 years after controlling for primary sex partner, region (urban and rural), education status, ethnicity, awareness and source of information about male circumcision. Similarly, women who were divorced, separated or

widowed and had a primary sex partner were 1.8 times more likely to have good and average knowledge versus poor knowledge compared to those that did not have a primary sex partner after controlling for age, region, education status, ethnicity, awareness and source of information about male circumcision. Further, women who had a primary, secondary and tertiary education were more likely to have good and average knowledge versus poor knowledge compared to women with no education after controlling for age, primary sex partner, region, ethnicity, awareness and source of information about male circumcision. Correspondingly, women who had heard of male circumcision from church were 3 more likely to have good and average knowledge versus poor knowledge compared to women with no education after controlling for age, primary sex partner, region, ethnicity and source of information about male circumcision. In addition, women who had talked to a family member about male circumcision from church were 3 more likely to have good and average knowledge versus poor knowledge compared to women with no education after controlling for age, primary sex partner, region, ethnicity, awareness and source of information about male circumcision from talking to a partner.

However, women in rural areas were 0.4 times less likely to have good and average knowledge versus poor knowledge compared women in urban areas after controlling for age, primary sex partner, education status, ethnicity, awareness and source of information about male circumcision. Similarly, women who talked to partners (husbands, boyfriend or sex partner) about male circumcision were 0.5 times less likely to have good and average knowledge versus poor knowledge compared women in urban areas after controlling for age, primary sex partner, education status, ethnicity, awareness and source of information from a family member. (See table 4)

**Table 4: Predictors of women's knowledge of male circumcision**

Characteristics/factors	Study Sample N (%)	Proportional Odds ratio (POR) (95% CI)	P-value
<b>Age group</b>			
15-19	783 (32.0)	1.0	
20-24	877 (35.8)	17.7 (2.76-113.20)	0.002
25-29	787 (32.2)	20.5 (1.85-226.88)	0.014
<b>Primary Sex Partner (Widowed, Divorced, Separated)</b>			
No	90 (66.2)	1.0	<0.001
Yes	46 (33.8)	1.8 (1.59-2.07)	
<b>Region</b>			
Urban	1721 (70.3)	1.0	<0.001
Rural	727 (29.7)	0.4 (0.23-0.63)	
<b>Education</b>			
No education	104 (4.3)	1.0	
Primary	795 (32.5)	2.9 (2.52-3.39)	<0.001
Secondary	1411 (57.6)	2.0 (0.82-4.97)	0.127
University/College	137 (5.6)	5.8 (33-9.97)	<0.001
<b>Ethnicity</b>			
Lozi	102 (4.2)	1.0	

Nyanja	529 (21.6)	7.9 (1.85-33.52)	0.005
Tonga	680 (27.8)	6.7 (1.35-33.59)	0.020
Lunda	13 (1.3)	7.0 (1.10-4.51)	<0.001
Bemba	741 (30.3)	2.9 (1.35-6.19)	0.006
Kaonde	164 (6.7)	44.3 (22.33-87.87)	<0.001
Luvale	42 (1.7)	7.2 (4.85-10.47)	<0.001
Non-Zambian	27 (1.1)	4.3 (16-1.11)	<0.001
Other	131 (5.4)	3.0 (1.40-22.04)	0.284
<b>Heard of male circumcision from church:</b>			
No	1,162 (54.6)	1.0	0.043
Yes	966 (45.4)	3.2 (1.04-10.09)	
<b>Talked to a husband, boyfriend or sex partner about MC:</b>			
No	1259 (59.4)	1.0	0.011
Yes	862 (40.6)	0.5 (0.33-0.86)	
<b>Talked with another family member about MC:</b>			
No	1555 (73.3)	1.0	0.026
Yes	566 (26.7)	2.1 (1.09-4.16)	

**Note:** Robust standard errors adjusted for 3 clusters, Significant at 5%.

### Discussion

Over 80% of the women in the study said male circumcision reduces a man's risk of contracting Human Immunodeficiency Virus (HIV). This number increased from 83% at baseline to 93% in stage three of follow-up indicating a positive change. This is consistent with findings in a Tanzanian study which found that women perceived male circumcision as a health-promoting practice that can prevent Human Immunodeficiency Virus (HIV) transmission and other sexually transmitted infections [6]. In a similar response, many women in this study revealed that male circumcision reduces a man's risk of contracting Sexually Transmitted Infections (STIs). This number increased from 85% at stage one-baseline to 93% in stage three of follow-up indicating a strong and positive increase in knowledge. This finding is also consistent with previous studies conducted in Kenya Nyanza Province where 81% of women believed that it was easier for uncircumcised men to acquire Sexually Transmitted Infections (STIs) compared with circumcised men while women in Jamaica (20.4%) also felt male circumcision lessens the likelihood of Sexually Transmitted Infections (STIs) [7,8]. Only 15% of the women in this study thought male circumcision has no effect on a woman's risk of getting Human Immunodeficiency Virus (HIV). These findings are consistent with findings in a qualitative study in Swaziland which found that women felt male circumcision protects them from contracting Human Immunodeficiency Virus (HIV) by up to 95% [9]. However, the study findings contradict the findings from South Africa which revealed that women did not believe that medical male circumcision would protect women from the risk of HIV [10]. Conversely, this study found that over 82% of the women thought male circumcision improves a man's hygiene or cleanliness. This number increased from 83% at stage one-baseline to 93% in stage three of follow-up, indicating an increase in women's knowledge on the influence that male circumcision has on hygiene. The findings are similar to what was found in a Jamaican study where, 41.8% of the women revealed that circumcision makes it easier to clean the penis [8].

Two key misconceptions regarding the protective effect of male circumcision for preventing HIV infection were reported in the study. These include the misconception that male circumcision is 100% protective and the renascence of risk compensation (i.e. an increase in risky sexual behaviour). This study found that the majority (48%) of women thought male circumcision is not fully protective of Human Immunodeficiency Virus (HIV). However, this decreased from 48% at stage one-baseline to 39% in stage three of follow-up thereby revealing an increase in the number of women who thought male circumcision is fully protective of HIV from 48% at baseline to 57% in stage three of follow-up. This finding has implications on risk compensation as this may cause women to engage into risky sexual behaviour. Fostered misconceptions that male circumcision offers protection to females and full protection to males negatively impact on HIV prevention as more men and women will engage in risky sexual activities based on that premise. The existing evidence only affirms that male circumcision prevents HIV infection in men who have sex with women and not affirms that it provides protection to women who have sex with HIV positive men. Male circumcision does not provide full protection against HIV infection but rather partial protection. There are misconceptions about the efficacy of male circumcision as a method of HIV prevention as women view male circumcision to be fully protective and it also provides protection to women. These misconceptions denote the messages disseminated to the community. Male circumcision does not provide full protection to men and does not women against HIV. The exhibited misconception on the level of protection that male circumcision offers also has other implications on women such as gender based violence and reduced negotiating power for safer sex. This entails that women will not practice or even negotiate for safe with a circumcised partner as they themselves believe that male circumcision is fully protective against Human Immunodeficiency Virus (HIV) and it also provides protection to women. These misconceptions also provide suggestions that women are left out in the decision making and male circumcision programs. In view of the revealed misconceptions, a study conducted by revealed that participants recognised that Medical Male Circumcision (MMC) leads to an increase in gender-based violence (GBV) and



heightened stigma for women living with HIV [11]. They attributed it to circumcised men's misperception that they cannot be Human Immunodeficiency Virus (HIV) positive and/or cannot transmit the virus. Misconception regarding the protective effect of male circumcision are an indication of a lag in the availed information and sensitization of male circumcision. The misconception also pose a challenge on the scale up of male circumcision as a prevention measure as is may lead to higher risky sexual behaviors among men and women which in turn will increase the incidence rates of HIV. Policy makers and program implementers must come up with strategies to curb these misconceptions through outreach and community sensitization. From the aggregated responses, the study deduced that the majority of the women had poor knowledge of male circumcision at baseline; Women's knowledge, however, increased in stage two and three of follow-up. These findings are similar to findings in Zimbabwe which showed that male circumcision knowledge and its benefits were low among men and women [12]. Other findings by showed that most practitioners working with sexually transmitted infection and neonate cases reported that the Hispanic community had little or no knowledge about circumcision, thus lack of information about circumcision is perceived as a barrier to the procedure [13]. It is evident from the findings that male circumcision campaigns may have failed to reach out effectively to many women and as a result have been unsuccessful in educating and imparting correct information on male circumcision. Women's knowledge of male circumcision is key in the roll out of male circumcision programs as documented by a study in Zimbabwe that, despite knowledge being lower among females, data suggested that women were likely to have considerable influence over their partner's decision to get circumcised [14]. This is evidence of the need for serious awareness campaigns among women, in as much as in men, to make male circumcision program successful.

The study revealed that background characteristics, awareness and sources of information had a significant influence on women's knowledge and attitude towards male circumcision [15]. The study showed higher odds of having good and average knowledge versus poor knowledge for women who; had heard of male circumcision from church; talked to a family member, spouse, boyfriend, girlfriend, sex partner and those that visited a health centre to learn about male circumcision. Older women, the divorced, widowed and separated women with sex partners and educated women had higher odds of having good and average knowledge [16]. Varying ethnic groups showed higher odds of having good and average knowledge. Women in rural areas had lower odds of having good and average knowledge.

## Conclusion

The study highlights the need for education due to inadequate knowledge about male circumcision. With the aforementioned, however, awareness and communication campaigns on male circumcision still need to be intensified and embedded in all programmes offering male circumcision services. Misconception about the extent to which male circumcision is protective against Human Immunodeficiency Virus (HIV) is very dominant among women in Zambia. Consequently amending misconceptions and misinformation should also be part of an overall plan for social change communication. Without curbing the existing misconceptions, the scaling up of male circumcision may result in risk compensation which would in turn increase the number of sexually transmitted diseases including Human Immunodeficiency Virus (HIV), and effectively undoing all the gains achieved so far.

The implication is that the purpose of using male circumcision as a preventive measure for Human Immunodeficiency Virus (HIV) would be defeated and would be a waste of scarce resources. Male circumcision was meant to be an efficacious intervention for HIV prevention if rolled out carefully while factoring in possible negative traits such as risk compensation as a result of misconceptions on the efficacy of protection against HIV for both men and women. Male circumcision is not a comprehensive HIV prevention package but rather a part of the package which includes correct and consistent use of male or female condoms, reduction in the number of sexual partners, delaying the onset of sexual relations and HIV testing and counselling.

## Abbreviations

AIDS: Acquired Immune Deficiency Syndrome; CDC: Center for disease control; CI: Confidence interval; CSO: Central statistics office; EIMC: Early infant male circumcision; HIV: Human Immunodeficiency Virus; MC: Male circumcision; MDGs: Millennium Development Goals; MMC: Medical male circumcision; MOH: Ministry of Health; NGO: Non-governmental organization; POR: Proportional odds ratio; STI: Sexually transmitted infection; WHO: World Health Organization; ZDHS: Zambia Demographic and Health Survey.

## Declarations

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## Availability of data and materials

The data is available in soft copy in STATA format and the questionnaires are available in soft copy as well. Authors' contributions

HTN was responsible for all aspects of this study and preparing the manuscript. CM contributed to the design, formulation, methods, analysis. HBC contributed to all facets of this research including writing, proof reading, data analysis and discussion. SN contributed to formulation, methods, analysis, presentation and interpretation. All authors read and reviewed the paper

## Ethics approval and consent to participate

The protocol was approved by ERES CONVERGE research ethics committee and approval was given (Protocol Assurance number: F.W.A. No. 00011697, I.R.B. No.00005948). Permission to use the data for this study was sought from Population Council authority. Population Council who sought ethical approval from University

of Zambia's (UNZA) Biomedical Research Ethics Committee (UNZABREC) (Protocol Assurance number: FWA00000338, IRB00001131 of IORG0000774). Participants were informed about the study and consent was sought to participate. Participation in the study was voluntary and participants had the right to refuse to respond or terminate the interview. The data collected is kept confidential and data collected does not have participant's names or identity. Therefore, the report infers to the entire country and not specific individuals.

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