PROTECTIVE EFFECT OF MALE CIRCUMCISION ON HUMAN IMMUNODEFICIENCY VIRUS INFECTION AMONG MEN IN MBEYA, TANZANIA

By

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A Dissertation Submitted in Partial Fulfillment of the Requirements for the Degree of Master of Public Health of the Muhimbili University of Health and Allied Sciences

Muhimbili University of Health and Allied Sciences

November, 2009

CERTIFICATION

The undersigned certifies that he has read and hereby recommends for acceptance by Muhimbili University of Health and Allied Sciences a dissertation entitled ***Protective effect of male circumcision on human immunodeficiency virus infection among men in Mbeya – Tanzania,*** in partial fulfillment of the requirements for the degree of Master of Public Health of the Muhimbili University of Health and Allied Sciences.

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Date.....30.10.2009.....

DECLERATION AND COPYRIGHT

I, **Msafiri Leonard Birigi**, hereby declare that this dissertation is my original work and that is a product of my own efforts and it has not been presented and will not be presented in any other University for similar or any other degree award.

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ACKNOWLEDGEMENT

I praise the LORD my GOD, the sole fountain of life and sustenance, who, by his unmerited favour, has taken me through this work and my studies at large. Glory, praise and honour be unto him now and forever more. Amen.

I would most sincerely like to acknowledge my sponsor Tanzania German Program to Support Health (TGPSH).

I would like to express my heartfelt gratitude to my supervisor Mr Cyprian K. Makwaya for his dedicated efforts, constructive criticism, tireless supervision and encouragement that enabled the production of this dissertation.

I am indebted immerse gratitude to my dear colleagues Mr. Christopher Mshana, Dr. Agnes S. Buchwa and Mr. Irenei Kiria for their special support during preparation and finalizing this work. I am also grateful to all my colleagues MPH participants 2008/2009 for their encouragement and cooperation.

Lastly but not least, special thanks to my wife Juliana and sons (Ochanga, Wandiba and Nyerere) for their moral and spiritual support that facilitated the completion of my studies.

DEDICATION

I would like to dedicate this work to my late beloved father Mr Paul Japan Birigi who always aspired for my success.

ABSTRACT

Evidence from recent clinical trials has shown a substantial protective effect of male circumcision to HIV infection. While the government is embarking on activities for scaling up male circumcision for HIV prevention, there was a need to examine the extent of protective effect of male circumcision in areas which are traditionally not practicing male circumcision like Mbeya region. This study aimed at measuring the extent of protective effect of male circumcision through physical examination, to determine the prevalence of male circumcision and its association to HIV infection and to explore the acceptability of male circumcision practice as a preventive strategy of HIV infection among men. This was an unmatched case-control study done in Mbeya city, involving males who were attending VCT services. Total sample size was 296 with 142 cases and 154 controls. Data analysis was done using SPSS version 13. Chi-square test was used to examine the association between the dependent and independent variables. Odds ratio was used as a measure of association between male circumcision and HIV infection. Multivariate logistic regression analysis was used to measure male circumcision status as a predictor of HIV infection while adjusting for other factors. The study revealed the prevalence of male circumcision to be 56.8%. Among various reasons for circumcision, cultural influence was found to be the most contributing reason. The overall acceptability of male circumcision was relatively higher (68%). The protective effect of male circumcision was found to be 95%. HIV status was found to be significantly related to the socio – demographic and behavioral factors. Circumcision status was associated with socio – demographic characteristics of the participants, such as peasants, rural dwellers, informal education and pagans. The observed acceptability was relatively high. There is a high protective effect (95%) of male circumcision for HIV infection. Male circumcision can be included among preventive strategies for HIV infection in areas which are traditionally not practicing male circumcision and having high prevalence of HIV infection, however, more sensitization on male circumcision should target peasants, rural dwellers, people with informal education and pagans.

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LIST OF ACRONYMS

AIDS ..... Acquired Immunodeficiency Syndrome

CI .....Confidence Interval

DHS .....Demographic and Health Survey

HIV.....Human Immunodeficiency Virus

IEC .....Information, Education, Communication

NCP.....Non Cohabiting Partner

PI..... .Principal Investigator

OR.....Odds Ratio

RA.....Research Assistant

RCT.....Randomized Clinical Trial

STD.....Sexual Transmitted Diseases

STI .....Sexual Transmitted Infection

TDHS .....Tanzania Demographic and Health Survey

THMIS .....Tanzania HIV and Malaria Indicator Survey

UNAIDS .....United Nation Programme on HIV/AIDS

VCT .....Voluntary Counseling and Testing

WHO..... World Health Organization

CHAPTER ONE

1.0 INTRODUCTION

1.1 Overview of HIV and AIDS pandemic

Human Immunodeficiency Virus (HIV) and Acquired Immunodeficiency Syndrome (AIDS) are among the major global health problems that pose an unprecedented threat to global health, development and security. The estimates indicate that, the global HIV/AIDS prevalence has leveled off although the number of people living with the disease continues to increase. An estimated 2.7 million people became newly infected with HIV in 2007 of which over two third (68%) occurred in Sub Saharan Africa, while 2.1 million people died of AIDS-related causes in 2007. Young people under the age of 25 years are estimated to account for more than half of all new HIV infections worldwide (UNAIDS/WHO epidemic updates, December 2007, July 2008).

Sub-Saharan Africa remains to be the mostly affected region, which is home to just over 10% of the world's population but has more than 68% of all people living with HIV/AIDS. The prevalence of HIV infection among adults 15 to 49 years is estimated to be 5% (range: 4.6 to 5.5%) with between 20.9 to 24.3 million people currently living with HIV. However, the actual prevalence of HIV varies between countries in the regions. Presently, Southern Africa is the hardest hit region, with adult prevalence exceeding 20% in some of the countries. For instance, the prevalence of HIV is 30% in Swaziland and Botswana (UNAIDS/WHO epidemic updates, December 2007, July 2008).

There are signs that the HIV/AIDS pandemic is declining in Eastern Africa region, notably in Uganda, which previously recorded one of the highest prevalence in the continent (UNAIDS/WHO epidemic updates, December 2007, July 2008).

In Tanzania, HIV/AIDS is the second serious public health problem after Malaria (National Policy on HIV/AIDS, 2001). Since the first AIDS cases were discovered in Tanzania in 1983, HIV prevalence has been on the increase. By 1986 all the regions in Tanzania mainland had reported a case of AIDS. To date, more than 2 million Tanzanians of whom 15.2% are young people (15 – 25 years) are infected with HIV (TDHS, 2003-04). The recent estimates show the prevalence of HIV in Tanzania has declined form 7% to 5.8% (TDHS, 2003-04, THMIS 2007/08). The prevalence of HIV infection has being found to be higher among women (6.8%) than among men (4.7%). Similarly, the prevalence of HIV infection is higher in Urban (8.7%) than in Rural (4.7%) areas. The regional variation of HIV prevalence has also been observed within Tanzania, where Iringa, Dar es Salaam and Mbeya regions are leading with HIV prevalence of 14.7%, 8.9% and 7.9% respectively (THMIS, 2007/08). While in Europe and USA, the major modes of HIV transmission being homosexual and drug injections, in sub-Saharan Africa including Tanzania heterosexual remain to be the most important mode of transmission of HIV (Koblin *et al*, 2003). Of which, about 80% of HIV infections are acquired through heterosexual (National policy on HIV/AIDS, 2001). Thus, factors that modify susceptibility of men to HIV infection are of great importance and would also translate into lower transmission rates to women.

There have been various preventive measures for HIV spread. These include Community health education through IEC which stresses on abstinences, being faithful to uninfected partner and condom use. Also the strategies focus on increasing community awareness of the importance of knowing their HIV status through counseling and testing services.

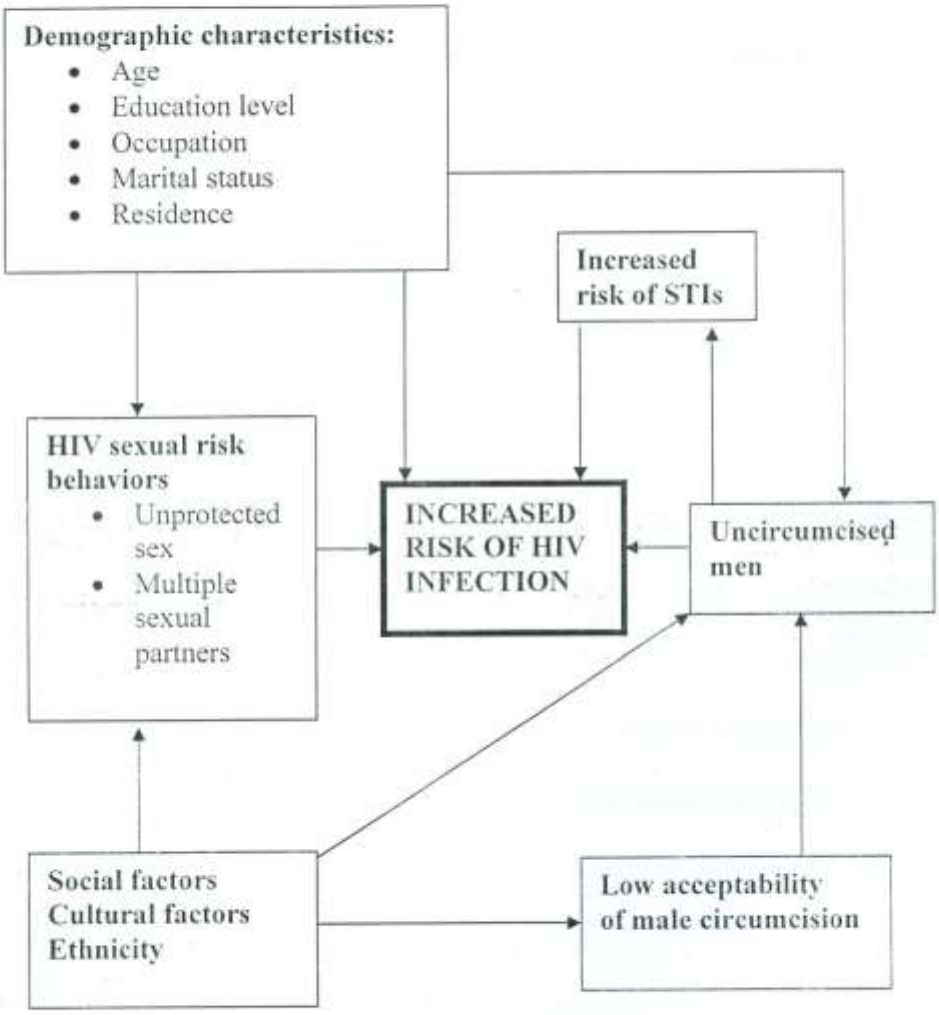
However, in spite of these vast arrays of preventive strategies, the prevalence of HIV/AIDS remained to be high in some regions. Among some urged explanations of this regional disparity is the epidemiological and biomedical evidence that links lack of male circumcision with HIV transmission (Halperin and Bailey, 1999). The study done in Nairobi, Kenya, by Cameron and his colleagues found that, men who were not circumcised had a 8-2-fold increased risk of seroconversion, compared with circumcised men (Cameron *et al*, 1989). For over a decade researchers have suggested that the foreskin provides a vulnerable portal of entry to HIV and other pathogens (Simonsen *et al*, 1988). The highly vascularised prepuce has been discovered to contain a higher density of Langerhans cells, primary target cells for sexual transmission of HIV than cervical, vaginal, or rectal mucosa (Hussain and Lehner, 1995). Other scientists and clinicians have noted that the foreskin is more susceptible to traumatic epithelial disruptions during intercourse, which allows additional vulnerability to HIV (Cameron *et al*, 1989). An intact foreskin also exposes a man to greater risk of ulcerative STDs, such as chancroid, syphilis, and herpes that are known cofactors for HIV infection (Moses *et al*, 1998). A number of observational studies indicate that circumcised men have lower levels of HIV infection than uncircumcised men (Weiss *et al*, 2000). It is estimated that male circumcision reduces the risk of HIV infection by 60% (Auvert *et al*, 2005). These

results reflect the situation in Tanzania, where some regions which are traditionally not practicing male circumcision have expressed higher HIV prevalence compared to those traditionally practice male circumcision. Though there are various co-existing factors to the observed disparity of HIV prevalence, male circumcision can not be ignored as an associated factor.

1.2 Research questions

1. Is there any difference in risk of HIV infection among circumcised and uncircumcised men?
2. What is the prevalence of male circumcision among men attending VCT in Mbeya city?
3. What are the views about male circumcision as a preventive strategy to HIV infection?

1.3 Conceptual framework



The framework above summarizes the interrelationship of different factors which increase the susceptibility to acquisition of HIV infection. Lack of male circumcision can directly be

influenced by cultural, social and ethnic characteristics which may as well lead to low acceptability of male circumcision practice and influence the HIV sexual risk behaviors. On the other hand, demographic characteristics also might influence male circumcision practice and HIV sexual behaviors. Non-circumcision can expose one to an increased risk of HIV infection through trauma during sexual intercourse or indirectly through increased risk of acquiring other STIs.

1.4 Statement of the problem

HIV infection is preventable. As stipulated in the national policy on HIV/AIDS of 2001, over 80% of HIV infection in Tanzania is through heterosexual contact, prevention of transmission through this route is the key to HIV/AIDS prevention.

HIV preventive programmes have been focusing their messages and efforts on three important aspects of behavior: using condoms, limiting the number of sexual partners/staying faithful to one uninfected partner and delaying sexual debut in young persons (abstinence) (THMIS, 2007/08). In recent years there has been a lot of debate on the role of male circumcision in prevention of HIV infection among men. However, three randomized controlled studies have provided evidence that male circumcision has protective effect to HIV infection from female to male transmission, for the reason that the foreskin with abundant primary target cells for HIV transmission has been removed. In view of this, male circumcision can be adopted as a preventive strategy for HIV infection (Auvert *et al*, 2005; Bailey *et al*, 2007 and Gray *et al*, 2007).

Despite the evidence, few countries have laid down policies to promote male circumcision. This has been partly due to doubt whether lack of male circumcision is an important driver of country specific HIV epidemic. According to the 2008 Tanzania national wide survey, HIV prevalence was reported to be high even in region like Dar es Salaam and Coastal region where male circumcision is high. Surprisingly, Kigoma region where male circumcision is very low came last with the lowest prevalence of 0.9% (THMIS 2007/08). This heterogeneous distribution of HIV magnitude by male circumcision rate in the country leaves a lot of un-answered questions in HIV prevention in Tanzania. Some observational studies have reported the relationship between male circumcision and HIV infection in the country (Urassa *et al*, 1997 and Nnko *et al*, 2001). However, several studies used a self reported circumcision status. This may be among the limitations of these studies and eventually their results which may be unreliable. Determining circumcision status by asking men "Are you circumcised?" may be misleading, not only because of unreliability of self-report, but also because different styles of circumcision result in varying amounts of residual foreskin (Brown *et al*, 2001).

The government of Tanzania is embarking on activities for scaling up safe male circumcision for HIV prevention and other related health benefits. However, there is a need to investigate the acceptability of the practice in areas which are traditionally not practicing male circumcision. In deed, the information available which was obtained through self reporting circumcision status is doubtful to what extent male circumcision has been practiced in Mbeya region which is among the regions traditionally not practicing male circumcision. As such the advocated protective effect of male circumcision would not be feasible without knowing the

prevalence of male circumcision through reliable sources especially physical examination of the genitalia.

This study aimed to measure the extent of protective effect of male circumcision through physical examination to increase the reliability of the circumcision status information. It was the expectation of this study to determine the prevalence of male circumcision and its association to HIV infection. The study also determined the associated risk factors for HIV infection. The study finally explored the acceptability of male circumcision practice as a preventive strategy among men attending to VCT in Mbeya.

1.5 Rationale of the study

HIV prevention must be greatly prioritized in the response to the HIV/AIDS epidemic and efforts are being made to find new prevention technologies to bolster the package of already known effective preventive methods. While male circumcision has been reported to have protective effect to HIV infection, Mbeya region is traditionally not practicing male circumcision, with estimated male circumcision prevalence of only 34% (TDHS, 2003-04), and is among the leading top three regions in Tanzania for HIV prevalence.

HIV infection has shown a shifting trend form urban to rural areas, where more than 80% of Tanzanian live. Though there are several preventive strategies in place, male circumcision

being found to have significant protection against HIV infection should be given a hand to complement the present strategies.

Well designed studies have provided satisfactory evidence on the role of male circumcision in HIV prevention. However, information whether male circumcision is an important factor locally is needed. This information will be instrumental on the ongoing discussion whether a policy should be put in place in Tanzania, because before establishing the policy, we need to know what people think about male circumcision as among the preventive strategies for HIV infection.

1.6 Objectives

1.6.1 Broad objective

To determine the protective effect of male circumcision on HIV infection among men in Mbeya city.

1.6.2 Specific objectives

1. To measure the extent of protective effect of male circumcision on HIV infection.
2. To determine the prevalence of male circumcision among men attending VCT.
3. To determine the extent of acceptability of male circumcision practice as a preventive strategy against HIV infection in men.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 The concept of male circumcision and HIV infection

Male circumcision is the surgical removal of all of the foreskin (or prepuce) from the penis (Alanis and Lucidi, 2004). Between 75% and 85% of cases of HIV infection worldwide have probably occurred during sexual activity (UNAIDS fact sheet, July 1996). Of the estimated 50 million people infected with HIV worldwide, about half are men, most of who have become infected through their penises. The inner surface of the foreskin, which is rich in HIV receptors, and the frenulum, a common site for trauma and other sexually transmitted infections, must be regarded as the most probable sites for viral entry in primary HIV infection in men (Szabo and Short, 2000). Several researches have documented that male circumcision significantly reduces the risk of HIV infection to men during penile vaginal sex (Bongaarts *et al*, 1989; Moses *et al*, 1990; Urassa *et al*, 1997; Nnko *et al*, 2001; Auvert *et al*, 2005; Bailey *et al*, 2007 and Gray *et al*, 2007).

2.2 Prevalence of male circumcision

The prevalence of male circumcision varies for African countries; it is almost universal in North Africa and most of West Africa. In contrast, it is less common in southern Africa, where self-reported prevalence is around 15% in countries such as Botswana, Namibia, Swaziland, Zambia and Zimbabwe (DHS, 2006; Drain *et al*, 2006; Langeni, 2005 and Connolly *et al*, 2004) and higher in Malawi 21%, South Africa 35%, Lesotho 48%, Mozambique 60%,

Angola and Madagascar more than 80% (DHS, 2006, Drain *et al*, 2006 and Connolly *et al*, 2004). Prevalence in Central and East Africa varies from approximately 15% in Burundi and Rwanda to 70% in the United Republic of Tanzania, 84% in Kenya and 93% in Ethiopia (DHS, 2006).

2.3 The protective effect of male circumcision to HIV infection

Male circumcision has been hypothesized to protect men from HIV infection through heterosexual transmission. Ecologic studies indicated a strong association between lack of male circumcision and HIV infection at the population level (Bongaarts *et al*, 1989 and Moses *et al*, 1990). Although links between circumcision, culture, religion, and risk behavior may account for some of the differences in HIV infection prevalence, the countries in Africa and Asia with prevalence of male circumcision of less than 20% have HIV infection prevalence several times higher than those countries in these regions where more than 80% of men are circumcised (Halperin and Bailey, 1999).

In a systematic review and meta- analysis done by Weiss and his colleagues that focused on male circumcision and heterosexual transmission of HIV in Africa, revealed a substantial protective effect of male circumcision on risk for HIV infection and a reduced risk for genital ulcer disease. After adjustment for confounding factors in the population-based studies, the relative risk for HIV infection was 44% lower in circumcised men. The strongest association

has been in men at high risk, such as patients at sexual transmitted infection (STI) clinics, for whom the adjusted relative risk was 71% lower for circumcised men (Weiss *et al.* 2000).

Gray (2000) in their cohort studies in Rakai, Uganda found a significant protective effect of male circumcision: The odds of infection were 42% lower for circumcised men.

Three Randomized controlled Clinical Trials (RCT) were conducted in South Africa, Kenya and Uganda to determine whether male circumcision of adult males will reduce their risk for HIV. However, the studies were stopped after interim analyses found a statistically significant reduction in male participants' risk for HIV infection from medical circumcision. In these studies, men who had been randomly assigned to the circumcision group had lower incidence of HIV infection compared with men assigned to the waiting list group to be circumcised at the end of the study by 60% in a South Africa study done by Auvert (2005), 53% in Kenyan Study done by Bailey (2007) and 51% in Ugandan study done by Gray (2007). In all three studies, a few men who had been assigned to be circumcised did not undergo the procedure and vise versa. When the data were reanalyzed to account for these occurrences, men who had been circumcised had a 76% (South Africa), 60% (Kenya), and 55% (Uganda) reduction in risk for HIV infection compared with those who were not circumcised.

In view of the above results, the practice had to be adopted by a substantial proportion of men within customarily non-circumcising societies, to have an impact on the HIV pandemic in developing countries. If the relative risk of HIV infection for uncircumcised men is 2·5 in a

country where 20% of men are not circumcised, which is roughly the situation in countries such as Nigeria and Indonesia, then the proportion of heterosexual HIV infections in men attributable to lack of circumcision is 23% (Kleinbaum *et al.* 1982, Moses *et al.* 1995). On the other hand, if 80% of men are not circumcised, as is roughly the case in Zambia and Thailand, an estimated 55% of HIV infections in men are attributable to lack of circumcision.

2.4 Controversies about protective effects of male circumcision to HIV infection

Some researchers do not agree with the results form the three RCT which favor protective effect to male circumcision (Mills and Siegfried, 2006; Dowsett and Couch, 2007). The critiques argue that, the protective effect found was attributed to circumcised males being required to abstinence after their circumcision. All three studies were terminated early, before the incidence of infection in circumcised males caught up with the incidence of infection in the non-circumcised males. If the studies had continued for their scheduled time, it is probable that there would have been little difference between the circumcised group and the non-circumcised group. Mills & Siegfried point out that early termination of such studies led the benefits to be exaggerated (Mills and Siegfried, 2006). Dowsett & Couch even after publication of the RCTs, found insufficient evidence exists to support a program of circumcision to prevent HIV infection (Dowsett and Couch, 2007).

In Tanzania with about 110 ethnic groups, some groups using universal male circumcision, others not circumcising show no difference in male prevalence between the groups after controlling for urbanization: in urban areas, HIV seroprevelence was 9.5% in circumcised group and 9.7% in uncircumcised groups, and conversely, 4.6% and 5.2%, respectively, in rural areas: none of the differences being significant (TACAIDS, National Bureau of standards, ORC Macro 2005).

Self- reporting of male circumcision status is among the limitations in many studies, and eventually their results may be unreliable. A study in the North-west of Tanzania found that the self-reported prevalence of circumcision was higher than the actual rate upon genital examination (34% vs. 28%) (Urassa *et al*, 1997), whereas in a study of adolescents in Texas, United States of America, the self-reported prevalence was lower than that found by clinical examination (36% vs. 49%) (Risser *et al*, 2004).

2.5 Age at male circumcision

The age for circumcision in Islam is no clearly prescribed, although the prophet Muhammad recommended it to be carried out at an early age (Rizvi *et al*, 1999). Although a Muslim may be circumcised at any age between birth and puberty, many of them perform the rite on the seventh day after birth as the prophet did to his sons. For instance in Pakistan, the general practice is to circumcise boys born in hospital a few days before discharge, whereas those born outside hospital are circumcised between the ages of 3 and 7 years. Likewise, Muslim boys in Turkey are circumcised between the eighth day after birth and puberty (Ozdemir, 1997), while

in Indonesia, on average circumcision is done between the ages of 5 and 18 years (Hull and Budiharsana, 2001). The age at circumcision varies by country in Africa. Neonatal circumcision is common in Ghana (Owusu-Danso, 2006), where as in other countries median age at circumcision varies from boyhood (median age 5–7 years) in Burkina Faso (DHS, 2006), to (age 7–10 years) in Zambia (Bowa, 2006), age 8–16 years in Kenya (Agot and Bailey, 2006), to the late teens or twenties, for instance in parts of Tanzania and South Africa (Nnko *et al*, 2001 and Auvert *et al*, 2005).

Some sources indicate that male circumcision typically occurs in puberty or young adulthood in Kenya, Lesotho and Tanzania (Devon *et al*, 2007). Age at circumcision can also vary considerably within a country. For instance, in Burkina Faso, families of higher socioeconomic status and education level or living in urban areas were more likely to circumcise their sons at a young age (DHS, 2006).

2.6 Historical overviews of male circumcision

The historical background of male circumcision has been related with religious practice and ethnic identity.

2.6.1 Religious practice

Male circumcision was practiced among ancient Semitic peoples, including Egyptians and Jews (Johnson, 1993). Muslims seems to be the largest religious group which practice male circumcision as part of their Abrahamic faith to confirm their relationship with God: the practice is also known as *tahera*, meaning "purification" (Tierney, 2003).

Male circumcision practice is almost commonly practiced among Jewish people. For instance, about 99% of Jewish men in the Britain and Northern Ireland (Dave *et al,* 2003) and 98% of Jewish men in the United States of America are circumcised (Laumann *et al,* 1997).

2.6.2 Ethnicity

Male circumcision prevalence within a country varies dramatically by ethnicity. For instance, although an estimated 84% of all Kenyan men are circumcised, the percentage is much lower among the Luo and Turkana ethnic groups (17% and 40%, respectively) (DHS, 2006), focus group discussions conducted among adult Luo men and women found no knowledge of any history of male circumcision among the Luo in Kenya (Bailey *et al*, 2002). In the ethnographic and health science literature, authors normally refer to male circumcision as a rite of passage into adulthood in Kenya, Lesotho, and Tanzania (Devon *et al,* 2007).

2.6.3 Cultural influences

Male circumcision is valued as an integral part of a rite of passage to manhood, although originally it may have been a test of bravery and endurance in the majority of cultures (Doyle, 2005). Circumcision is also related with factors such as masculinity, social unity with boys of the same age who become circumcised at the same time, self-identity and spirituality (Niang CI, 2006).

Currently, male circumcision is performed for a variety of reasons, largely social or health related, in addition to religion, cultural and ethnicity. The aspiration to conform is an important motivation for circumcision in places where the majority of boys are circumcised (Brown, 1987).

The foremost link of circumcision status was related to circumcision status of the father, with 90% of circumcised fathers choosing to circumcise their son, compared with 23% of non-circumcised fathers (Brown, 1987).

2.7 Factors that influence acceptability of male circumcision practice

The reasons given for the uptake of male circumcision included social, hygiene, disease prevention, female preference and enhanced sexual enjoyment (Mensch *et al.* 1999).

2.7.1 Social and health related factors

Among the motivating factors in the spread of circumcision practices in some of industrialized world has been the discernment that it results in improved penile hygiene and lower risk of infections. These were also the key factors found in recent studies of factors determining acceptability of male circumcision in sub-Saharan African communities that do not traditionally circumcise (Westercamp and Bailey, 2007).

The University Teaching Hospital in Lusaka, Zambia established a male circumcision service and of the 895 circumcisions that have been undertaken there, 91% of clients requested the procedure because they considered it protective against sexually transmitted infection (STI), including HIV (Bowa, 2006). In the Philippines, improved hygiene was also cited by 23% of 110 boys circumcised (Lee, 2005) and in South Korea, the most important reason given for circumcision among those who thought it was essential, was "to improve penile hygiene" by 71% to 78% (Kim *et al,* 2002) and to prevent conditions such as penile cancer, sexually transmitted diseases and HIV (Ku *et al,* 2003).

Irrespective of their partiality for male circumcision, 96% of uncircumcised men and 97% of women in Nyanza Province, Kenya, stated their view that it was easier for circumcised men to maintain cleanliness (Mattson *et al,* 2005). Focus group discussions which included male participants in Botswana, Kenya, Malawi, Tanzania, Zambia and Zimbabwe also revealed that it was easier to keep the circumcised penis clean (Halperin and Bailey, 1999, Nnko *et al,* 2001, Bailey *et al,* 2002, Kebaabetswe *et al,* 2003, Steele *et al,* 2004, Mattson *et al,* 2005, Ngalande *et al,* 2006, Lukobo and Bailey, 2007).

Conversely, social attraction may also add to the relatively recent uptake of circumcision among traditionally non circumcised societies. An example of recent changing practice comes from Sukuma tribe in Tanzania, which is also traditionally non-circumcising. The word for circumcision in the Sukuma language is derogatory (*njilwa*), however, now that boys mix with other ethnic groups at school, the practice is more acceptable, with an estimated prevalence of

21% (Nnko *et al,* 2001). The study also discovered that most people accept male circumcision because it has a preventive effect to HIV and other STI, improves penile hygiene and enhances sexual performance.

2.7.2 Socio-economic factors

Socioeconomic factors also influence circumcision prevalence, especially in countries with more recent uptake of the practice, such as English-speaking industrialized countries. In a recent nationwide survey in Australia, it was found that the proportion of men circumcised was significantly associated with higher levels of education and income (Richters *et al*, 2006). Even though circumcision is rare in Thailand, it tends to be related with higher educational and socioeconomic status (Tangcharoensathien, 2006).

On the contrary, the Demographic and Health Surveys in sub-Saharan African countries show no reliable relationship with socioeconomic status. For instance, in Lesotho, circumcision is most common among men with no education, in the lowest wealth quintile and living in rural areas whereas, in Tanzania, higher rates of circumcision are seen among men with higher levels of education, of higher socioeconomic status and living in urban areas. In Ethiopia the prevalence of male circumcision is unanimously high (93%) but men are most likely to be circumcised if they are in a higher wealth quintile, have at least secondary education and live in an urban area (DHS, 2006).

2.7.3 Sexual desirability

Perceived improvement of sexual pleasure and performance can also encourage circumcision. In Nyanza Province, Kenya, 55% of uncircumcised men believed that women enjoyed sex more with circumcised men, and this belief was a strong predictor of preference to be circumcised even after controlling for education, employment and beliefs about whether circumcision was associated with disease. Likewise, the greater part of women believed that women enjoyed sex more with circumcised men, even though it is likely that most women in Nyanza have never experienced sexual relations with a circumcised man (Mattson *et al*, 2005). Research done in Westonaria District, South Africa, about half of men said that women preferred circumcised partners (Lagarde *et al*, 2003) while in southern Nigeria, the enhancement of sexual performance and reproductive ability was also an important reason given for male circumcision (Myers *et al*, 1985). In the North-west of Tanzania, younger men associated circumcision with enhanced sexual pleasure for both men and women (Nnko *et al*, 2001).

2.8 Risk factors for HIV infection

Socio- demographic characteristics have been implicated to be among the risk factors for HIV infection. In a study done in Mwanza, Tanzania, it was found that occupation as significantly associated with HIV infection ($P = 0.002$). The study also revealed a significant association of place of residence with HIV status that those who have lived in urban areas had high prevalence of HIV infection compared to those lived in rural areas ($P = 0.011$). Marital status

was showed to have significant association with HIV infection (P = 0.008), participants who ever married (divorced or widowed) were three times more likely to be HIV positive than those currently married. The age at first sexual intercourse and level of education had no significant association with HIV infection (Quigley et al, 1997).

Behavioral associated risk factors for HIV infection includes multiple partners and unprotected sex. In Tanzania it is estimated that, about 19.1% of men have multiple partners other than their wives. However, the proportion of men practicing unprotected sex is significantly high (81.2%), among those 92.4% were married men (TDHS 2003-04). In a study done by Quigley (1997), there was no significant association between reported condom use and HIV infection either before or after adjustment for confounders. Sexually transmitted diseases (STDs) can increase risk for acquisition and transmission of HIV via a number of mechanisms, including breaching of mechanical barriers to infection, increased inflammation and higher levels of HIV cellular targets, and increased genital tract HIV levels (Cohen, 2004).

CHAPTER THREE

3.0 METHODOLOGY

3.1 Study area

This study was done in Mbeya city located in the southern- west highlands of Tanzania. The city comprises a mixture of people including the indigenous tribes of Mbeya region. These tribes are Wanyakyusa from Kyela and Tukuyu districts, Wandali from Ileje district, Wabungu from Chunya districs, Wanyiha, Wasafwa, Wamalila from Mbeya rural district, Sangu, Wanji and Sukuma from Mbalali district. Most of the tribes do not traditionally practicing male circumcision. The population of Mbeya region is estimated to be about 2.2 million people with urbanization rate of 14%, and population density of 35 people per squire kilometer.

Administratively, the region has eight district councils namely; Rungwe, Mbozi, Mbalali, Kyela, Ileje, Chunya, Mbeya city and Mbeya Rural. The region has seven district hospitals, one regional hospital and one referral hospital. The region has 146 VCT centres; 10-Mbalali, 20-Mbozi, 16- Chunya, 12-Ileje, 12-Kyela, 30-Rungwe, 20-Mbeya Rural, 26-Mbeya city.

3.2 Study design

This was an unmatched case-control study using quantitative methods (structured questionnaire) to determine the association between male circumcision and risk of HIV infection. Cases was those who were HIV positive and controls was those who were HIV

negative, assumed that they had the same characteristics as they were using the same service in the health facility.

3.3 Study population

The study included males aged 15 to 59 years who were attending VCT services in Mbeya city. Where, those who were found to be HIV positive composed the 'cases' and those HIV negative was defined as 'controls'. VCT centers were selected because were the reliable place where both cases and control could be recruited within a short time.

3.3.1 Inclusion criteria

- Males who attended selected VCT clinics.
- Aged between 15-59 years
- Those who grant consent

3.3.2 Exclusion criteria

- Failure to grant consent.
- Age below 15 years or above 59 years.

3.4 Sample size

In order to compute the sample size, EPI info computer program was used with the following specifications:

Confidence level: 95%

Power of the study: 80%

Percentage of exposure (uncircumcised) in the general population in Mbeya: 66%

Estimated risk of HIV infection in uncircumcised relative to risk in circumcised (odds ratio): 2.5

Case: control ratio 1:1

Total sample size was 230 (115 cases and 115controls).

Non response was estimated to be 20% for both cases and controls: 46

Hence total sample size was 276: 138 cases and 138 controls.

3.5 Sampling procedures

The study sample was obtained through multistage cluster sampling method;

1. Mbeya city was chosen by convenience as it has a mixture of different cultures representing tribes of Mbeya region, which are traditionally not practicing male circumcision and has a high prevalence of HIV.
2. Simple random sampling method was used to choose 15 out of 26 VCT centers.
3. In each VCT centers, all men who met the study criteria during the study period (from 15th June to 25th July 2009) were included in the study. After completion of counseling and testing services, every man was requested to participate in the study. The counselor who attended the client was responsible to interview and do physical examination to the participant in the same counseling room. The participant was requested to show his penis for physical examination which was done through inspection at the end of the interview.

All participants who were found to be HIV positive were assigned to "case group" while those HIV negative were assigned to "control group".

3.6 Recruitment and training of interviewers

The recruitment of the interviewers considered the ability to work morning to evening for the whole period, skills to fill the questionnaire, ability to read, write and speak Swahili. The interviewers were health personnel mostly VCT counselors.

3.7 Data collection

Data was collected using structured questionnaire with closed and open ended questions. The questionnaire was developed in English and translated in to Swahili (The language understandable to most of the Tanzanians). Data on socio-demographics characteristics, HIV risky sexual behaviors (unprotected sex, multiple partners), history of suffering STI, and acceptability for male circumcision, circumcision status and HIV serostatus were collected.

3.8 Variables

3.8.1 Dependent variables: HIV serostatus (cases and controls)

3.8.2 Independent variables:

1. Socio-demographic characteristics (age, marital status, place of residence (urban/rural), occupation and education level).
2. Circumcision status.
3. Age at circumcision
4. Age at sexual debut

5. History of suffering other STIs,
6. Sexual behaviors; sex with NCP in last six months, condom use during last sex non-cohabiting partner.
7. Acceptability of circumcision practice as a preventive strategy.

3.9 Pre- testing

Prior to data collection process, pretest was done to respondent aged 18 to 59 who were attending two VCT centers in Mbeya city, and these respondents were not included in the main study. This aimed at identifying gaps which needed to be sorted out before commencing data collection.

3.10 Data processing and analysis

Collected data were edited during and after collection, sorted and coded. SPSS software programme was used to enter data. Descriptive summary statistics was first obtained using univariate analysis, then, a binary analysis was performed to examine the association of HIV infection and individual factors. Statistical significance of association was assessed using χ^2 test at a significance level of 0.05. Odds of male circumcision in both HIV positives (cases) and HIV negatives (controls) were determined, and odds ratio was used as a measure of effect on the potential of male circumcision in reducing the risk of HIV infection. In particular, protective effect was reported in terms of the extent (in %) to which male circumcision reduces the risk of HIV infection. Multivariate logistic regression analysis was used to measure the significance of male circumcision together with other factors as predictors of the risk of HIV infection.

3.12 Ethical consideration

Ethical clearance was obtained from the Muhimbili University of Health and Allied Sciences Ethical Review Committee. The request to carry out the study was sent to the to Regional Administrative Secretary and copies to District Administrative Secretary, City Executive Director, City Medical Officer and Director of Mbeya referral hospital. All participants were fully informed of the purpose of the study and informed oral or written consent was sought from each participant.

Respondents were informed regarding the purpose of the study and how the information will be used. They were assured that the information will be presented in general terms nothing will point any particular details of individual respondents. The entire interview was done in a private room where the respondent and the interviewer felt comfortable. Since there were counseling rooms in all VCT clinics, the research used these rooms for interview. Again because respondents are those who were coming for counseling and testing therefore being in the counseling room implied that the client is attending counseling services. This increased the confidence and confidentiality to the respondent.

All interviewees were informed that the information gathered will be anonymous to eliminate the possibility that this information will be viewed by unauthorized personnel. Interviewers

were trained VCT counselors who are bound to ethics of confidentiality hence, more confidence on handling respondent information.

CHAPTER FOUR

4:0 RESULTS

4.1 Socio-demographic characteristics by type of study participants

A total of 296 males aged between 15 and 59 were involved in this case control study. Out of these 154 (52%) were categorized as controls (Table 1). The overall mean age of the study participants was 32.6 ± 9.8 years, where the mean age of cases was 35.0 ± 9.2 and controls was 30.6 ± 9.6. Most 182 (61.5%) of the participants were from urban area.

As it is depicted in (Table 1) majority 117 (39.3%) of participants were in the age group 25 – 34 years. The univariate analysis revealed that majority 147 (48.6%) of the study participants were married, singles were 113 (38.2%), Separated and divorced composed of 36 (6.1%). Most 118 (39.9%) of the study participants were peasants, businessmen comprised 92 (31.1%), while participants who were employed accounted for 49 (16.6%). Students comprised the minority 37 (12.5%) of the participants. The univariate analysis also discovered that over two third 229 (77.6%) of study participants were Christians and a small proportion 27 (9.2%) being pagans.

Table 1 also summarizes results of a bivariate analysis that examined the distribution of some socio-demographic characteristics in cases and controls. As it reflected, the variables were unevenly distributed between cases and controls. The cases were dominated by 25-34 age group 55 (38.7%) followed by 35-44 age group 44 (31%). The younger ages (15-24) were the

least 18 (12.7%) among cases. The controls were still dominated by 25-34 age group 62 (40.3%) followed by the younger age 15-24 by 49 (31.8). Cases were more from rural areas 74 (52.1%) while their urban counterparts comprised the majority 182 (61.5%) of the control group. Married group were found to be more 83 (58.5%) in the cases followed by those not married (singles) 35 (24.6). The control group were dominated by those not married (singles) 78 (50.6%) followed by married group 61 (39.6%). Those who were separated and divorced both had the same counts in both cases and controls 11 (7.7%) and 7 (4.5%) respectively. The cohabiting participants were the least in cases and controls 29 (1.4%) and 1 (0.6%) respectively.

The cases were found to compose most 78 (54.9%) of the peasants followed by businessmen, students were the least 7 (4.9%) among the cases. The composition of the controls was dominated by businessmen 53 (34.4%) followed by peasants 40 (26%). Students were still forming the least 30 (19.5%) group. Participants who had primary education composed the majority 89 (62.7%) of cases, while the control group was dominated by participants with secondary and post secondary education (75/152 = 48.7%). Cases were dominated by non-Muslims 137 (96.5%) while most Muslims 34 out of 39 were found in the control group.

Table 1: Demographic characteristics by type of study participants

Characteristics	Case (%)	Control (%)	Total (%)	χ^2	P-value
Age (in years)				**20.6**	**< 0.01**
15-24	18 (12.7)	49 (31.8)	67 (22.7)		
25-34	55 (38.7)	62 (40.3)	117 (39.3)		
35-44	44 (31)	25 (16.2)	69 (23.4)		
≥ 45	25 (17.6)	18 (11.7)	43 (14.6)		
Residence				**21**	**< 0.01**
Urban	68 (47.9)	114 (74)	182 (61.5)		
Rural	74 (52.1)	40 (26)	114 (38.50		
Marital status				**20.9**	**< 0.01**
Single	35 (24.6)	78 (50.6)	113 (38.2)		
Married	85 (59.9)	62 (40.3)	147 (48.6)		
Ever married	22 (15.5)	14 (9.1)	36 (6.1)		
Occupation				**31**	**< 0.01**
Employed	18 (12.7)	31 (20.1)	49 (16.6)		
Peasant	78 (54.9)	40 (26)	118 (39.9)		
Businessman	39 (27.5)	53 (34.4)	92 (31.1)		
Student	7 (4.9)	30 (19.5)	37 (12.5)		
Level of education				**26.6**	**< 0.01**
No formal education	20 (14.1)	5 (3.2)	25 (8.4)		
Primary education	89 (62.7)	74 (48.1)	163 (55.1)		
Secondary and above	33 (23.2)	75 (48.7)	108 (36.5)		
Religion				**40.9**	**< 0.01**
Muslim	5 (3.5)	34 (22.2)	39 (13.2)		
Christian	112 (78.9)	117 (76.5)	229 (77.6)		
Pagan	25 (17.6)	2 (1.3)	27 (9.2)		

4.2 Prevalence of male circumcision

The male circumcision status was found to be more diverse. The overall prevalence of male circumcision among the study participants was found to be 56.8% (168/296).

Apparently controls were circumcised at a younger age 10.2 ± 7.1 years compared to cases 12.7 ± 8.1 years, but the association was not statistically significant ($\chi^2 = 3.19$; P = .076).

Table 2 shows preponderance 66 (58%) of study participants from rural areas were uncircumcised, where as most 120 (66%) of participants from urban areas were circumcised, the observed association was found to be significant (P < 0.01). Most 33 (67%) of employed participants were found to circumcised. Likewise, majority 58 (63%) of businessmen were circumcised. Greater part 29 (78%) of students were also circumcised. On the other hand, majority 70 (59%) of peasants were uncircumcised, the association was statistically significant (P = < 0.01). The largest part 20 (80%) of participants who had on formal education were found to be uncircumcised. Those with primary education were almost evenly distributed among circumcised and uncircumcised groups. Nevertheless, most 80 (74%) of those with secondary and above were circumcised and the association was significant (P = < 0.01). Ninety percent of Muslims were circumcised followed by Christians 128 (56%). Most 23 (85%) of pagans were not circumcised, the observed association was statistically significant (P < 0 .01).

Table 2: Circumcision by some of demographic characteristics

Characteristics	Circumcised (%)	Uncircumcised (%)	χ^2	P-value
Residence			**16**	**< 0.01**
Urban	120 (66)	62 (34)		
Rural	48 (42)	66 (58)		
Occupation			**23**	**< 0.01**
Employed	33 (67)	16 (33)		
Peasant	48 (41)	70 (59)		
Businessman	58 (63)	34 (37)		
Student	29 (78)	8 (22)		
Education level			**29**	**< 0.01**
No formal education	5 (20)	20 (80)		
Primary education	83 (51)	80 (49)		
Secondary and above	80 (74)	28 (26)		
Religion			**36.7**	**< 0.01**
Muslim	35 (89.7)	4 (10.3)		
Christian	128 (56)	101 (44)		
Pagan	4 (15)	23 (85)		

4.2.1 Reported reasons for circumcision

There were diverse reasons for either undergoing or not undergoing male circumcision among the study participants. Majority 68 (40.1%) in the circumcised group were circumcised because of cultural influence, social interactions 46 (27.2%), religious reasons 30 (17.8%) and sexual desire 12 (7.1%) each. Other reasons were medical grounds 6 (4.2%), cleanliness 3 (1.8%) and some of them had no reasons for circumcision because it was done in their childhood age.

4.2.2 Reported reasons for not circumcised

The major reason for not circumcising was due to cultural factors 123 (96.1%), other reasons being fear of the side effects of circumcision 3 (2.3%) financial problems 1 (0.8%) and one (0.8%) participants pointed out that removal of foreskin (circumcision) will reduce his sexual stimulation.

4.3 Extent of acceptability of male circumcision practice as a preventive strategy against HIV infection.

There was a positive trend on acceptability of male circumcision as 68% (201/296) of the participants perceived that male circumcision is beneficial. As shown in table 3; 83 (87.4%) of participants who did not accept if there are any benefits from male circumcision came from the uncircumcised group.

Large number 55% (212/296) of participants were willing to recommend male circumcision to a person who has not circumcised to do so, and the majority 161 (75.9%) of the participants were circumcised. Conversely, 77 (91.7%) of participants who did not accept to recommend male circumcision to a person who has not circumcised fell in the uncircumcised group.

Greater part 55.4% (164/296) of the study participants accepted that male circumcision can be used as one of the preventive strategies for HIV infection. However, 94 (71.2%) of uncircumcised men refused male circumcision to be considered as a preventive strategy for HIV infection. In general, a significantly higher percentage of male circumcision was observed in those with positive aspects of attitude than those with a negative attitude towards male circumcision.

Table 3: Circumcision status by acceptability of male circumcision

Characteristics	Circumcised (%)	Uncircumcised (%)	Significance χ^2	P-value
Benefits of circumcision			**111.2**	**< 0.01**
Yes	156 (77.6)	45 (22.4)		
No	12 (12.6)	83 (87.4)		
Recommendation of male circumcision			**112**	**< 0.01**
Yes	161 (75.9)	51 (24.1)		
No	7 (8.3)	77 (91.7)		
Use of male circumcision as a preventive strategy for HIV infection			**76.3**	**< 0.01**
Yes	130 (79.3)	34 (20.7)		
No	38 (28.8)	94 (71.2)		

Various benefits highlighted by participants included cleanliness as the mostly reported benefits of circumcision (38.8%), followed by prevention of STI (37.1%) and sexual desires (20.7%) such as enhancement of sexual performance, increases pleasure during sexual intercourse and most women prefer circumcised men. Few 2 (0.5%) of them pinpointed that circumcised penis simplifies to put on a condom.

4.4 Protective effect of male circumcision on HIV infection

4.4.1 Crude protective effect

Analysis of case-control study data in Table 4, suggest a statistically significant association between HIV infection and male circumcision: odds ratio (OR) = 0.05 (95% CI = 0.03 to 0.09). Thus being circumcised was observed to have a protective effect on HIV infection of 95%. That is, 2protective effect = 1- OR = 0.95 = 95%. Equivalently the results show that those who are not circumcised are at least 20 times (1/0.05) more at risk of getting HIV infection than circumcised counterparts.

Table 4: HIV infection by circumcision status

	Case (%)	Control (%)	Total (%)	OR (95% CI)	χ^2	P-value
Circumcised	34 (23.9)	134 (87)	168 (56.8)	0.05 (0. 03, 0.09)	119	< 0.01
Uncircumcised	108 (76.1)	20 (13)	128 (43.2)	Reference		
Total	142 (100)	154 (100)	296 (100.0)			

4.4.2 Single factor adjusted protective effect

Generally, the protective effect of male circumcision (measured by 1-OR) when adjusted for other important risk factors (Table 3) remained almost the same; That is, adjusted odds ratios remained very similar to the crude odds ratio of = 0.05. The linear logistic regression model used to determine the protective effect adjusted for a single factor, say $\mathbf{x_2}$, was generally of the form: $\mathbf{logit\ p = \beta_0 + \beta_1 x_1 + \beta_2 x_2}$, where $\boldsymbol{\beta_0}$ is a constant and $\mathbf{x_1}$ is the circumcision status as a covariate. Below are the results from the linear logistic regression models that provided the adjusted odds ratios which led to obtaining a measure of the protective effect.

4.5 Other risk factors for HIV infection

Table 5 shows the risk of HIV infection with other factors (socio-demographic and behavioural). We note that participants aged 15-24 were at the lowest risk of having HIV infection compared to older ages, while participants from rural areas were found to be three times more likely to have HIV infection compared to urban participants (OR=3.1; 95% CI= 1.9, 5.1). Participants who previously married (separated and divorced) were more than three times at risk of HIV infection than those who were not married (OR = 3.5; 95% CI = 1.5, 8.2). Likewise, participants who were currently married were three times more at risk of HIV infection than singles (OR = 3.1; 95% CI = 1.8, 5.3). With regard to occupation, students were at the lowest risk followed by those employed then businessmen.

Participants with secondary education and above were at the lowest risk of having HIV, compared to primary education and without formal education. Participants who reported to

have had sex with a non cohabiting partner in past six months were at a slightly (but not significantly) higher risk of having HIV infection compared to those who had no history of having sex with a non cohabiting partner (OR = 1.18; 95% CI = 0.71, 1.95). However, the risk of HIV infection was significantly higher (OR = 3.5; 95% CI = 1.9, 6.5) among those who reported not to have used a condom at last higher risk sexual intercourse (i.e. sexual intercourse with a non-cohabiting partner) than in those who reported to have used a condom. Risk of acquiring HIV infection was almost 3 times among those with history of suffering STI compared to those who had not suffered from STI in the past (OR = 2.74; 95% CI = 1.53, 4.93). On the other hand, there was no significant difference in risk of having HIV infection between those who were transfused and those who did not (P = 0.925).

Table 5: Risk of HIV infection by some socio - demographic characteristics and behavioral factors

Characteristics	Case (%)	Control (%)	OR (95% CI)	P-value
Age (in years)				
15-24	18 (12.7)	49 (31.8)	Reference	
25-34	55 (38.7)	62 (40.3)	2.4 (1.2, 4.9)	.007
35-44	44 (31.0)	25 (16.2)	4.8 (2.2, 10.7)	< .01
≥ 45	25 (17.6)	18 (11.7)	3.8 (1.6, 9.3)	< .01
Residence				
Urban	68 (47.9)	114 (74.0)	Reference	
Rural	74 (52.1)	40 (26.0)	3.1 (1.9, 5.1)	< .01
Marital status				
Single	35 (24.6)	78 (50.6)	Reference	
Previously married	22 (15.5)	14 (9.1)	3.5 (1.5, 8.2)	< .01
Married	85 (59.9)	62 (40.3)	3.1 (1.8, 5.3)	< .01
Occupation				
Businessman	39 (27.5)	53 (34.4)	0.38 (0.21, 0.69)	< .01
Student	7 (4.9)	30 (19.5)	0.12 (0.04, 0.32)	< .01
Employed	18 (12.7)	31 (20.1)	0.30 (0.14, 0.63)	.07
Peasant	78 (54.9)	40 (26.0)	Reference	
Level of education				
No formal education	20 (14.1)	5 (3.2)	Reference	
Primary education	89 (62.7)	74 (48.1)	0.30 (0.09, 0.9)	.017
Secondary and above	33 (23.2)	75 (48.7)	0.11 (0.03, 0.35)	< .01
History of condom use with non cohabiting partner				
Yes	36 (35.6)	66 (66.0)	Reference	
No	65 (64.4)	34 (34.0)	3.5 (1.9, 6.5)	< .01
History of sex in six months with non cohabiting partner				
Yes	100 (71.4)	100 (68.0)	1.18 (0.71, 1.95)	.53
No	40 (28.6)	47 (32.0)	Reference	
History of suffering from STI				
Yes	42 (30.2)	21 (13.6)	2.74 (1.53, 4.93)	< .01
No	97 (69.8)	133 (86.4)	Reference	
History of blood transfusion				
Yes	6 (4.3)	7 (4.6)	0.95 (0.31, 2.89)	.925
No	132 (95.7)	146 (95.4)	Reference	

4.6 Multiple factor adjusted protective effect of male circumcision on HIV infection

The protective effect of male circumcision for HIV infection, after controlling for place of residence, marital status, occupation, education level, condom use, history of suffering from STI and age of respondents (which were found to be significantly associated with HIV infection) was found to be 96.3% (OR=0.037; 95% CI = 0.015, 0.090) as shown in table 6a. In the multivariate logistic regression analysis, circumcision and age of respondents were found to be significant predictors of HIV infection.

Table 6a: Model one: Multivariate logistic regression of HIV infection on some covariates

	OR	95% C.I. for OR	
		Lower	Upper
Circumcision	.037	.015	.090
Residence	.620	.266	1.445
Marital status	.547	.261	1.144
Occupation	.932	.573	1.516
Education level	1.265	.625	2.558
Condom use	.647	.288	1.452
STI	2.146	.850	5.423
Age	.950	.904	.999
Constant	21.053		

When the two variables (circumcision and age of respondents) that showed significant association with HIV infection were put in the logistic regression model, the protective effect of male circumcision was found to be 95.5% (OR = 0.045; 95% CI = 0.24, 0.09) while that of

age of was 5.4% (OR = 0.946; 95% CI = 0.92, 0.98), as presented in table 6b. That is, the final logistic regression model is: **logit p = 3.2 – 3.1 circumcision status – 0.06 age**

Table 6b: Model two: Logistic regression of HIV infection on circumcision and age of respondents

	OR	95% C.I. for OR	
		Lower	Upper
Circumcision	.045	.024	.085
Age	.946	.917	.977
Constant	24.567		

CHAPTER FIVE

5.0 DISCUSION

5.1 Prevalence of male circumcision

The present study findings indicate the prevalence of male circumcision among men participated in the study was higher (56.8%) compared to the available data (34%) for Mbeya region (TDHS 2003/04). However, this prevalence is still lower compared to the national average of 70% (DHS 2006). This difference of male circumcision prevalence in the present study may be attributed to fact that, the current study was facility based and conducted in an urban area, where there is mixture of different cultures and many social interactions which influence male circumcision prevalence as stipulated in DHS 2006.

5.2 Factors associated with male circumcision

Majority of demographic characteristics found to be associated with circumcision status of the participants in this study. These results are similar to other previous studies, which showed that male circumcision was influenced by socioeconomic status and high level of education (Richters et al, 2006 and Tangcharoensathien, 2006). The Demographic Health Survey (2006) found male circumcision among other factors, to be associated with place of residence where those residing in urban areas were likely to practice male circumcision compared to rural dwellers (DHS 2006).

Most of participants indicated cultural requirement as the main reason for their circumcision status (both circumcised and not circumcised), other factors being improved social interaction, religious requirement and increased sexual desire. The results reflect to studies previously done which pinpointed the cultural association to male circumcision status (Doyle, 2005 and Niang 2006).

The literature also add sexual desirability and social interactions, where the aspiration to conform being the motivating factor for circumcision (Myers et al, 1985; Brown, 1987; Nnko et al, 2001), results which coincide with what had been revealed in the current study.

5.3 Extent of acceptability of male circumcision practice

Interestingly irrespective of their circumcision status, about two thirds of the participants appreciated the benefits of male circumcision. Most of participants were willing to recommend male circumcision to another person who has not circumcised in spite of their circumcision status.

This brings the sense that male circumcision can be accepted by most of the population regardless of their diverse cultural beliefs. The acceptability of male circumcision was accompanied with various reasons. The main reasons for accepting male circumcision in this study was Cleanliness (38.8%), prevention of STI (37.1%) and sexual desirability which most of the participants claimed that circumcision increases pleasure and enhances performance

during sexual intercourse, most women prefer circumcised men and some pointed out that circumcised penis simplify the putting on of condom. These results coincide with several studies which accessed acceptability of male circumcision. Improving penile hygiene, prevention of STI and sexual attraction which included enhancement of sexual performance and women preference was the main findings in most of the previous studies (Mensch *et al*, 1999; Nnko *et al*, 2001; Lagarde *et al*, 2003; Mattson *et al*, 2005; Bowa, 2006). The acceptability of male circumcision was less in the uncircumcised men compared to their counterparts. This might be due to lack of awareness of the benefits of the procedure as shown in table 7a. Most (86%) among those who didn't know the benefits of circumcision were composing the uncircumcised men.

There are positive indicators from this study, which show most (55.4%) of men, do recommend the use of male circumcision as among the preventive strategies for HIV infection despite their circumcision status. However the discrepancy is obvious between the circumcised and uncircumcised group in their recommendations. Only few of uncircumcised men seem to agree with the concept, but this can be attributed to lack of awareness and strong cultural influence. In some studies done in South Africa to assess acceptability of male circumcision, it was found that most of uncircumcised men were willing to be circumcised if male circumcision were proved to be protective against HIV and other STI (Lagarde *et al*, 2003 and Rain-taljaard et al, 2003). This gives hope that even in Tanzania male circumcision can be used as a preventive strategy for HIV infection as it has proved to be protective.

5.4 Protective effect of male circumcision on HIV infection

This case control study has revealed a significantly higher (95%) protective effect of male circumcision compared to those from recently published study findings. Even after considering the possible confounding factors (socio – demographic and behavioral factors), the adjusted odds ratios were almost the same (Range of adjusted OR were 0.04 to 0.06). This implies that the difference in circumcision status within individual socio – demographic and behavioral characteristics had no influence to the overall protective effect of male circumcision. In the recent randomized clinical trials the crude protective effects of male circumcision ranged from 51 to 60% but after adjustment for confounding factors the protective effect ranged from 55% to 76%. The observed difference in protective effects in different studies entails that apart from the study designs, HIV infection has many different influencing factors which differ from one place to another. Hence these factors may modify the risk of acquiring HIV. In view of this, if other risk factors for HIV infection will be modified for preventive purposes, the protective effect of male circumcision can be enhanced. However, the higher protective effect in this study may be attributed to the fact that it was conducted in high HIV prevalence area with strong negative cultural influence in circumcision. Never the less, the protective effect found is more significant and a good indicator for scaling up male circumcision for HIV prevention in areas with high HIV prevalence and low prevalence of circumcision.

With exception of history of sex in six months with non cohabiting partner, HIV infection was found to be highly associated with other measured socio-demographic and behavioral

characteristics. The observed results correspond with other previous studies which found almost the same findings (Quigley et al, 1997, Cohen, 2004). However, rural residents were about three times higher at risk of HIV infection compared to urban residents. This differs from other studies which showed urban residents to be at higher risk (TDHS, 2003/04, THMIS, 2007/08). This may be due to the fact that most of the rural residents were uncircumcised which increase the risk of HIV infection. Also this difference may be attributed by unclear definition of boundaries of rural and urban areas to the participants.

5.5 Study limitations

Results of this case-control study offer an illustrative overview of protective effect of male circumcision for HIV infection in Mbeya. However, the data should be considered in the light of few weaknesses such as validity of some recall information on past exposures where few participants couldn't recall and thus information was missed. Focusing in the issue of acceptability, the study missed the information from women as an integral part of the society.

CHAPTER SIX

6.0 CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusions

The overall prevalence of male circumcision was relatively higher (56.8%) compared to the available data (34%) for Mbeya region. Circumcision was associated with socio – demographic characteristics of participants, where as peasants, rural dwellers, participants with no formal education and pagans were most likely to be uncircumcised compared to other categories.

Culture was reflected to be the most determinant of male circumcision to both circumcised and none circumcised participants. Other factors which showed more influence in the uptake of male circumcision were social interaction, religious reasons and sexual desire.

The study highlighted apparently high acceptability of male circumcision which was associated with various reasons irrespective of circumcision status. This hints on the possible uptakes of male circumcision as a preventive strategy on HIV infection in areas traditionally not practicing male circumcision.

The overall protective effect of male circumcision on HIV infection is quite high (95%) and this remained almost unchanged even after adjusting for other risk factors. In this study the socio – demographic and behavioral factors had no significant influence on the protective effect of male circumcision.

The HIV infection was highly associated with socio – demographic and behavioral characteristics studied, but the factors had no significant confounding effect on the association between HIV infection and male circumcision. Though this is not a new finding but emphasizes their importance in modifying the trend of HIV infection.

6.2 Recommendations

Male circumcision can be included among preventive strategies for HIV infection in areas which are traditionally not practicing male circumcision and having high prevalence of HIV infection. However, the community should be provided with accurate and balanced information about the protective effect of male circumcision to help them to make informed choices. The procedure might be counterproductive if men opt for male circumcision believing it will fully protect them from HIV infection.

Socio – demographic and behavioral characteristics should be considered while scaling up male circumcision as they seem to be highly associated with HIV infection. Therefore, the

community should continue to be emphasized on other preventive strategies like doing safer sex, being faithful to one uninfected partner and abstinence.

While considering scaling up male circumcision for prevention of HIV infections; peasants, rural dwellers, informal education and pagans among other factors should be considered as highly associated factors for circumcision. In view of that, more sensitization on male circumcision should target this group.

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