The University of Zambia
School of Medicine
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Predictors of abnormal cervical lesions among women

(15-49 years old) in Zambia: A cross-sectional study.

By
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DECLARATION

This dissertation is the original work of **Twaambo E Hamoonga.**

It has been produced in accordance with the guidelines for Master of Public Health dissertation for the University of Zambia. It has not been submitted elsewhere for a degree at this or another University.

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CERTIFICATE OF APPROVAL

The University of Zambia approves this dissertation of **Twaambo E Hamoonga** in partial fulfilment of the requirements for the award of the degree of Master of Public Health in Population Studies.

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CERTIFICATE OF COMPLETION

I …………………………………………………......hereby certify that this dissertation is the product of my own work, and in submitting it for the Degree of Master of Public Health in Population Studies programme, further attest that it has not been submitted to any other university in part or whole for the award of any programme.

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I ……………………………………………….having supervised and read this dissertation is satisfied that this is the original work of the author under whose name it is being presented.

I confirm that it has been completed satisfactorily and is ready for presentation to the examiners.

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DEDICATION

This dissertation is dedicated to my family for the continuous support during the course of the programme. It is especially dedicated to my grand-mother who has continually offered spiritual support in prayers during my studies. I further wish to dedicate this dissertation to all the women in the world.

ACKNOWLEDGEMENTS

ABSTRACT

Background: Cervical cancer has been identified as the second most common female malignancy and leading cause of death among women in the world. Despite concerted efforts through the Cervical Cancer Prevention Program in Zambia (CCPPZ), there has been observed low uptake of the service, with 80% of women presenting very late when only palliative care can be given. This study aimed at determining the predictors of abnormal cervical lesions among women (15-49 years old) in Zambia.

Methods: The study was a cross-sectional study. 14,301 women (15-49 years old) from 6 provinces of Zambia were recruited. Secondary data from the CCPPZ was used for the study. SPSS version 21 was used for data analysis. Descriptive statistics using the chi2 test were used to explore proportions of women by their various socio-economic, demographic, medical and obstetric characteristics. Univariate logistic regression analysis was used to explore associations between the outcome variable (cervical lesions) and various predisposing factors. Finally, multiple logistic regression analysis was used to control for confounding, and thereby determine the predictors of abnormal cervical lesions in the final model.

Results: The prevalence of abnormal cervical lesions was 10.7% (n=14,301). The predictors of abnormal cervical lesions were; education [AOR 0.684; 95% CI 0.505, 0.925; p=0.014] where women with tertiary education had a reduced risk compared to those with no formal education, marital status (married vs. never married) [AOR 0.776; 95%CI 0.624, 0.964; p= 0.022]. Other predictors were cigarette smoking (yes vs. no) [AOR 1.657; 95% CI 1.182, 2.322; p=0.003], condom use [0.652; 95% CI 0.434, 0.979; p=0.039] where women who always used a condom had a reduced risk compared to women who never used one, and HIV (positive vs. negative) [AOR 1.969; 95% CI 1.681, 2.305; p<0.001].

Conclusion: One in every ten women who screened for cervical cancer had abnormal cervical lesions. Education, marital status, smoking, condom use with regular partner and HIV status were significantly associated with having abnormal cervical lesions. There is, therefore, need for concerted efforts to design cervical cancer awareness programs targeting the high risk populations, including lobbying for a policy to make cervical cancer screening mandatory and routine for early detection and prevention of the development of cervical cancer.

LIST OF ACRONYMS

AIDS	Acquired Immune Deficiency Syndrome
ANC	Antenatal Care
AOR	Adjusted Odds Ratio
CI	Confidence Interval
CIDRZ	Adult Centre for Infectious Disease Research in Zambia
CSO	Central Statistics Office
ERES	Excellency in Research Ethics and Science
HIV	Human Immunodeficiency Virus
HPV	Human papillomavirus
HSV-2	Herpes Simplex Virus type 2
MOH	Ministry of Health
OR	Odds Ratio
VIA	Visual inspection with acetic-acid
WHO	World Health Organization
ZDHS	Zambia Demographic and Health Survey

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CHAPTER ONE: INTRODUCTION

1.0 BACKGROUND

Reproductive health, as defined by the International Conference on Population and Development (ICPD) is not just the absence of disease. It refers to a spectrum of conditions, events and processes that occur throughout one's life, ranging from healthy sexual development, physical comfort and closeness and the joys of safe childbearing, abuse, disease and even death (Ministry of Health, 2008). Reproductive health needs, particularly for women, increase during adolescence and reproductive years, and in later years the general health continues to reflect earlier reproductive life events, with other health issues such as cancers becoming more prominent (ibid).

Non-communicable diseases, and especially cancers, are recognized as an increasing problem globally, and especially for low and middle income countries (Parkin D. et al., 2014). About 715,000 new cancer cases and 542,000 cancer deaths occurred in 2008 on the African continent, with these numbers expected to double in the next 20 years simply because of the aging and growth of the population (Jemal, A., et al., 2012).

Cancer is a deadly disease which begins in cells, and arises from the build-up of extra cells that often form a mass of tissue also known as malignant growths or tumors, which in most cases are more harmful than benign ones. Cervical cancer (CC), on the other hand refers to the disease that arises from malignant tumors that start in the cervix, specifically from the squamous cells (Magnussgu, 1999). If these abnormal cells are not found early and treated, pre-cancers and later cervical cancer can develop (Roden, 1997).

1.1. EPIDEMIOLOGY:

1.1.1. CERVICAL CANCER: A GLOBAL PERSPECTIVE

Cervical cancer is the second most common female malignancy in the world (Ferlay, 2004). Worldwide, approximately 493,000 new cases of CC are diagnosed annually (Koushik and Franco, 2006). Of the 225,000 annual deaths from CC, 80–85 per cent are in developing countries (Dailard, 2006). In one study, more than 80% of these cases occur among women who reside in resource-constrained nations (Adanu, 2002 and Kleine et al, 2004), reflecting limited

access to health care and preventive technologies. In a study conducted in Chennai (former Madras), by Shanta et al (2000), the truncated rate (TR) in the age group 35-64 years in Chennai, India, is even higher (99.1/100,000; 1982-95) than the rate reported from Cali, Colombia (77.4/100,000, 1987-91). The cervical cancer burden in India alone is estimated at 100,000 in 2001.

1.1.2. CERVICAL CANCER: A REGIONAL PERSPECTIVE

In sub-Saharan Africa, and indeed Africa as a whole, cervical cancer affects women in the prime of their lives causing premature and needless suffering and death in a critically important segment of the world's population, despite being one of the few cancers that can be prevented with simple testing. According to Jemal A., et al., (2010), cervical cancer is the second most frequently diagnosed cancer (80,400) and the leading cause of cancer deaths (50,300) in African women. According to estimates of the incidence and mortality of cancer in Africa in 2012, derived from "GLOBOCAN 2012," there were 847,000 new cancer cases (6% of the world total) and 591,000 deaths (7.2% of the world total) in the 54 countries of Africa in 2012, with about three quarters in the 47 countries of Sub-Saharan Africa (Parkin et al. 2014).

Cervical cancer rates vary substantially across regions, with the incidence and death rates in East Africa and West Africa 5 times as high as the rates in North Africa. .According to Ferlay (2004), approximately 20% of the annual deaths caused by cervical cancer occur among women who live in sub-Saharan Africa. In Eastern Africa, about 33.6% of women in the general population are estimated to harbour the cervical human papillomavirus (HPV) infection at a given point in time (ibid).The 2013 consensus paper on the recommendations for the prevention of cervical cancer in sub-Saharan Africa also alludes to this assertion. The paper posits that more than 200 million females older than 15 years are at risk in this region. Notably, some countries in East Africa, including Zambia, Malawi, Mozambique, and Tanzania have among the highest cervical cancer rates (50 cases per 100,000) worldwide (Parkin et al. 2014).

While the cancer profiles often differ markedly between regions, the most common cancers in men were prostate (16.4% of new cancers), liver (10.7%), and Kaposi sarcoma (6.7%); in women, by far the most important are cancers of the breast (27.6% of all cancers) and cervix uteri (20.4%)(Parkin et al. 2014).

1.1.3. CERVICAL CANCER: THE ZAMBIAN CASE

In Zambia, like many other sub-Saharan countries, cervical cancer is the most common malignancy and the leading cause of cancer-related deaths among women. For many years now, cervical cancer has continued to claim the lives of many women in Zambia with 80% of cases being advanced at presentation, when only palliative treatment can be given (Parham et al., 2006). To date, there are only 150,000 women who have ever screened for cervical cancer (CIDRZ, 2013), out of 6,638,019 females in Zambia (CSO, 2012).Current estimates indicate that every year 1,839 women are diagnosed with cervical cancer and 1276 die from the disease. According to Mwanahamuntu et al (2007), the new standardized cervical cancer incidence rate is above 55 per 100,000 whereas the standardized mortality from cancer of the cervix stands at 41 per 100,000 making Zambia's cancer burden only second in Africa after Guinea and 6th in the world (ibid).

1.2. MEASURES PUT IN PLACE TO ADDRESS THE SCOURGE

1.2.1. SCREENING FOR CERVICAL CANCER

Screening for cervical lesions has proven successful in the industrialized world, with incidences of cervical cancer reduced by 80% in countries with organized screening and treatment programs. The success of these programs can largely be attributed to the use of the Papanicolaou (pap) smear, a test described by Papanicolaou and Traut in 1941, and also DNA-PCR testing for human papillomavirus (HPV). These have been proven to effectively reduce the incidence of cervical cancer by 75-90% (Sankaranarayanan and Boffetta, 2010). On the contrary, effective cytological screening programs are difficult to implement in low resource settings because of high cost, training requirements for laboratory technicians, and competing health priorities. Nevertheless, numerous demonstration projects have proven the efficacy of simplified "screen and treat" approaches (such as visual inspection with acetic acid (VIA) and immediate cryotherapy) for cervical cancer prevention in low income countries (Mwanahamuntu et al. 2011).

In a study to assess the effectiveness of VIA, fifteen journal articles published between 1982 and 2002 were reviewed. When reported, sensitivity ranged between 66% and 96% and specificity between 64% and 98%for VIA (Gaffikin et al. 2003). Another study reported an 80% sensitivity

(range, 79%–82%) and a 92% specificity (range, 91%–92%) for VIA (Sauvaget et al. 2011).Authors comparing VIA with cytology noted that the overall usefulness of VIA compares favourably with that of the Pap test. This method is used especially in resource poor countries as it is less costly as compared to the Pap smear test (Mwanahamuntu M et al., Hicks LM, Parham GP, 2008).

Findings from a study by Moscicki (2001) suggest that the risk of developing squamous intraepithelial lesions of the cervix in young females is only present within the first 3 years after detection of HPV deoxyribonucleic acid (DNA). As a result, regular screening of sexually active women would undoubtedly confer an overall public health benefit by reducing morbidity and mortality from this disease and so should be encouraged.

In Zambia, which has the world's second highest annual cervical cancer incidence and mortality rates, a unique partnership for providing cervical cancer prevention services within the public sector health care system was initiated. The Ministry of Health and partners have designed a number of interventions in an attempt to reduce morbidity and mortality from cervical cancer, including the launch of the "Cervical Cancer Prevention Program in Zambia (CCPPZ). This program advocates for a comprehensive cancer control mechanism which should include: Primary cervical cancer prevention (vaccination and life style change advocacy); Secondary prevention (to make available affordable universal cervical cancer screening) and; Improvement on the management of cervical cancer.

Since the inception of the program in 2006 to date, there have been nurse-led screening and treatment services in 26 government-operated clinics in all provinces in Zambia, using visual inspection with dilute (5%) acetic acid (VIA) screening linked to immediate cryotherapy (see and treat) (Sahasrabudhe et al., 2006). The Cervical Cancer Prevention Program in Zambia (CCPPZ), launched in 2006 and initially targeting the highest risk HIV-infected women, has cumulatively provided services to over 58,000 women (regardless of HIV status) over the past 5 years (Mwanahamuntu et al., 2011).

Screening for cervical lesions can give either a positive result (presence of abnormal lesions) or a negative one (absence of abnormal lesions). If the testing determines that there's the presence of a precancerous cervical lesion, there are treatments that can help reduce the chances that the

lesion will develop into cervical cancer. Treatment options for a precancerous cervical lesion include:

- Loop electrosurgical excision procedure (LEEP): A thin, electrically charged wire is used to remove abnormal lesions from your cervix.
- Freezing (cryotherapy): Some precancerous cervical lesions can be destroyed by freezing them with a cold probe; this causes them to eventually shed from the cervix.
- Laser treatment: The precancerous cervical lesion is destroyed with a beam of laser light.
- Conization: A small, cone-shaped piece of tissue containing the abnormal area of the cervix is removed surgically.

1.2.2. HPV VACCINE

A quadrivalent HPV vaccine to prevent HPV-6, HPV-11, HPV-16, and HPV-18 was licensed for use in the US in June 2006 and an application for Food and Drug Administration licensure was submitted for a bivalent HPV vaccine to prevent HPV-16 and HPV-18 in March 2007. Currently in the US, the quadrivalent HPV vaccine is recommended for routine immunization of girls aged 11 and 12 years, and catch-up immunization is recommended through age 26 years (Dunne e al. 2008). The quadrivalent HPV vaccine, which is active against HPV types 6, 11, 16, and 18, is efficacious in preventing persistent infection and genital disease caused by these HPV types in females (Giuliano et al. 2011). The vaccine has also been used among school going children in Zambia.

Gardasil and Cervarix are non-infectious, recombinant vaccines, which stimulate an immune response but cannot cause HPV because they are made with proteins that contain only part of the virus (Wheeler, 2007). Both target HPV-16 and HPV-18, which together account for about 70 per cent of cervical cancers. One study found that Gardasil was 99 per cent effective in preventing cervical cancer and pre-cancerous lesions in women who had never had (vaginal) sex but only 44 per cent effective in sexually-experienced women, who potentially had been exposed to HPV (Ault et al. 2007).

1.3. BIOLOGY:

1.3.1. ANATOMY AND VIROLOGY

Cervical cancer has been recognized as a rare outcome of a common Sexually Transmitted Infection (STI). In the vast majority of cases, the primary cause of cervical cancer is a persistent infection with an oncogenic human papillomavirus (HPV), a sexually transmitted virus that develops into invasive cancer over a 10-20 year period of time (CIDRZ, 2008). While most HPV strains are relatively harmless, some increase a woman's risk of developing cervical cancer. Over 100 types of HPV have been identified to date, 30 of them transmissible via sex, making HPV the most common STI in the world. Yet, while some HPV types develop into cervical cancer, many do not (Lowy and Schiller, 2006).

Epidemiologic studies have equally shown that the association of genital HPV with cervical cancer is strong, independent of other risk factors, and consistent in several countries. In one study, more than 1000 specimens from sequential patients with invasive cervical cancer were collected and stored frozen at 32 hospitals in 22 countries. Polymerase chain reaction-based (PCR) assays capable of detecting more than 25 different HPV types was used. In this study, HPV deoxyribonucleic acid (DNA) was detected in 93% of the tumors, with no significant variation in HPV positivity among countries. HPV 16 was present in 50% of the specimens, HPV 18 in 14%, HPV 45 in 8%, and HPV 31 in 5%. HPV 16 was the predominant type in all countries except Indonesia, where HPV 18 was more common. Wiley and Masongsong (2006) agree with the findings in their assertion that the majority of HPV-associated disease is caused by four (4) HPV types: HPV 6 and 11 which are responsible for low-grade genital lesions and more than 90% of genital warts, and HPV 16 and 18 both of which account for approximately 70% of all high-grade cervical intraepithelial neoplasia (CIN) or dysplasia and invasive cervical cancer (ICC) (ibid). These results confirm the role of genital HPVs, which are transmitted sexually, as the central etiologic factor in cervical cancer worldwide (Bosch F, Manos M, Munoz N, Sherman M et al, 1995).

Clinical manifestations of HPV infection include genital warts, CIN, and ICC, all of which cause significant morbidity and, in the case of cervical cancer, mortality (Wiley and Masongsong (2006). With respect to reducing mortality, advances in cancer treatment have not been as

effective as those for other chronic diseases (Danaei et al., 2005). Therefore, reduction of exposure to key behavioural and environmental risk factors would prevent a substantial proportion of deaths from cancer.

1.4 PREDICTORS OF HAVING ABNORMAL LESIONS OF THE CERVIX

Given that the major mode of transmission of genital HPV is sexual, certain patterns of sexual behaviour (early age at first sexual intercourse, number of sexual partners and sexual behaviour of the partner) are associated with an increased risk of HPV genital acquisition. Almonte et al., (2008) note that although HPV infection is necessary for carcinogenesis, certain co-factors (high parity, long term use of oral contraceptives, smoking and co-infection with the human immunodeficiency virus (HIV)) help in the progression from infection to cancer.

The etiologic association and possible predictors of having abnormal cervical lesions have been extensively studied worldwide, across different ethnic and professional groups. A large number of studies have shown a relationship between sexual activity indicators and invasive cervical cancer (ICC) risk, which is expected since the necessary cause of the disease, HPV, is sexually transmitted (Brinton et al, 1987). Generally, the factors are: Sexual and reproductive factors, socio-economic factors (education and income), viruses e.g., herpes simplex virus type 2 (HSV-2), human papillomavirus (HPV), human immunodeficiency virus (HIV) in cervical carcinogenesis and other factors like smoking.

1.4.1. Education and Marital Status

Studies have shown an association between education and abnormal cervical lesions. One such case is that of a study involving 3,241 women who were screened between October 3 2007 and October 22, 2010 from 3 clinics in Kisumu Kenya. According to findings, women who had attained some college/tertiary education had a reduced risk (OR 0.97, CI 0.57, 1.67, p= 0.838) though relationship not statistically significant (Huchko J.M. et al, 2014). Also in a study by Srivastava S et al. (2014), investigations revealed that the low socio-economic status of women was significantly associated with the risk of cervical cancer (OR=3.3, p<0.001). In another study, participants with only high school degree were at a 30% increased risk of HPV infection compared to college-educated women (Devarakonda S. et al., 2014). From the same study by

Devarakonda S. et al. (2014), never married (OR=1.89) or divorced or separated (OR=2.4) women had an increased risk of being infected with HPV compared to women who are married.

1.4.2. Parity

Studies have identified an association between number of births and having abnormal lesions of the cervix. In a study by (Brinton et al, 1987), women with multiple births were at significantly elevated risks of having abnormal cervical lesions than their counterparts, even after adjustment for sexual parameters. Women who reported 7 or more births had a six-fold higher risk than those with 1 or 2 births (ibid). Having had 5 or more births was also found to be a risk factor by Shanta et al (2000). In another study, the influence of parity in a pooled analysis of 10 case-control studies coordinated by IARC (Duttagupta et al, 2002), women who had had 5–6 or 7 or more full-term pregnancies showed, compared to nulliparous women, a risk of 8.3 and 5.0, respectively. A similar, although apparently weaker, association with parity was reported in developed countries (Parazzini, 1989 and Rotkin, 1967) where a smaller parity range can be studied.

1.4.3. Multiple Sexual Partners

The effect of having multiple sexual partners on cervical lesions has been investigated, and there has been established a relationship between the two variables. The International Collaboration of Epidemiological Studies of Cervical Cancer (ICESCC) in 2009, combined data on lifetime number of sexual partners and age at first sexual intercourse from 21 studies, or groups of studies, including 10,773 women with invasive cervical carcinoma, 4,688 women with cervical intraepithelial neoplasia grade 3 (CIN3)/carcinoma in situ, and 29,164 women without cervical carcinoma. Relative risks for invasive cancer and CIN3 were estimated by conditional logistic regression. Risk of invasive cervical carcinoma increased with lifetime number of sexual partners. The relative risk for those who had 6 partners was two-times higher than those with 1 partner, conditioned on age, study, and age at first intercourse. According to Mishicki (2001), risk increased nearly 10-fold for each new partner per month reported.

In a case-control study of 418 women with invasive squamous cell cervical cancer and 704 population controls, an evaluation of risk factors for cervical cancer was done. Consistent with an infectious etiology was a pronounced effect of multiple sexual partners, with those reporting 10 or more partners being at a significant threefold excess risk (Brinton et al, 1987). Women who reported having 2 sexual partners in their lifetimes appeared to be at an increased risk of HPV DNA detection, about 4 times higher. In a study by Sukvirah (2003), no HPV infection was detected among 14 women who reported being virgins. These findings seem to suggest an association between number of sexual partners and having abnormal cervical lesions. HPV infection is 3.7 times more likely for women who have had >11 partners as compared to women with 0-1 partners (Devarakonda S et al., 2014).

1.4.4. Age at Sexual Debut

It has been argued that early exposure to sexual intercourse may be a risk factor for developing abnormal lesions of the cervix. The prevalence of HPV is highest in populations in their late teens and early twenties, with nearly half of all new HPV infections occurring within 3 years of first intercourse (CIDRZ, 2008). According to Wiley and Masongsong (2006), HPV infection is highly prevalent in sexually active adolescents and young adults. Sexual activity is the most important risk factor for infection, with 64% to 82% of sexually active adolescent girls testing positive for HPV. Data analyzed by the International Collaboration of Epidemiological Studies of Cervical Cancer in 2009 equally noted that the risk of invasive cervical carcinoma increased with earlier age at first intercourse. The relative risk for age at first intercourse for adolescents aged 14 years was 4 times higher than among women aged 25 years, conditioned on age, study, and lifetime number of sexual partners.

A pooled analysis of case–control studies on ICC from eight developing countries with 1864 cases and 1719 controls investigated the roles of age at first sexual intercourse (AFSI), age at first pregnancy (AFP), and ICC risk. The ICC risk was 2.4-fold among those who reported AFSI and AFP at ≤16 years compared with those with AFSI and AFP at ≥21 years, thereby confirming AFSI and AFB as risk factors for ICC in eight developing countries (Louie et al. 2009). This was also the case in a study by Brinton et al (1987) where early first intercourse was associated with some residual effect on risk, which was two-fold for age at first intercourse <15 years compared

to those aged ≥ 21 years. However, there was no explanation that was readily apparent for the relationship between the two variables.

1.4.5. History of Sexually Transmitted Infections

Women who have suffered from sexually transmitted infections (STIs) are at a higher risk of ICC compared to their counterparts. In a study by Sukvirach et al (2003), HPV DNA was significantly associated with a reported history of STIs, with those who had HSV- 2 seropositivity having a two-fold higher risk. Daling (1996) argues that it is well known that primary and secondary HSV infections result in breaks of the cervical mucosal barrier through inflammation and ulceration, thereby granting easy access to the basal epithelial cells for viruses such as HPV. This could probably explain the observed association between STIs and having abnormal lesions of the cervix. Brinton et al (1987) observed that a five-fold ICC risk emerged for a husband's history of syphilis; fourteen-fold gonorrhoea; ten-fold for genital warts; and herpes genitalis.

According to CIDRZ (2008), women with HIV/AIDS are at much higher risk of developing cervical neoplasia than their HIV-negative counterparts because of weakened immune systems which make it difficult for them to clear the HPV virus. HIV and cervical cancer are intersecting epidemics in sub-Saharan Africa, where three quarters of the world's HIV infected women live and cervical cancer is the second most common cause of cancer-related death in women (Huchko J. et al, 2014, UNAIDS report on the global AIDS epidemic, 2010). De Vuyst H et al (2008) also argues that HIV infection increases a woman's risk of human papillomavirus (HPV) infection as well as persistence and development of HPV related precancerous and cancerous lesions. According to Denny L et al. (2008), these risks increase as HIV related immuno-suppression worsens.

1.4.6. Current Use of Oral Contraceptives and Smoking Cigarette

Prolonged use of oral contraceptives has been associated with development of squamous intraepithelial lesions in several studies (Irwin et al, 1988 and Clarke, 1985). Miscicki et al (2001) also found that daily cigarette smoking had a deleterious effect, which contributed to the development of lesions of the cervix. The mechanism for observation has not yet been fully explored and understood. However, several epidemiologic studies have found a role for cigarette

smoking in invasive cervical cancer after finding nicotine and other cigarette metabolites in the cervical mucus (Winkelstein et al, 1984).

1.4.7. Poverty and Sexual Behaviour of Woman's Husband

Other than HPV, indicators of poverty and the sexual behaviour of a woman's husband seemed to be the most important risk factors for cervical carcinoma in a study conducted in India. An excess of cervical cancer among low socioeconomic class women is one of the earliest and most consistent findings of epidemiologic studies of this tumour (Shanta et al., 2000). According to Sukrach et al (2003), HPV DNA detection was also higher among women who reported that their husband had other sexual partners (19%) or contact with prostitutes (16%).

CHAPTER TWO: RESEARCH FOCUS

2.1. STATEMENT OF THE PROBLEM

In Zambia, like many other sub-Saharan countries, cervical cancer has continued to claim the lives of many women with 80% of cases being advanced at presentation, when only palliative treatment can be given. In responding to this, the Ministry of Health and partners in 2006 launched the "Cervical Cancer Prevention Program in Zambia (CCPPZ), which advocates for a comprehensive cancer control mechanism which should include: Primary cervical cancer prevention (vaccination and life style change advocacy); Secondary prevention (to make available affordable universal cervical cancer screening) and; Improvement on the management of cervical cancer.

Since the inception of the program to date, there has been nurse-led screening and treatment services in 26 government-operated clinics in all provinces in Zambia, using visual inspection with dilute (5%) acetic acid (VIA) screening linked to immediate cryotherapy (see and treat). Despite interventions by the Ministry of Health and partners to address the problem of cervical cancer through the provision of screening services, current estimates still indicate that every year about 1839 women are diagnosed with cervical cancer and 1276 die from the disease. The new standardized cervical cancer incidence rate is above 55 per 100,000 whereas the standardized mortality from cancer of the cervix stands at 41 per 100,000 making Zambia's cancer burden only second in Africa after Guinea and 6th in the world.

The lack of adequate understanding of the predictors of abnormal lesions among women poses a huge challenge in addressing the scourge. As such, primary prevention through lifestyle and environmental interventions might offer the best option for reducing the large and increasing burden of cervical cancer in Zambia. Policies and programmes to implement such interventions depend on reliable and comparable analyses of the effect of various predictors of abnormal cervical lesions at national level.

2.2. RATIONALE

Cervical cancer has continued to claim lives of many women in Zambia and yet not much is known about the predictors of having abnormal cervical lesions. The continued increase in the rate of HPV infection and incidence of cervical cancer entails that improvement in screening

services is not by itself sufficient to result in reduced incidence of the disease. There is need to understand the various socio-economic, socio-cultural and demographic predictors of abnormal cervical lesions among women, paying particular attention to specific population sub-groups in Zambia. Moreover, most of the studies in the area of cervical cancer in Zambia have been conducted on women who are HIV positive. However, it is of great importance to note that cervical cancer doesn't only affect women with HIV and AIDS. In this light, therefore, this study sought to determine the predictors of having abnormal cervical lesions in the general population of women in Zambia, regardless of their HIV status. This is the only way through which information could be gathered so as to strengthen guidance for evidence-based health policy implementation of primary and secondary cervical cancer prevention strategies in the country. The study was conducted with the hope that the findings would add to already existing knowledge on cervical cancer and stimulate further research on the subject matter and thus contribute towards efforts being made towards reducing morbidity and mortality from the disease.

2.3. RESEARCH QUESTION:

What is the prevalence of abnormal cervical lesions among women in Zambia and what predictors could be associated with it?

2.4. GENERAL OBJECTIVE:

To determine the prevalence and investigate possible predictors of abnormal cervical lesions among women aged 15-49 years old in Zambia.

2.5. SPECIFIC OBJECTIVES:

1. To determine the proportion of women who ever had abnormal cervical lesions by province, in Zambia.
2. To investigate socio-economic, demographic and sexual behaviour related predictors of having abnormal cervical lesions among women in Zambia.
3. To investigate if there is an association between abnormal cervical lesions and the HIV status of women in Zambia.

2.6. CONCEPTUAL FRAMEWORK

To help explore the possible predictors of abnormal cervical lesions among women in Zambia, the following conceptual framework was developed after reviewing literature on cervical cancer.

The framework illustrates that having abnormal cervical lesions can be predicted by various factors. From the framework, economic factors such as household income are likely to influence the number of sexual partners that a woman has as a source of income. The more sexual partners one has, the higher their risk of being exposed to STIs such as the human immunodeficiency virus (HIV) and herpes simplex virus-type 2 (HSV-2) which is also sexually transmitted. This also implies that one has a higher probability of getting infected with human papillomavirus especially HPV 16 and 18, both of which are responsible for high grade cervical intraepithelial neoplasia. This study explored the role that the factors identified in the framework play as predictors of abnormal cervical lesions among women in Zambia.
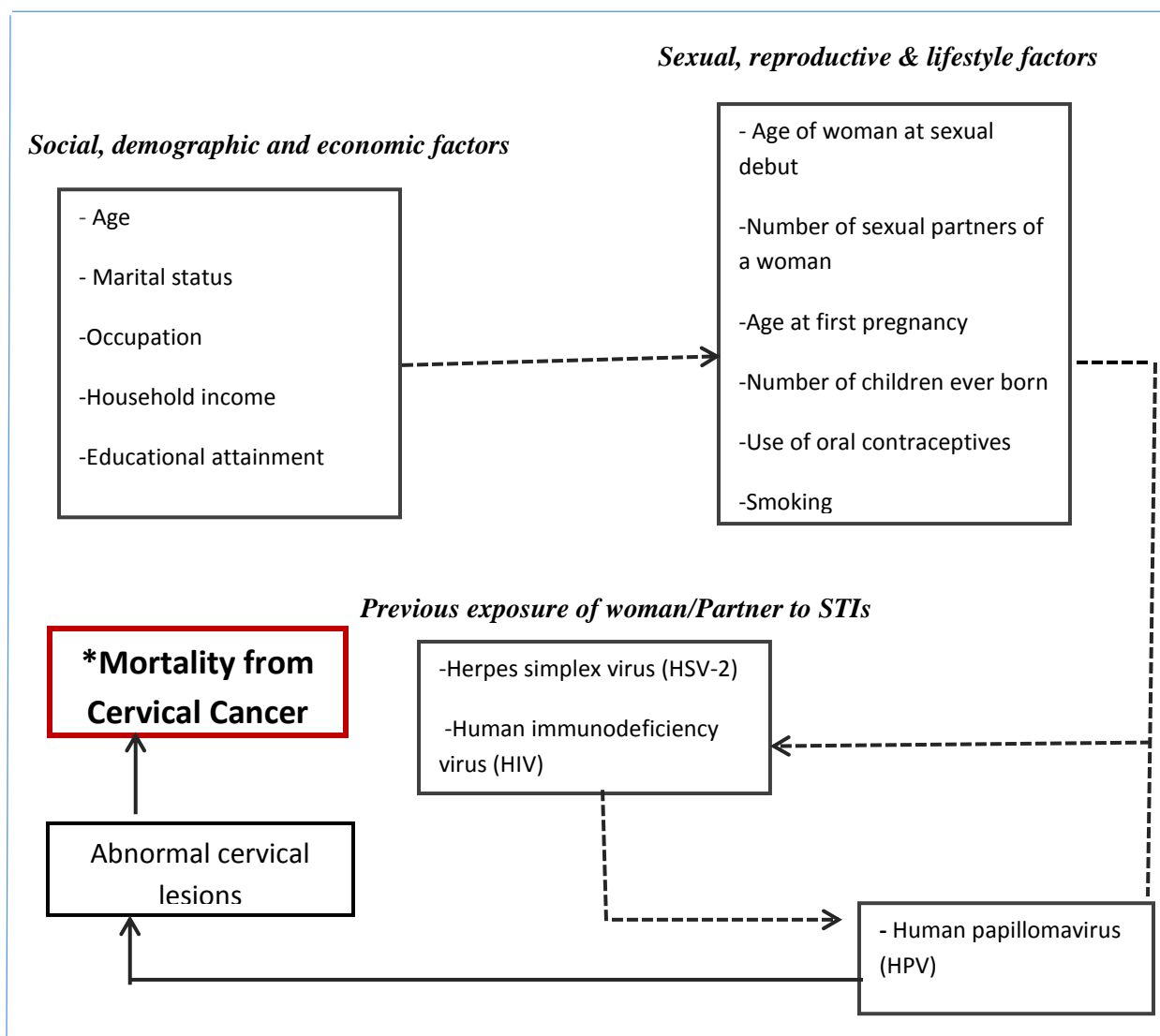

Figure 2.1: Predictors of having abnormal cervical lesions

CHAPTER THREE: RESEARCH METHODOLOGY

This study was embedded within the Cervical Cancer Prevention Program in Zambia (CCPPZ), a programme that has been running since 2006. The programme provides screening services for women wishing to screen for cervical cancer at 26 government health facilities. The 26 government health facilities offering cervical cancer screening services are located in the following districts; Lusaka (11), Chongwe (1), Kafue (1), Livingstone (2), Monze (1), Mongu (1), Kabwe (1), Ndola (1), Kitwe (1), Chingola (1), Kasama (1), Mansa (1), Chinsali (1), and Solwezi (1). These health facilities offer screening services for cervical cancer to all women in the reproductive age groups.

3.1. THE CCPPZ DESIGN:

The study used secondary data from the CCPPZ, a unique collaboration between Zambian and United States partner institutions from the academic (University Teaching Hospital of Zambia-UTH; University of North Carolina at Chapel Hill), research (Centre for Infectious Disease Research in Zambia-CIDRZ), and governmental (Zambia Ministry of health) sectors. The CCPPZ was designed to increase access to cervical cancer screening in order to reduce the incidence rate of the disease. The program offers cervical cancer screening services to women using visual inspection with dilute (5%) acetic acid (VIA) linked to immediate cryotherapy (see and treat).

The data under the program is collected on a routine basis from all women who go to screen for cervical cancer. All women are asked a series of questions including background information and socio-economic and demographic characteristics before they are screened. The questions asked before screening are on age at last birthday, marital status, occupation, household income and highest level of educational attainment. Information pertaining to medical history is also collected and questions asked under this section relate to age at first sexual intercourse, number of lifetime sexual partners, age at menarche, age at menopause, history of cigarette smoking, and contraception use by method of contraception. Under the obstetric history section, data on age at first pregnancy and number of children ever had is collected. Other information collected is on history of cervical cancer in any family member and HIV status (and CD4 count for those that

are HIV+). After screening, information on outcome of screening for cervical cancer is also recorded on the enrolment sheet. This information is collected for the purposes of research, communication and feedback purposes between care providers and for patient-care quality management. Since the inception of the program in 2006 to date, the dataset consists of 150,000 women who had ever screened for cervical cancer from the 26 government health facilities under CCPPZ.

The information that is obtained under the CCPPZ is from women who screen for cervical cancer. This entails that the dataset consists of all women who had ever screened for cervical cancer at any of the 26 government health facilities offering screening services under the CCPPZ since the program's inception in 2006 to date. Therefore, no sampling technique is employed in enrolling women under the screening program.

3.2. THE CERVICAL LESIONS SURVEY

3.2.1. STUDY SETTING
This study was conducted in Zambia, a land locked sub Saharan country with a mixed economy consisting of a modern urban sector that, geographically, follows the old rail line and a rural agricultural sector. The country is divided into ten provinces and is characterized by a heavy disease burden exacerbated by the high HIV prevalence rate of 14.3 percent and high poverty levels. Zambia is one of the most urbanized countries in Sub-Sahara with 39 percent of its total population living in urban areas (CSO, 2010).

3.2.2. STUDY DESIGN
This was a cross-sectional study, implying that the study was conducted at one point in time to determine both exposure and outcome of variables of interest. The study used secondary data that was extracted from the CCPPZ database. This data pertains to the demographic, socio-economic, medical and obstetric characteristics of the women who had ever screened for cervical cancer since 2006 to date, at any of the 26 government facilities under the CCPPZ. Data for this study was collected from the Adult Centre of Excellence under CIDRZ, situated within the University Teaching Hospital (UTH), the largest hospital and main referral health institution in Zambia.

3.2.3. STUDY POPULATION

The population for the study comprised all women who ever screened for cervical cancer at any of the 26 government health centres providing screening services, during the 12 month period beginning October, 2013 to September, 2014. The data for the women in the study was collected from CIDRZ. The Adult Centre of Excellence was purposively selected as it hosts the database for all the centres offering cervical cancer screening under CCPPZ. This data was representative of the Zambian female population (6,638,019), which is 50.7% of the total population (13,091,666) (CSO, 2012) since the data contained in the database was from various centres across the different provinces of the country. The dataset contained a total of 150,000 women who had ever screened for cervical cancer from any of the 26 government health facilities under the CCPPZ since the inception of the program in 2006 to date. However, only 11,059 records were used for the purpose of this study as this was the number of women that had screened between the dates under consideration.

The variables of interest that were used for analysis were extracted from the enrolment forms that were administered to all women before being screened for cervical cancer.

3.3. SAMPLE SIZE CONSIDERATION:

The population for this study was 11,059 women who had ever screened for cervical cancer at any of the 26 government health facilities offering screening services under the CCPPZ, during the 12 month period from October, 2013 to September, 2014.

3.3.1. Inclusion criteria

All women who had ever screened for cervical cancer at any of the 26 government health facilities under the CCPPZ between October, 2013 and September, 2014. This included both those women who had normal lesions and those who had abnormal lesions of the cervix.

3.3.2. Exclusion criteria

All women whose questionnaires had missing data on outcome of cervical cancer screening.

3.4. DATA MANAGEMENT

3.4.1. DATA EXTRACTION

Data for this study was extracted from the CCPPZ database under CIDRZ. A checklist was used as a tool to ensure that variables of interest were extracted from the database. The dataset constituted all women who had ever screened for cervical cancer under the CCPPZ between October, 2013 and September, 2014. Background characteristics such as age of woman at last

birthday, marital status, occupation, residence (district), educational attainment, and household income were obtained. Data on those who were found with either normal or abnormal lesions of the cervix upon screening for cervical cancer was extracted. Thereafter, statistical methods were employed in order to analyze the data.

3.4.2. DATA ENTRY, STORAGE AND CLEANING

The data from CIDRZ was extracted from the CCPPZ database and entered in SPSS where it was cleaned before being saved as backup for the research. Data cleaning ensured that all incomplete and inconsistent entries were accounted for and excluded from the analysis.

3.4.3. DATA ANALYSIS

The data was analyzed using SPSS version 21. Both descriptive and analytical statistical methods were used for analysis. Univariate analysis was used to determine associations between the various demographic, socio-economic variables and the presence of abnormal cervical lesions. The variables that exhibited a statistically significant association with presence of abnormal cervical lesions were fitted into the multivariate logistic regression model. Multivariate logistic regression analysis was used to determine significant predictors of abnormal cervical lesions and quantify the relationship between abnormal cervical lesions and the independent variables. An effort was made to convert all continuous independent variables into categorical variables and then analyzed using the Chi squared test. A p-value less than 0.05 was significant with an associated 95% confidence interval. The factors associated with abnormal cervical lesions were analyzed and compared between districts.

MEASUREMENTS:

For the analysis, the following variables were used.

Dependant variable –Binary

- Presence or absence of abnormal cervical lesions, given by a positive VIA test

Independent vartiables

Social, demographic and economic factorssuch as age of woman at last birthday, hjghest level of educational attainment of woman, marital status of woman,household income and area of residence (district).

Sexual, reproductive & lifestyle factors such as age at sexual debut, number of sexual partners of a woman, age at first pregnancy, number of children ever born and use of oral contraceptives.

Exposure status of woman to STIs such as HIV, HPV and HSV-2

3.5. ETHICAL CONSIDERATIONS

This study used secondary data and therefore there was no contact with study participants. This implies that the study had minimal to no risk at all to study participants. The study had no direct benefits for individual study participants, but it is hoped that the information gathered will benefit the nation as a whole through implementation of problem-specific interventions towards reducing cervical cancer related mortality. Permission to use the CCPPZ dataset was sought from the Director-CIDRZ, and approval to conduct the research was obtained from the University of Zambia, School of Medicine. The CCPPZ is a service provision programme that is being implemented by CIDRZ together with the Ministry of Health, therefore, a waiver of consent was sought from the Research Ethics Committee (ERES Converge).

3.6. PROJECT MANAGEMENT

This study was carried out within a period of fourteen months, beginning with proposal development to data collection, analysis, report-writing and dissemination of findings to relevant stakeholders (see annex i). In order to successfully complete this study, financial resources were required for procurement of some materials. Some of the things procured included a laptop, printer, toner, external hard-drive, A4 plain papers, pens, pencils, software for analysis and finances to meet other administrative costs. Financial resources amounting to K10, 750.00 were required in order to successfully carry out this study (see annex ii). This study was self-funded. No research assistants were used for this study as data was already available.

CHAPTER FOUR: RESULTS

Data used in the study represents women who screened for cervical cancer from Choma General Hospital, Ndeke Clinic, Kasama General Hospital, Kitwe Central Hospital, Livingstone General Hospital, Mansa General Hospital, Mosi-oa-tunya Clinic, Ndola Central Hospital, Solwezi General Hospital, and St. Francis' Hospital, representing a total of 10 screening facilities and 6 out of the 10 provinces of Zambia. Women in the study were aged 15 to 49 years, that is, women in the reproductive age groups (18.5% aged 15-24, 38.2% aged 25-34 and 43.3% aged 35-49). From a total of 14,301 participants whose VIA test results were known, 12,777 (89.3%) tested negative while 1,524 (10.7%) women tested positive for abnormal cervical lesions. The highest proportion of women testing positive for abnormal cervical lesions were from Mansa (20.5%), followed by Ndola (19.9%), Kitwe (15.4%), Solwezi (11.7), St. Francis' (11.6), Livingstone (8.9%), Kasama (4.9), Mosi-oa-tunya (4.0%), Choma (2.6%) and finally Ndeke (0.6%). A total of 2,476 (22.3%) women were HIV positive while 8,649 (77.7%) were HIV negative.

Table 4.1 below depicts the descriptive statistics for the study population, disaggregated by whether women tested positive or negative for abnormal cervical lesions using the Visual Inspection with Acetic acid (VIA) test, represented by VIA positive and VIA negative, respectively. Included in the table are descriptive statistics for all the variables included in the study.

Table 4.1: Socio-demographic, Medical and Obstetric Characteristics of the Study Population

Variable	VIA Positive n (%)	VIA Negative n (%)	P- value (Chi^2)
Age (N= 11,557; Mean 33.05; Med 33.00; Std. Dev. 8.265)			
15-24	205 (16.5)	1927 (18.7)	0.09
25-34	467 (37.7)	3954 (38.3)	
35-49	568 (45.8)	4436 (43.0)	
Screening centre (N= 16,466)			
Choma General Hospital	40 (2.6)	608 (4.8)	<0.001
Ndeke Clinic	9 (0.6)	6 (0.0)	
Kasama General Hospital	74 (4.9)	1785 (14.0)	
Kitwe Central Hospital	234 (15.4)	1059 (8.3)	
Livingstone General Hospital	135 (8.9)	2138 (16.7)	
Mansa General Hospital	312 (20.5)	951 (7.4)	
Mosi-o-tunya Clinic	61 (4.0)	543 (4.2)	

Ndola Central Hospital	303 (19.9)	1658 (13.0)
Solwezi General Hospital	179 (11.7)	2400 (18.8)
St Francis' Hospital	177 (11.6)	1629 (12.7)
Education (N= 15,939)		
No formal Education	146 (9.8)	986 (8.0)	<0.001
Primary education	574 (38.7)	4510 (36.5)
Secondary Education	548 (36.9)	4532 (36.7)
Tertiary Education	217 (14.6)	2337 (18.9)
Income (N= 10,558)		
Less than K500	107 (10.5)	871 (11.4)	<0.001
K500-K999	112 (11.0)	498 (6.5)
K1,000-K5,000	179 (17.5)	1117 (14.6)
Above K5,000	621 (60.9)	5161 (67.5)
Marital status (N= 15,945)		
Never Married	186 (12.5)	1567 (12.7)	<0.001
Married	943 (63.4)	8803 (71.1)
Separated/divorced/widowed	358 (24.1)	2008 (16.2)
Age at sexual debut (N= 15,474)		
10-19 years	1142 (78.6)	9092 (76.1)	0.03
20 years and above	311 (21.4)	2859 (23.9)
Age at first pregnancy (N= 14,035)		
10-19 years	838 (61.3)	6355 (58.8)	0.08
20 years and above	528 (38.7)	4445 (41.2)
Ever used oral contraceptives		
Yes	389 (99.2)	3104 (98.7)	0.39
No	3 (0.8)	40 (1.3)
Years on oral contraceptives (N= 3,336)		
One year	104 (29.5)	799 (29.8)	0.93
More than one year	248 (70.5)	1884 (70.2)
Ever smoked cigarette (N= 13,357)		
Yes	62 (4.3)	281 (2.4)	<0.001
No	1373 (95.7)	11641 (97.6)
Years of smoking cigarette (N= 257)		
One year	26 (56.5)	141 (66.8)	0.18
More than one year	20 (43.5)	70 (33.2)

Sexual life partners (N= 13,660; Mean 2.67; Med 2.00; St. Dev. 2.711)

Condom use with regular partner (N= 13,686)

Never used a condom	776 (58.4)	6239 (59.7)	0.06
Used a condom sometimes	467 (35.1)	3629 (34.7)	
Used a condom almost all the time	48 (3.6)	253 (2.4)	
Always used a condom	38 (2.9)	329 (3.1)	

History of cervical cancer in the family   (N= 13,368)

Yes	39 (2.7)	293 (2.5)	0.58
No	1406 (97.3)	11630 (97.5)	

HIV Status (N= 14,232)

Positive	411 (35.1)	2065 (20.7)	<0.001
Negative	760 (64.9)	7889 (79.3)	

4.1. SOCIO-DEMOGRAPHIC CHARACTERISTICS

From table 1 above, statistics obtained from cross tabulations between the VIA test and the various socio-demographic, medical and obstetric characteristics of the study population revealed that among the elderly women, a high proportion tested positive for abnormal cervical lesions as compared to the other age groups. Among women who had attained tertiary education, there were proportionately few that tested positive for abnormal cervical lesions, compared to the other categories. There were more women testing positive for abnormal cervical lesions among those earning an income between K500 and K5000. The opposite was with women earning less than K500 and those earning an income greater than K5000. Among the never married and the married women, more tested negative for abnormal cervical lesions while there were more positives than negatives among the separated, widowed and the divorced.

4.2. MEDICAL AND OBSTETRIC CHARACTERISTICS

Women were asked to provide information on their medical and obstetric history. From findings, it was observed that among women who were HIV positive, more of them tested positive for abnormal cervical lesions as compared to those who tested negative, 35.1% and 20.7%, respectively (p <0.001). A larger proportion of HIV negative women also tested negative for the

VIA test against those that tested positive (79.3% and 64.9%, respectively, p <0.001). There wasn't so much of a difference between women who had a history of cervical cancer in the family and those who didn't (2.7% and 2.5%, respectively, p= 0.58) though the difference is minimal. Among women who had their sexual debut and their first pregnancy in their adolescent years, more of them tested positive for abnormal cervical lesions. Among women who had ever smoked cigarette, more tested positive for abnormal cervical lesions than those who tested negative. A similar observation was made with women who said they had taken oral contraceptives, where more of them tested positive for abnormal cervical lesions than those who had never used oral contraceptives (99.2% and 98.7% respectively, p= 0.39), though there difference was minimal.

Women in the study were asked to state the number of sexual partners they had had during their lifetime. As at September 2014, on average, every woman in the study had had about 2.67, approximately 3 sexual partners in their life time. As regards women who said they had used condoms all the time with their regular sexual partners, fewer of them tested positive for abnormal lesions of the cervix compared to those that tested negative (2.9% and 3.1%, p=0.06).

Figure 4.2.1 below is a graphical representation of women's VIA test results (VIA positive for presence of abnormal cervical lesions and VIA negative for absence of abnormal cervical lesions) classified by name of health facility where the women had their screening for cervical cancer.
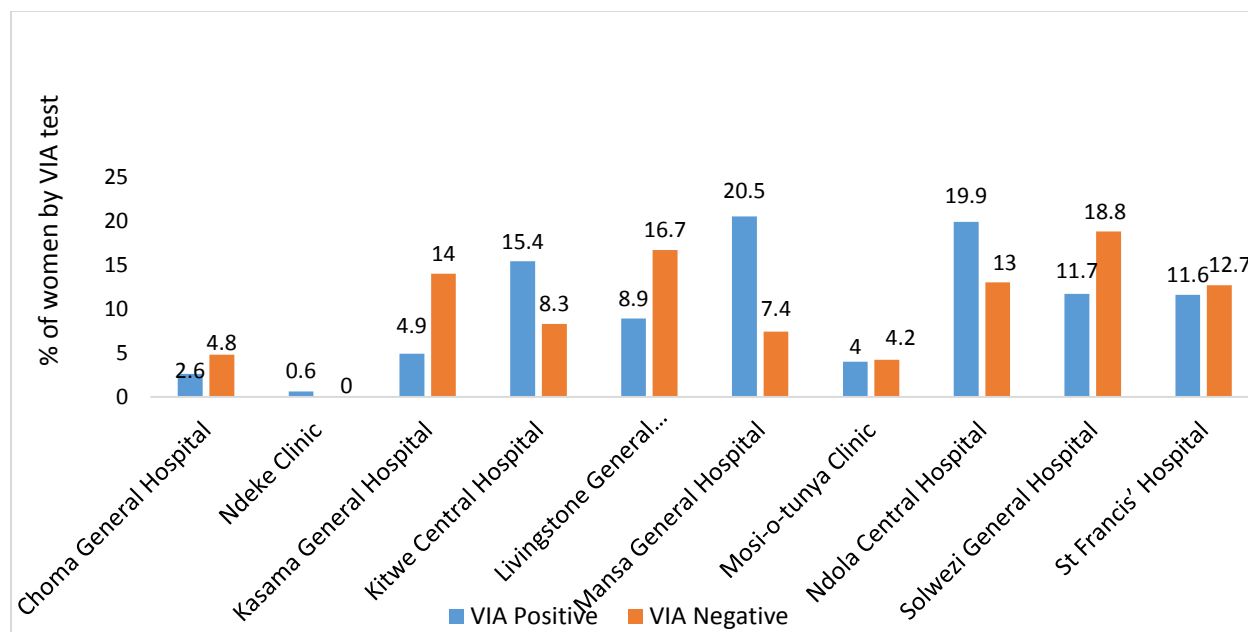
Figure 4.2.1.: Graphical Distribution of Women's VIA Status by Health Facility

From the graph above, Ndeke clinic, Mansa hospital, Ndola hospital and Kitwe hospital had the highest proportions of women testing positive for abnormal cervical lesions than those testing negative. The rest of the health facilities had more women testing negative than those testing positive for the same. However, Ndeke clinic, Mosi-o-tunya clinic and St. Francis hospital showed marginal differences in percentages between women testing positive and negative for abnormal cervical lesions.

4.3. LOGISTIC REGRESSION ANALYSIS

Logistic regression analysis was used to test the statistical significance of relationships observed between testing positive for abnormal cervical lesions and the various predisposing factors assumed to be predictors of abnormal cervical lesions. These factors ranged from socio-demographic factors to medical and obstetric factors. Table 4.3.1 below gives a statistical description of the observed relationships.

Table 4.3.1.: Logistic Regression: Unadjusted and Adjusted Odds Ratios

Variable	Unadjusted OR (95%CI)	P-value	Adjusted OR (95%CI)	P-value

Age

15-24	1.00			
25-34	1.11 (0.93, 1.32)	0.25		
35-49	1.20 (1.02, 1.42)	0.03		

Marital Status

Never Married	1.00		1.00	
Married	0.90 (0.76, 1.06)	0.21	0.70 (0.53, 0.91)	0.01
Separated/divorced/widowed	1.50 (1.24, 1.81)	<0.001	0.90 (0.67, 1.22)	0.51

Educational Attainment

No formal Education	1.00		1.00	
Primary Education	0.86 (0.71, 1.04)	0.13	0.90 (0.68, 1.19)	0.46
Secondary Education	0.82 (0.67, 0.99)	0.04	0.88 (0.66, 1.17)	0.38
Tertiary Education	0.62 (0.50, 0.78)	<0.001	0.71 (0.51, 0.99)	0.04

Household Income

Less than K500	1.00			
K500 – K999	1.83 (1.37, 2.44)	<0.001		
K1,000 – K5,000	1.30 (1.01, 1.68)	0.04		
Above K5,000	0.98 (0.79, 1.22)	0.85		

Ever Smoked Cigarette

No	1.00		1.00	
Yes	1.87 (1.41, 2.48)	< 0.001	1.581 (1.10, 2.28)	0.01

Ever Used Oral contraceptives

No	1.00			
Yes	1.67 (0.51, 5.43)	0.39		

Years on Oral Contraceptives

One year	1.00			
More than one year	1.01 (0.79, 1.29)	0.93		

Age at Sexual Debut (cat)

10-19	1.00		1.00	
20+	0.87 (0.76, 0.99)	0.03	1.17 (0.94, 1.46)	0.17

No. of Sexual Life Partners

	1.02 (1.01, 1.04)	0.01	0.99 (0.97, 1.02)	0.58

Condom use with Regular Partner

Never used a condom	1.00		1.00	
Used a condom sometimes	1.04 (0.92, 1.17)	0.57	1.12 (0.96, 1.32)	0.15
Used a condom almost all the time	1.53 (1.11, 2.10)	0.01	1.28 (0.87, 1.89)	0.21

Always used a condom	0.93 (0.66, 1.31)	0.68	0.66 (0.43, 1.03)	0.07
Age at 1st Pregnancy(cat)				

Age at 1st Pregnancy(cat)

10-19 years	1.00		1.00	
20 years and above	0.90 (0.80, 1.01)	0.08	0.85 (0.70, 1.03)	0.10

Family History of C/Cancer

No	1.00		
Yes	1.10 (0.79, 1.55)	0.58	

HIV

Negative	1.00		1.00	
Positive	2.07 (1.81, 2.35)	< 0.001	1.99 (1.68, 2.35)	<0.001

Screening Health Facility

Choma General Hospital	1.00	
Kasama General Hospital	0.60 (0.42, 0.86)	0.006
Kitwe Central Hospital	13.80 (4.86, 39.24)	<0.001
Livingstone General Hospital	0.38 (0.29, 0.50)	<0.001
Mansa General Hospital	2.03 (1.65, 2.51)	<0.001
Mosi-o-tunya Clinic	0.58 (0.46, 0.73)	<0.001
Ndola Central Hospital	3.02 (2.47, 3.69)	<0.001
Solwezi General Hospital	1.03 (0.76, 1.40)	0.831
St. Francis' Hospital	1.68 (1.38, 2.05)	<0.001
Ndeke Clinic	0.69 (0.55, 0.85)	<0.001

At unadjusted logistic regression analysis, HIV was significantly associated with abnormal cervical lesions (UOR 2.07, CI 1.81, 2.35, p<0.001). This shows that women who were HIV positive were approximately 2 times more likely to have abnormal cervical lesions as compared to women who were HIV negative.

Married women on the other hand had a reduced risk of having abnormal cervical lesions as compared to the never married, although the relationship was not statistically significant. However, there was observed an increased risk (UOR 1.50, 95% CI 1.24, 1.81, p <0.001) of having abnormal cervical lesions among the widowed, separated and divorced as compared to women who had never been married before. Education attainment was also significantly associated with abnormal cervical lesions, with women who had attained secondary and tertiary

education having a reduced risk (UOR 0.82, CI 0.67, 1.00, p-value 0.04 and UOR 0.62, CI 0.50, 0.78, p<0.001, respectively) as compared to women who had no formal education. Having a monthly household income less than K5000.00 was also found to increase the risk of having abnormal cervical lesions (UOR 1.30, CI 1.01, 1.68, p= 0.04, respectively).

Women who had ever smoked cigarette were approximately 2 times more at risk of having abnormal lesions of the cervix compared to those who had never smoked cigarette (UOR 1.87, CI 1.41, 2.48, p<0.001). In like manner, women who had used condoms almost all the time with their regular sexual partners had an increased risk (UOR 1.53, CI 1.11, 2.10, p-value 0.01) compared to those who never used condoms at all. Women who had their sexual debut at 20 years and older had a reduced risk (UOR 0.87, CI 0.76, 0.99, p-value 0.03) of having abnormal cervical lesions compared to women who had their sexual debut in their adolescent years (x ≤19 years old). With regards to sexual partners, an additional increase in number of sexual partners increased the risk of having abnormal lesions of the cervix (UOR 1.02, CI 1.01, 1.04, p-value 0.01). Other variables did not exhibit statistically significant relationships between them and having abnormal cervical lesions. These include variables such as ever used oral contraceptives, years on oral contraceptives, and family history of cervical cancer. Age at pregnancy exhibited a borderline significance (UOR 0.90, CI 0.80, 1.01, p-value 0.08). Women who had their first pregnancy post adolescence had a reduced risk compared to those who had their first pregnancy in their adolescent years.

All variables that showed a statistically significant relationship at multivariate analysis from table 4.3.1 above were selected in order to further observe any changes in their relationship with having abnormal cervical lesions, if put together in one model. Table 4.3.2 below represents the final model depicting the final predictors of having abnormal lesions of the cervix among women in Zambia, according to findings from this study.

Table 4.3.2: Final Model, Predictors of Having Abnormal Lesions of the Cervix among Women in Zambia

Variable	Unadjusted OR (95%CI)	P-value	Adjusted OR (95%CI)	P-value
Marital Status				
Never Married	1.00		1.00	

Married	0.90 (0.76, 1.06)	0.21	0.78 (0.62, 0.96)	0.02
Separated/divorced/widowed	1.50 (1.24, 1.81)	<0.001	1.02 (0.79, 1.32)	0.88
Educational Attainment				
No formal Education	1.00		1.00	
Primary Education	0.86 (0.71, 1.04)	0.12	0.91 (0.70, 1.19)	0.49
Secondary Education	0.82 (0.67, 0.99)	0.04	0.90 (0.69, 1.17)	0.43
Tertiary Education	0.62 (0.60, 0.78)	<0.001	0.68 (0.50, 0.92)	0.01
Ever Smoked Cigarette				
No	1.00		1.00	
Yes	1.87 (1.41, 2.48)	< 0.001	1.66 (1.18, 2.32)	0.003
Condom use with Regular Partner				
Never used a condom	1.00		1.00	
Used a condom sometimes	1.04 (0.92, 1.17)	0.57	1.11 (0.96, 1.30)	0.16
Used a condom almost all the time	1.53 (1.11, 2.10)	0.01	1.27 (0.88, 1.83)	0.20
Always used a condom	0.93 (0.66, 1.31)	0.68	0.65 (0.43, 0.98)	0.04
HIV				
Negative	1.00		1.00	
Positive	2.07 (1.81, 2.35)	< 0.001	1.97 (1.68, 2.30)	<0.001

From table 4.3.2 above, all the variables that were statistically significant at multivariate analysis still continued to exhibit statistically significant relationships with having abnormal cervical lesions, even when put together in one model.

Women who were HIV positive were twice more likely to have abnormal cervical lesions than women who were HIV negative (AOR 1.97, CI 1.68, 2.30, p< 0.001). Women who always used a condom compared to those who never did with their regular sexual partners had a reduced risk (AOR 0.65, CI 0.43, 0.98, p=0.04) of having abnormal cervical lesions. Women who had ever smoked cigarette had an increased risk (approximately 2 fold) of having abnormal cervical lesions compared to those that had never smoked cigarette (AOR 1.66, CI 1.18, 2.32, p=0.003). Women who had attained tertiary education were less likely to have abnormal cervical lesions (AOR 0.68, CI 0.50, 0.92, p=0.01) compared to those who had never attained any formal

education. Women who were married had a reduced risk (AOR 0.78, CI 0.62, 0.96, p=0.022) of having abnormal lesions compared to women who had never been married before.
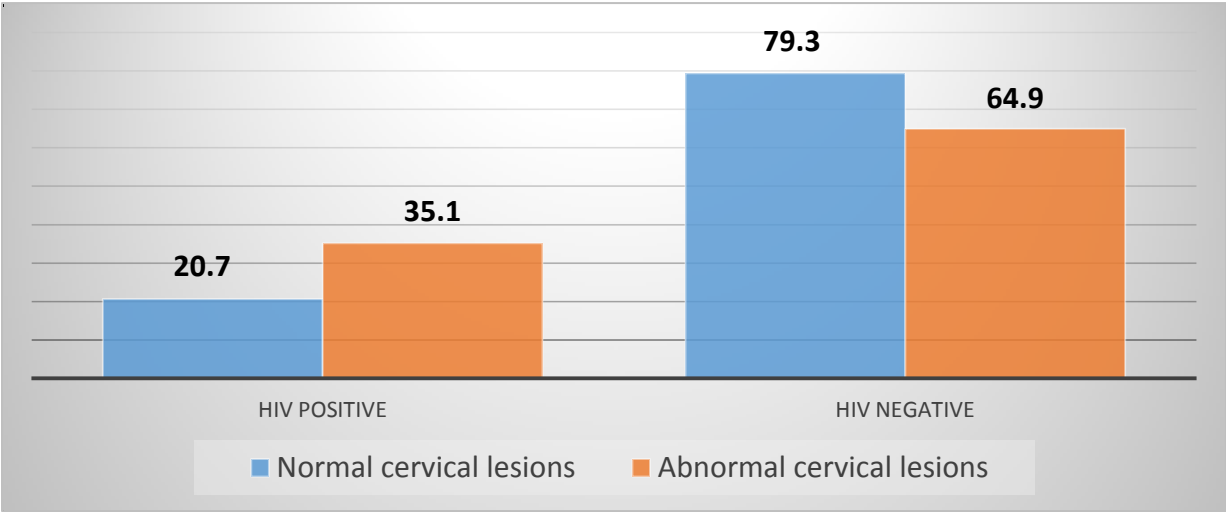

Figure 4.3.1: Distribution of Cervical Lesions by HIV Status

Figure 4.3.1 above is the distribution of cervical lesions by HIV status. It can be observed, from the figure, that among women who were HIV positive, a higher proportion off them tested positive for abnormal cervical lesions (35.1% vs. 20.7%). Among women who were HIV negative, a similar pattern was observed, where a higher proportion also tested negative for abnormal cervical lesions (79.3% vs. 64.9%). These findings imply that women who were HIV positive were more likely to have abnormal cervical lesions while HIV negative women were, in like manner, more likely to test negative for abnormal cervical lesions. This suggests that one's HIV status, is to a greater extent a predictor of abnormal cervical lesions.

CHAPTER FIVE: DISCUSSION OF FINDINGS

This section is a discussion of findings from the study. The prevalence of abnormal cervical lesions in the study areas was at 10%, implying that one in every ten women who screened for cervical cancer had abnormal cervical lesions. Mansa followed and Ndola and Kitwe general hospitals had the highest prevalence of abnormal cervical lesions. A higher proportion of women in the study were HIV negative, however, a higher proportion of women who were HIV positive also tested positive for abnormal cervical lesions. From the findings from this study, five independent variables were found to have a statistically significant association (p-value < 0.05 and 95% CI) with abnormal cervical lesions among women aged between 15 and 49 years old in the study areas. These variables include marital status, highest level of educational attainment, smoking of cigarette, condom use with regular sexual partners and HIV status.

5.1. HIV STATUS

Findings from this study revealed an association between ones HIV status and the risk of having abnormal cervical lesions. Women who were HIV positive were approximately 2 times more likely to have abnormal cervical lesions compared to women who were HIV negative (AOR 1.97, p<0.001, CI 1.68, 2.31). These findings are consistent with findings from CIDRZ (2008), where women with HIV/AIDS were at much higher risk of developing cervical neoplasia than their HIV-negative counterparts because of the weakened immune systems which make it difficult for them to clear the HPV virus. HIV and cervical cancer are intersecting epidemics in sub-Saharan Africa, where three quarters of the world's HIV infected women live and cervical cancer is the second most common cause of cancer-related death in women (Huchko J. et al, 2014, UNAIDS report on the global AIDS epidemic, 2010). De Vuyst H et al (2008) also argues that HIV infection increases a woman's risk of human papillomavirus (HPV) infection as well as persistence and development of HPV related precancerous and cancerous lesions. According to Denny L et al. (2008), these risks increase as HIV related immuno-suppression worsens.

5.2. CONDOM USE WITH REGULAR SEXUAL PARTNER

This study revealed an association between the use of condoms with regular sexual partners and the risk of having abnormal cervical lesions. Women who always used a condom with their sexual partners were less likely to have abnormal cervical lesions compared to women who never used a condom with their regular sexual partners (AOR 0.65, CI 0.43, 0.98, p= 0.04). These

findings are consistent with those by other researchers. In a study by Devarakonda S et al., (2014), for instance, women who had sex without a condom half the time were at a 47% increased risk for contracting HPV as compared to women who had sex with a condom at all times.

5.3. SMOKING CIGARETTE

Findings from this study revealed an association between smoking cigarette and having abnormal cervical lesions. Women who had ever smoked cigarette were almost 2 times more likely to have abnormal cervical lesions compared to women who had never smoked cigarette (AOR 1.66, CI 1.18, 2.32, p= 0.003). These findings are consistent with those from a study conducted by Miscicki et al. (2001), who also found that daily cigarette smoking had a deleterious effect, which contributed to the development of abnormal cervical lesions. The mechanism for observation has not yet been fully explored and understood. However, several epidemiologic studies have found a role for cigarette smoking in invasive cervical cancer after finding nicotine and other cigarette metabolites in the cervical mucus (Winkelstein et al, 1984).

5.4. EDUCATIONAL ATTAINMENT

An association between ones educational attainment and the risk of having abnormal cervical lesions was observed from this study. Women who had attained tertiary education had a relatively reduced risk of having abnormal cervical lesions compared to women who had never attained any formal education (AOR 0.68, CI 0.50, 0.92, p= 0.01). Similar findings were made in a study involving 3,241 women who were screened between October 3 2007 and October 22, 2010 from 3 clinics in Kisumu Kenya. According to findings, women who had attained some college/tertiary education had a reduced risk (OR 0.97, CI 0.57, 1.67, p= 0.84) though relationship not statistically significant (Huchko J.M. et al, 2014). In another study, participants with only high school degree were at a 30% increased risk of HPV infection compared to college-educated women (Devarakonda S. et al., 2014).

5.5. MARITAL STATUS

This study also revealed an association between ones marital status and the risk of having abnormal cervical lesions. Women who were married had a reduced risk of having abnormal cervical lesions compared to women who were never married (single women) (AOR 0.78, CI 0.62, 0.96, p=0.02). A study by Devarakonda et al (2014) also revealed similar findings, where

never married (OR=1.89) or divorced or separated (OR=2.4) women had an increased risk of being infected with HPV compared to women who are married. HPV infection is 3.7 times more likely for women who have had >11 partners as compared to women with 0-1 partners.

CHAPTER SIX: CONCLUSION, LIMITATIONS AND RECOMMENDATIONS

The study revealed that the prevalence of abnormal cervical lesions in the study areas of Zambia is high. Mansa, Kitwe and Ndola general hospitals had the highest proportions of women with abnormal cervical lesions that is 20.5%, 15.4% and 19.9%, respectively. In these areas, women who tested positive for abnormal cervical lesions out-numbered the number of women who tested negative for the same. Going by province, Copperbelt had the highest prevalence of abnormal cervical lesions (35.9%) followed by Luapula 20.5%; North-western 18.8%; Southern 15.5%; Eastern 11.6% and Northern 4.9% province.

Education, marital status, smoking, condom use with regular partner and HIV status were significantly associated with having abnormal cervical lesions among women (15-49 years) studied. There was a very strong association between ones HIV status and testing either positive or negative for abnormal cervical lesions. Even within the two categories i.e. among HIV positive and HIV negative women, a higher proportion of women who were HIV positive also had abnormal cervical lesions. Similarly, a higher proportion of women who were HIV negative also tested negative for abnormal cervical lesions. Needless to mention that a critical examination of findings indicates that sexual behaviour has the greatest contribution in predisposing women to the risk of abnormal cervical lesions. Important to note also that other risky behaviours such as smoking are key in increasing ones risk of abnormal cervical lesions.

This study, like any other studies of this type didn't go without limitations. The study was only restricted to women who had screened for cervical cancer, implying that a larger proportion of women who have never screened were left out and yet a lot could have been learnt from this group of women. Additionally, not all provinces could be represented in the study, only six provinces out of ten were represented. This was mainly due to the fact that data entry and verification for the other four provinces was still on-going at the time the data for the study was being extracted from the database. Further, the study revealed a positive association of HIV and cervical cancer. Therefore, the cervical cancer prevalence could have been under-reported mainly due to the fact that Lusaka province which has the highest HIV prevalence was not included in the study. Certain predictors of interest such as parity, and the role of male circumcision as a predisposing or protective factor against cervical cancer could not be studied due to unavailability of data on the same. The study was not free from missing data, ranging

from 3% to 98%. All variables that had more than 50% missing values were excluded from the analysis. This was a limitation in that there was an unobserved effect of these variables on the other predictor variables and ultimately on the risk of abnormal cervical lesions.

From findings, it can be recommended that health promotion programs, especially cervical cancer awareness programs aimed at targeting high risk populations be designed. Owing to the fact that findings are based on only 5% of women in the productive ages who ever screened for cervical cancer, there's need for deliberate policies to increase the number of women screening for cervical cancer across the country. A possible approach could be developing a policy guideline to make cervical cancer screening mandatory and routine for all women seeking ante-natal and postnatal care services. Lessons can be learnt from the integration of HIV testing into ANC services which has enabled a lot of women to know their HIV status early enough to seek medical attention to save both the mother and the baby's lives. Like the adage goes, knowledge is power, and until they screen for cervical cancer, many women's lives will be lost as more than 80% of them present to a health facility when it's too late to treat cervical cancer. Last but not the least, there is need for further research in future with stronger research designs in order to capture more women in the community as opposed to facility based data. Further, it would be important to randomly select women from all provinces in order to have a more representative study population.

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Appendix 1: Time line (Gantt Chart)

	Nov 2013	Dec 2013	Jan 2014	Feb 2014	Mar 2014	Apr 2014	May 2014	Jun 2014	Jul 2014	Aug 2014	Sep 2014	Oct 2014	Mar 2015	Apr –May 2015
Submit proposal to supervisor	■													
Presentation of proposal to department		■												
Working on comments from department			■	■	■									
Presentation of proposal to the Graduate Forum						■								
Submit proposal to the Dean Post-graduate							■							
Submit proposal to REC and wait for approval								■	■	■	■			
Data Extraction and Analysis												■		
Presentation and submission of dissertation														■

Appendix 2: Budget

Item	Quantity	Unit Cost	Total Cost
Laptop	1	4,500.00	4,500.00
Printer	1	800.00	800.00
External drive	1	600.00	600.00
Bond paper	10	30.00	300.00
Toner	2	500.00	1,000.00
Pens/pencils	10	1.00	10.00
Stapler	1	45.00	45.00
Staples	10	5.00	50.00
Binding	4	45.00	45.00
Poster printing	1	900.00	900.00
REC fees	1	2,500.00	1,000.00
Contingency		1,075.00	1,000.00
Total			**11,825.00**

Appendix 3: Checklist

Predictors of Abnormal Cervical Lesions among Women (15-49 years old) in Zambia

Research objectives	Variables
1. To determine the proportion of women who ever had abnormal cervical lesions by province, in Zambia.	1. Women who had abnormal cervical lesions in all the 26 government health facilities
2. To investigate which factors could be associated with abnormal cervical lesions among women in Zambia	1. Age 2. Marital status 3. Household income 4. Education 5. Cigarette smoking 6. Use of oral contraceptives 7. Use of condoms 8. Age at sexual debut and first pregnancy 9. Number of lifetime sexual partners
3. To investigate if there is an association between abnormal cervical lesions and the HIV status of women in Zambia.	1. HIV status of women doing the screening

Data extraction Process:

Source of data – CCPPZ database

Step 1-Trace woman's enrolment sheet

Step 2-Trace entry on outcome of screening from enrolment sheet

Step 3-Compare the selected independent variables (demographic, socio-economic and socio-cultural factors) from enrolment sheet with outcome of screening

Appendix 4: Cervical Health Enrolment Sheet

CERVICAL HEALTH ENROLLMENT

Date: ☐☐ / ☐☐☐ / ☐☐

COPIZ ☐ ☐☐☐ - ☐☐☐☐ ☐   CCSC ☐☐

Patient ID ☐☐☐ - ☐☐☐ - ☐☐☐☐☐ ☐   *Ask patient if she was given a patient ID number in the ART, MCH, or TB clinics*

Patient Last Name ____   Patient First Name ____   Clinic site ____

Date of birth ☐☐ / ☐☐☐ / ☐☐   NRC number ☐☐☐☐☐☐ , ☐☐ , ☐

Age at last birth day ☐ ☐ Age unknown

Patient's education level: ☐ No formal education ☐ Some primary education ☐ Some high sch completed ☐ High school completed ☐ Primary school completed ☐ College/University

Marital status: ☐ Never married ☐ Married, husband home ☐ Married, husband away ☐ Separated ☐ Divorced ☐ Widowed

Occupation: ☐ House wife ☐ Formal sector ☐ Informal sector ☐ Other, specify____

Est. household income/mo: ☐ < 50,000 ☐ 50,000-99,999 ☐ 100,000-199,999 ☐ 200,000-499,999 ☐ > 500,000

PAST MEDICAL HISTORY Ever smoked Cigarettes? ☐ Yes (☐ 1yr ☐ 1-5yrs ☐ >5yrs) ☐ No

Age at first sexual intercourse ☐
☐ Before onset of menses
☐ After onset of menses

Number of lifetime sexual partners ☐

Age at first sexual intercourse ☐
☐ Before onset of menses
☐ After onset of menses

Number of lifetime sexual partners ☐

Current contraceptive use:
(tick all that apply)
☐ None ☐ yr ☐ 1-5yrs ☐ >5yrs
☐ Natural Method ☐ yr ☐ 1-5yrs ☐ >5yrs
☐ Tubal ligation ☐ yr ☐ 1-5yrs ☐ >5yrs
☐ Oral Contraceptive pills ☐ yr ☐ 1-5yrs ☐ >5yrs
☐ Injectable/implanted hormones ☐ yr ☐ 1-5yrs ☐ >5yrs
☐ IUD ☐ yr ☐ 1-5yrs ☐ >5yrs ☐ Condom /barrier methods ☐ yr ☐ 1-5y ☐ >5yrs
☐ Hysterectomy: Reason: ____

Condom use with partners:
☐ Never use a condom
☐ Using a condom sometimes
☐ Using almost everytime
☐ Always use a condom

Age at menarche (years) ☐

Age at menopause (years) ☐
☐ Not applicable

OBSTETRIC HISTORY ☐ Not Applicable
Age at first pregnancy (years): ____
Number of pregnancies client has had? ____

Please Note that 1-4 are not applicable if menopausal (1)Last menstrual period ☐☐ / ☐☐☐ / ☐☐
2) Menstrual blood flow ☐ Heavy ☐ Moderate ☐ Scanty   (3) Menstrual cycle regularity ☐ Regular ☐ Irregular
4)Associated abdominal/pelvic pain ☐ Painful periods ☐ No pain   (5)History of bleeding during or after coitus? ☐ Yes ☐ No

Does pt use anything else to clean or dry vagina? ☐ Yes ☐ No   If yes, what?____

Did you ever have a pap smear test? ☐ Yes ☐ No   When was your last pap smear? ☐☐ / ☐☐☐ / ☐☐

History of cervical cancer in any family member? ☐ Yes ☐ No

Staff Initial & Last Name:____   Staff ID ☐☐☐

☐ Referral to DCT in this clinic; Client accepts?   Most recent HIV test: ☐ Positive ☐ Negative ☐ Not done
☐ Yes,Date: ☐☐ / ☐☐☐ / ☐☐   ☐ No   Place ____ Date: ☐☐ / ☐☐☐ / ☐☐
Test result: ☐ Positive ☐ Negative ☐ Indeterminate

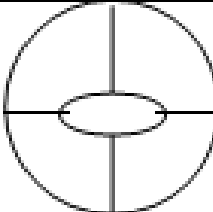Initial CD4 count ☐ ☐☐ / ☐☐☐ ☐   Most recent CD4 ☐ ☐☐ ☐☐☐ / ☐☐

☐ Patient has never taken ARVs   ☐ Patient is currently taking ARVs   ☐ Patient took ARVs but stopped
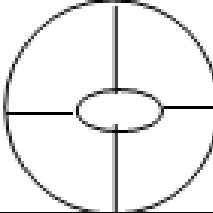
If on ARVs, date started ☐☐ / ☐☐☐ / ☐☐

Taking traditional medicines or supplements for HIV/AIDS? ☐ Yes ☐ No If yes, specify:____

Eligible for study enrollment? ☐ No ☐ Yes:____   Consents to enroll? ☐ No ☐ Yes:____
☐ Not applicable   Study name   Study name

Page 1 of 2 CERVICAL HEALTH ENROLLMENT v2.7

Appendix 4: Cervical Health Enrolment Sheet

SYMPTOMS AND CONCERNS

What concerns does patient have? _____

- Vaginal/vulval itching ☐Yes ☐No
- Vaginal discharge ☐Yes ☐No Pelvic or lower abdominal pain or tenderness ☐Yes ☐No
- Fever ☐Yes ☐No Pain or burning with intercourse or urination ☐Yes ☐No

EXAM PRIOR TO ACETIC ACID APPLICATION

Pelvic exam done? ☐Yes ☐No

Abnormal vaginal discharge ☐Yes ☐No   Peri - anal ☐Yes ☐No

PHYSICAL EXAM

Vulva/Perineum _____	Cervix _____
Vagina _____	Lower abdomen _____

CLINICAL DIAGNOSIS N/A ☐

- ☐ Cervicitis
- ☐ Genital ulcer
- ☐ Vaginitis
- ☐ Invasive cancer
- ☐ PID
- ☐ Other, specify: _____

PRESCRIPTION N/A ☐

- ☐ Metronidazole 2g oral
- ☐ Metronidazole 400-5 oral bd
- ☐ Fluconazole 150-200mg oral
- ☐ Ciprofloxacin 500mg oral
- ☐ **Clotrimazole 500mg pessary
- ☐ Erythromycin 400-500mg qd
- ☐ **Clotrimazole/Miconazole 200mg pessary intravag ad
- ☐ *Doxycycline 100mg bd
- ☐ Other, specify _____

* Not if pregnant
** Not within 6 weeks of cryo or LEEP

VISUAL INSPECTION WITH ACETIC ACID (VIA)

VIA done? ☐Yes ☐No   VIA Performed by: _____

Transformation zone completely seen? ☐Yes ☐No

Query I.C.C? ☐Yes ☐No

Ectopy ☐Yes ☐No

Other comments: _____

TEST RESULTS ☐Negative ☐Positive ☐Result Uncertain

- Entire lesion seen ☐Yes ☐No
- Extends into cervical os ☐Yes ☐No
- Covers < 75% of cervix ☐Yes ☐No
- Covers > 75% of cervix ☐Yes ☐No
- Atypical vessels ☐Yes ☐No
- Punctations ☐Yes ☐No
- Mosaicism ☐Yes ☐No

Digital Cervicography (DC)

D.C done? ☐Yes ☐No   EDI performed by: _____

Reason D.C not done? _____

Transformation zone completely seen? ☐Yes ☐No

Query I.C.C? ☐Yes ☐No

Ectopy ☐Yes ☐No

TEST RESULTS ☐Negative ☐Positive ☐Result Uncertain

- Entire lesion seen ☐Yes ☐No
- Extends into cervical os ☐Yes ☐No
- Covers < 75% of cervix ☐Yes ☐No
- Covers > 75% of cervix ☐Yes ☐No
- Atypical vessels ☐Yes ☐No
- Punctations ☐Yes ☐No
- Mosaicism ☐Yes ☐No

PLAN

☐ Follow Up   ☐ Antibiotics/antifungal

Scheduled return Date ☐☐ / ☐☐☐ / ☐☐

☐ Cryotherapy

Query _____

Response _____

☐ Referral to specialist. Reason: _____

- Polyp ☐Yes ☐No
- Lesion too large for cryotherapy ☐Yes ☐No
- Lesion extends into cervical os ☐Yes ☐No
- Query ICC ☐Yes ☐No
- Atypical vessels ☐Yes ☐No
- Punctations or mosaicism ☐Yes ☐No
- Post-cryo lesion ☐Yes ☐No
- Post-LEEP lesion ☐Yes ☐No
- Other _____ ☐Yes ☐No

Scheduled Vist at UTH: ☐☐ / ☐☐☐ / ☐☐

Cryotherapy: ☐3-5-3 minutes ☐7 minutes

Cryotherapy performed by: _____

Date of cryotherapy: ☐☐ / ☐☐☐ / ☐☐
     Day   Month   Year

Cryo Done ☐Yes ☐No

Reason not done / Complications _____

Comments _____

Staff Initial & Last Name: _____

Staff ID ☐☐☐