FINAL RESEARCH REPORT

THE PREVALENCE OF HIV AND ITS ASSOCIATION WITH TERMINATION OF PREGNANCY AT SESHEGO ZONE 4 CLINIC, CAPRICORN DISTRICT, LIMPOPO PROVINCE

by

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[redacted]

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DEDICATION

I humbly dedicate this dissertation to my family, especially my husband Mpho Martin Mposi and kids Thabang, Musoni and Mulivhuwe, who encouraged and motivated me on my studies, they had faith in me and gave me strength at all times. I have spent many hours at work and on studies with their support.

To my Acting Assistant Manager at District office Ms. Daphney Magoro who assisted with the provision letter of permission to further my studies. To my Operational Manager at Zone 4 clinic, Mrs Tlou Maloka, who encourage and motivated me to continue with my studies and draw the duty roster that was suitable for class attendance. To the department of health that permitted me with an opportunity to further my studies. To God almighty who provided me with strength, knowledge and wisdom, has guided me through all the years of my study.

DECLARATION

I declare that "**The prevalence of human immunodeficiency virus and its association with women who terminate pregnancy at Seshego Clinic, Capricorn District, Limpopo Province"**, hereby submitted to the University of Limpopo, for the degree of Master of Public Health, is my own work and that all the sources that I have used or quoted have been indicated and acknowledged by means of complete references and that this work has not been submitted before any other degree at any institution.

Avian Mantoa Molepo  Date: 19/12/2020

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ABSTRACT

Background:

In South Africa, the Choice on Termination of Pregnancy Act (CTOP) (No. 92 of 1996) promotes a woman's reproductive right and choice to have an early, safe and legal abortion. Pregnancy termination among young women constitutes a public health problem particularly in South Africa where high prevalence of abortion has been recently recorded. HIV acquisition is increased two to four-fold during pregnancy, due to biological and behavioural factors including immunological changes, hormonal changes affecting the genital tract mucosa, higher frequency of unprotected sex and incident sexually transmitted infections (STIs) during pregnancy. There is a growing interest in exploring maternal mental health effects of unintended pregnancies. However, the evidence base from a small number of available studies is characterized by considerable variability, inconsistency and inconclusive findings. Therefore, the primary objective of this study was to investigate the prevalence of HIV and its association with termination of pregnancy at Seshego Zone 4 clinic in Limpopo Province.

Methodology:

A cross-section descriptive retrospective review study in which convenience sampling of the records of women who terminated pregnancies was used in this study. The key variable of interest in this study was HIV results and all patients records without evidence of HIV testing, and the associated results were excluded. A self-designed data extraction tool was used to extract the data from patients records and tool covered variables such as the age of the women, educational status, marital status, occupational status, year and month of termination of pregnancy, gestational age, parity, and gravidity, method of contraceptive used, HIV status, ARV and ARV regimens. Data analysis was done using the STATA statistical software version 12 for Windows (STATA Corporation, College Station, Texas).

Results:

The mean age was 24.98 years SD±14.4 and majority of women who terminated pregnancies were in the age group 20 – 24 years at 35.7% and the least number of women who terminated pregnancies were in the age groups ≥ 40 years and ≤ 14 years at 2.3% and 0.3% respectively. Majority of the women who terminated pregnancies had parity of 1 – 2 at 47.4% followed by parity of zero at 42.3% and 3 – 4 at 9.9%. Majority of the women who terminated pregnancies were in gravida 1 at 42.8% followed by those with gravida 2 at 27.1% and those who were pregnant between the 3rd and 4th time were 26.9%. There was a statistical significance difference (*p<0.001*) of the use of contraceptives by age groups and also in relation to parity and similarly to gravidity.

The prevalence of HIV amongst women who terminated pregnancies in the current study was found to be 11.6% and this was high in 2018 at 10.5% followed by 2019, 2015 and 2016 at 10.3%, 9.2% and 9.1% respectively. The prevalence of HIV amongst women who terminated pregnancies increased with increasing level of education from 4.1% amongst women who had primary or no educational level the followed by 9,0% and 13.6% in women who had secondary and tertiary educational level respectively. The risk of women who terminate pregnancies being HIV positive in the current study increased significantly with increasing age as older women were 1.9 times more likely to be HIV positive as compared to younger ones (*p=0.004*)

Conclusion:

The findings of this study highlight the need to address the structural socio-economic drivers of the HIV epidemic among women of child-bearing age. Women of child-bearing age in this setting have large unmet reproductive health needs. Structural interventions, such as increasing contraceptive use which may be useful for reducing the burden of unplanned pregnancies.

Key concepts

Human immunodeficiency virus, Acquired immunodeficiency syndrome, Termination of pregnancy, Parity and Gravidity.

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DEFINITION OF CONCEPTS

90-90-90 targets

The 90-90-90 targets are the targets set by the Joint United Nations Programme on HIV and AIDS (UNAIDS) and partners aiming to diagnose 90% of all HIV positive people, provide antiretroviral therapy (ART) for 90% of those diagnosed and achieve viral suppression for 90% of those treated, by 2020 (Levi, Raymond, Pozniak, Vernazza, Kohler & Hill, 2016). In the context of this study, the 90-90-90 targets has been used as defined above.

Endemic

An endemic disease is a common disease that become increasingly tolerated, and the locus of responsibility may shift to the individual. Rather than public authorities actively detecting cases and subsidizing risk protection, people may be increasingly encouraged to pay for the means to manage their own risk and seek care (Medley & Vassall, 2017). In the context of this study, endemic disease is a disease that community member need not to worry about as they understand preventative measures.

Gestational age

Gestational age is the common term used during pregnancy to describe how far along the pregnancy is. It is measured in weeks, from the first day of the woman's last menstrual cycle to the current date. A normal pregnancy can range from 38 to 42 weeks (Battersby, Longford, Costeloe & Modi, 2017). In the context of this study, gestational age has been defined as a measure of the age of a pregnancy which is taken from the beginning of the woman's last menstrual period (LMP).

Gravidity

Gravidity is defined as the number of times that a woman has been pregnant (Chen et al., 2020). In the context of this study, gravidity has been used as defined above

Human immunodeficiency virus (**HIV):** is a virus that attacks cells that help the body fight infection, making a person more vulnerable to other infections and diseases (WHO, 2013). In the context of this study, human immunodeficiency virus (HIV) will be defined as a virus destroying specific blood cells, called CD4 and T cells, which are crucial to help the body fight disease.

Pandemic

A pandemic disease is a disease that pose a threat to humans as the infectious organism is capable of spreading beyond a particular ecological niche or geographic region to cause infection in human populations worldwide (Smith & Upshur, 2019). In the context of this study, pandemic has been defined as above.

Parity

Parity is defined as the number of times that a woman has given birth to a fetus with a gestational age of 24 weeks or more, regardless of whether the child was born alive or was stillborn (Chen, Subesinghe, Muller, Hider, Mallen & Scott, 2020). In the context of this study, parity has been used as defined above

Prevalence is defined as the number of affected persons present in the population at a specific time divided by the number of persons in the population at that time, that is, what proportion of the population is affected by the disease at that time? (Gordis, 2009; Szklo & Nieto, 2014). In the context of this study, prevalence of HIV will be the women who have done termination of pregnancy and are HIV positive amongst all women who have done termination of pregnancy.

Termination of pregnancy

Termination of pregnancy is the removal of an embryo or foetus from uterus at a stage of pregnancy when it is deemed incapable of independent survival (at any time between conception and 24th week of pregnancy) (Oxford Concise Medical dictionary, 2015). In the context of this study, termination of pregnancy will be defined as a process when a woman decides to end her pregnancy by medical means before the full term.

LIST OF ABBREVIATIONS

AIDS	:	Acquired Immunodeficiency Syndrome
ARV	:	Anti- Retro Viral
cART	:	combination antiretroviral therapy
CTOP	:	Choice on Termination of Pregnancy
EECA	:	Eastern Europe and Central Asia
EU	:	European Union
hcG	:	Human Chorionic gonadotropin
HIV	:	Human immunodeficiency Virus
HSRC	:	Human Science Research Council
IUD	:	Intrauterine Device
LMP	:	Last Menstrual Period
MCS	:	Multi-Country Survey
NDOH	:	National Department of Health
PAIA	:	Promotion of Access to Information Act
PLHIV	:	People Living with HIV
PMTCT	:	Prevention of Mother to Child Transmission
SD	:	Standard deviation
SRH	:	Sexual Reproductive Health
STI	:	Sexual Transmitted Infections
TOP	:	Termination of Pregnancy
WLWH	:	Women living with HIV
WHO	:	World Health Organization

1. CHAPTER ONE

1.1. INTRODUCTION

Human immunodeficiency virus (HIV) is the virus that can lead to acquired immunodeficiency syndrome (AIDS) and it can damage a person's body by destroying specific blood cells, called CD4 and T cells, which are crucial to help the body fight disease (WHO, 2013). This virus spreads through body fluids to attack the immune system of a person, focusing on CD4 cells (Sabin, McNabb & DeSilva, 2014). HIV infection has spread over the last 30 years and has had a great impact on health, welfare, employment and criminal justice sectors; affecting all social and ethnic groups throughout the world (Awofala & Ogundele, 2018). Recent epidemiological data indicate that HIV remains a public health issue that persistently drains our economic sector having claimed more than 25 million lives over the last three decades (Awofala, & Ogundele, 2018).

In many developing countries, estimates on the magnitude of HIV and trends on the HIV epidemic are obtained through HIV seroprevalence surveys conducted over a period of time (Manyahi, Jullu, Abuya, Juma, Ndayongeje & Kilama et al., 2015). Increased heterosexual transmission has resulted in an increased number of cases among women in many countries (Domingues, Szwarcwald, Souza & do Carmo Leal, 2015). Adolescents and youths having unprotected heterosexual intercourse are at risk of HIV infection and unwanted pregnancy (Christofides, Jewkes, Dunkle, Nduna, Shai & Sterk, 2014).

Eastern Europe and Central Asia (EECA) is a socioeconomically and geopolitically diverse region that, has experienced intersecting epidemics of sexually transmitted infections (STIs) (particularly syphilis), HIV, hepatitis C virus (HCV) and tuberculosis (TB), reflecting major socioeconomic changes, disruption to public health systems and increased risk behaviours (Bailey, Turkova & Thorne, 2017). The EECA represent one of the few regions globally where there is a continued increase in the incidence of HIV infection (DeHovitz, Uuskula & El-Bassel, 2014). EECA is one of only two regions in

the world where HIV incidence is increasing, with new infections increasing by more than 50% between 2010 and 2015. This reflects a high proportion of undiagnosed individuals, low treatment coverage and insufficient and/or ineffective harm reduction and prevention services (Bailey et al., 2017). Across southern Africa, HIV prevalence among women increases rapidly between the teenage years and young adulthood (Harrison, Colvin, Kuo, Swartz & Lurie, 2015). The incidence of HIV in South Africa has been reported to be higher among pregnant women than among the general population (Domingues et al., 2014). The adult HIV prevalence is 16.8 % in South Africa, 23 % in Botswana, 23 % in Lesotho, and 26.5 % in Swaziland (Harrison et al., 2015). Incidences of HIV and pregnancy among adolescents remain high in South Africa. HIV prevalence among young women aged 15–19 is 6.9% and is 21.1% in the age range of 20–24 (Domingues et al., 2014).

In many countries, women have more pregnancies and children than they want and become pregnant much sooner than desired (Sedgh, Singh & Hussain, 2014). Termination of pregnancy (TOP) is the removal of an embryo or foetus from uterus at a stage of pregnancy when it is deemed incapable of independent survival (at any time between conception and 24th week of pregnancy) (Elizabeth & Martin, 2015). Approximately 67 countries by the year 2007, had legislation explicitly permitting legal termination of pregnancy (Benson, Andersen, & Samandari, 2011) and worldwide, approximately one in five pregnancies ends in abortion (Hodes, 2016). European Union (EU) countries that allow termination of pregnancy on request report an annual rate of 12.2 abortions per 1000 women aged <20 years (Pereira, Pires, Araújo Pedrosa, Vicente & Bombas et al., 2017).

Although causal relationships are difficult to establish, numerous studies have indicated that unintended pregnancies are associated with an array of negative health, economic, social, and psychological outcomes for women and children (Sedgh et al., 2014; Kost & Lindberg, 2015; Sarvestani, Ahmadi, Enayat & Movahed, 2017). The ongoing high HIV prevalence in pregnant women in this rural community of South Africa despite prevention and treatment programs, is deeply concerning (Kharsany,

Frohlich, Yende-Zuma, Mahlase & Samsunder et al., 2015). It is therefore, against this background that this study is aiming to investigate the prevalence of HIV and its association with termination of pregnancy at Seshego Clinic in Limpopo Province. This is done with an aim to provide valuable information which will assist government policy makers and researchers to develop targeted interventions for teenagers, especially for those in age-disparate relationships to reduce the impact of HIV epidemic trajectory. The impact of changing trends on the patterns of termination of pregnancy data can also assist to determine the needs of women in reproductive age groups. Therefore, data of termination of pregnancy and its association with HIV prevalence can assist in monitoring progress toward improvement of maternal health and access to family planning.

1.2. PROBLEM STATEMENT

Termination of Pregnancy (TOP) is considered to be a national strategic intervention for Sexual Reproductive Health (SRH) program which allows pregnant women to terminate their unwanted pregnancy legally in South Africa (Mbizvo & Zaidi 2010; Mantell, Cooper, Exner, Moodley, Hoffman & Myer et al., 2017). The researcher as a professional nurse at Seshego Zone 4 Clinic noticed that there is a high uptake of TOP services at the clinic and this was supported by the review of the monthly records which proved that approximately 30 TOPs were performed per month. The ability to substantially reduce the HIV transmissions and achieve epidemic control can be achieved by potentially transforming the pandemic to low level epidemics. This can be achieved by focusing more on high transmission areas and key populations, together with the implementation of evidence-based combination prevention strategies (Kharsany & Karim, 2016). Initiatives to prevent sexual transmission of HIV, indeed the major mode of transmission in South Africa remains a challenge to the possibility of an AIDS free generation. This is happening notwithstanding the major advances in the delivery of HIV prevention and treatment to attain epidemic control. Little is known about the prevalence of HIV amongst women terminating pregnancies and the association of HIV with termination of pregnancy in Limpopo Province. It is therefore, against this background that this study aimed to investigate the prevalence of HIV and

its association with termination of pregnancy in in Seshego Zone 4 clinic in Limpopo Province.

1.3. LITERATURE REVIEW

The literature review was undertaken and the process followed during this review of the literature was thematic. This means that small aspects of termination of pregnancy were organized into five themes, namely, the global HIV prevalence among pregnant women, the HIV prevalence among pregnant women in Africa; the HIV prevalence among pregnant women in South Africa, the association of HIV and termination of pregnancy and the public health intervention to reduce termination of pregnancy and the spread of HIV.

1.4. PURPOSE OF THE STUDY

1.4.1. Aim of the study

To investigate the prevalence of HIV and its association with termination of pregnancy at Seshego Zone 4 clinic in Limpopo Province

1.4.2. Objectives of the study

- To outline the socio demographics of women performing termination of pregnancy at Seshego Zone 4 clinic in Limpopo Province

- To determine the HIV prevalence among women performing termination of pregnancy at Seshego Zone 4 clinic in Limpopo Province.

- To determine the association between HIV and termination of pregnancy at Seshego Zone 4 clinic in Limpopo Province.

1.5. RESEARCH QUESTION

1.5.1. What is the prevalence of HIV and its association with termination of pregnancy at Seshego Zone 4 clinic in Limpopo Province?

1.6. RESEARCH METHODOLOGY

1.6.1. Research design

Research design is defined as type of inquiry within qualitative, quantitative and mixed methods approaches used to provide specific direction for designing research (Creswell, 2013). A cross-sectional descriptive study design was used to help address the research question posed in this study and to determine the relationship between HIV and termination of pregnancy including other variables of interest as they exist within a defined population at a particular point in time (Detels, Gulliford, Karim & Tan, 2015).

1.6.2 Sampling

Convenience sampling of the study population was used in this study. Convenience sampling is a type of non-probability or non-random sampling technique where members of a target population that meet certain practical criteria, such as easy accessibility, geographical proximity, availability at a given time or the willingness to participate, are included for the purpose of the study (Etikan, Musa & Alkassim, 2016). In this study, all records of women who terminated pregnancy at Seshego Zone 4 clinic from January 2015 to December 2019 were included for analysis and all records of women who terminated pregnancy at Seshego Zone 4 clinic from January 2015 to December 2019 but with incomplete information were excluded. The key variable of interest in this study was HIV results and all records without evidence of HIV testing and the associated results, were excluded.

1.6.3 Data collection and analysis

In the current study, a self-designed data extraction tool was used to extract the data from patient's records. This tool covered variables such as the age of the women, educational status, marital status, occupational status, year and month of termination of pregnancy, gestational age, parity, and gravidity, method of contraceptive used, HIV status, ARV and ARV regimens. Data analysis was done using the STATA statistical software version 12 for Windows (STATA Corporation, College Station, Texas). A detailed description of how reliability and validity of the data was achieved including the data analysis and the measures to minimise bias is presented in chapter 3.

1.7 ETHICAL CONSIDERATIONS

To ensure ethical considerations were taken into account in this study; permission to conduct the study was sought from University of Limpopo's Turfloop Research Ethics Committee and then from the Limpopo Department of Health Provincial. In addition, a storage system was implemented to store the extracted data and records were kept in such a manner as not to reveal the identity of the patients in order to ensure their confidentiality, privacy and anonymity. There were no foreseeable risks associated with participation in this study since secondary data was used.

1.8 SIGNIFICANCE OF PROPOSED RESEARCH

The current study might provide valuable information which will assist government policy makers and researchers to develop targeted interventions for teenagers, especially for those in age-disparate relationships to reduce the impact of HIV epidemic trajectory. The impact of changing trend patterns on termination of pregnancy data can also assist to determine the needs of women in reproductive age groups. Therefore, data of termination of pregnancy and HIV prevalence together with trends will assist in monitoring progress toward improvement of maternal health and access to family planning. In conclusion, the research findings will be presented to the

Provincial Health Department and to the Seshego Zone 4 clinic to ensure that they benefit from the outcomes of this study.

1.9 CONCLUSION

The information presented above provided an overview of this study. The next chapter, which is Chapter 2, describes the literature review which was done to highlight previous research studies conducted across the globe on this research topic. Chapter 3 will highlight the research methodology employed; Chapter 4 dealt with the presentation and representation of the study's research findings, while Chapter 5 presents a summary of the study and recommendations emanating from the results of this study.

2. CHAPTER 2: LITERATURE REVIEW

2.1. Introduction

Human immunodeficiency virus (HIV) and acquired immunodeficiency syndrome (AIDS) are a continuing international epidemic (Bourgeois, Edmunds, Awan, Jonah, Varsaneux & Siu, 2017). For the past three decades, legislative approaches to prevent HIV transmission have been used globally (Lehman, Carr, Nichol, Ruisanchez, Knight & Langford et al., 2014). However, HIV continues to be a global public health concern, with 2.1 million people newly infected in 2015 (Bourgeois et al., 2017). This is trendy even though various global declarations and commitments were made and set by world leaders and governments since the year 2000 with specific goals and targets to respond to the HIV and AIDS epidemic (Idele, Gillespie, Porth, Suzuki, Mahy & Kasedde et al., 2014). Nearly all countries conduct some form of HIV surveillance to monitor patterns and trends in the HIV epidemic (Eaton, Rehle, Jooste, Nkambule, Kim & Mahy et al., 2014). The predominant data source for monitoring the epidemic in countries with generalized HIV epidemics where HIV infection is firmly established in the heterosexual population are sentinel surveillance among pregnant women attending antenatal care (ANC) clinics in urban and rural areas (Marsh, Mahy, Salomon & Hogan, 2014).

2.3 Global HIV prevalence among pregnant women

The epidemiology of HIV infection and AIDS in Western countries is evolving owing to earlier screening, improved management and wider access to combination antiretroviral therapy (cART) (Canet & Azoulay, 2014). The HIV epidemic is not homogenous across the Latin America and Caribbean countries. During the year 2012, approximately 1.5 million adults and children were estimated to be living with HIV in Latin America, with a stable prevalence ranging from 0.2% in Mexico to 0.7% in Guatemala, Panama and Uruguay (De Boni, Veloso & Grinsztejn, 2014). Although many high-income countries have noted decreasing rates of HIV, between 2013 and 2015 Canada's rates had stabilized at 5.8 per 100,000 population. HIV prevalence

and incidence are inequitably distributed among women in Canada (Salters, Loutfy, de Pokomandy, Money, Pick & Wang et al., 2017).

Liangshan Prefecture which is an autonomous prefecture occupying much of the southern extremity of Sichuan province in China, has one of the highest HIV prevalence rates in China. Approximately 29,987 HIV/AIDS cases had been reported in 2015 and HIV epidemic had spread throughout Liangshan's 17 districts (Yang, Yang, Liao, Zhai, Yu & Xiao et al., 2017). There are approximately 2.12 million persons infected with HIV in India however, there is a steady decline in the number of PLHIV and pregnant women tested at antenatal clinics showed a prevalence rate of 0.35% (Paranjape & Challacombe, 2016).

2.4 HIV prevalence among pregnant women in Africa

Majority of pregnant women living with HIV in the world are from sub-Saharan Africa (Ndege, Washington, Kaaria, Prudhomme-O'Meara, Were & Nyambura et al., 2016). The prevalence of HIV among pregnant women was conducted on women attending antenatal clinics (Eaton et al., 2014), however, there has been slight decline in the prevalence of HIV among pregnant and all women. The prevalence of HIV among pregnant women in Western Africa has declined from 4.3 to 2.9% and from 4.0 to 3.4% among all women. Whereas in Eastern Africa, the decline was from 3.6% to 2.9% for pregnant women and 4.5% to 4.1% for all women, and lastly in Southern Africa the decline was from 17.3% to 16.1% for pregnant women and increased from 20.1% to 20.9% for all women (Eaton et al., 2014). In 2007 study conducted in Kenya, 6.9% of pregnant women tested positive for HIV (Ndege et al., 2016).

It is estimated that about 3, 229, 757 people live with HIV in Nigeria and about 220, 393 new HIV infections occurred in 2013 and 210,031 died from AIDS related cases (Awofala & Ogundele, 2018). The countries such as Malawi and Uganda report a tremendous increase in the numbers of pregnant women infected with HIV and enrolled on ART (Buregyeya, Naigino, Mukose, Makumbi, Esiru & Arinaitwe et al., 2017). Southern African countries are home to <1 % of the global population but these

countries are home to about 20% of the global burden of HIV infection and this part of Africa continues to experience high rates of new HIV infection despite substantial programmatic scale-up of treatment and prevention interventions (Delva & Karim, 2014). In Southern Africa, Swaziland's has the highest HIV prevalence rate of 41 % which is among the highest in the world among pregnant women (Katirayi, Chouraya, Kudiabor, Mahdi, Kieffer & Moland et al., 2016).

2.5 HIV prevalence among pregnant women in South Africa

HIV still remain the primary burden of the disease in South Africa, in which the national prevalence estimates was 12.2% in 2012 and 14% in 2017 (Gutreuter, Igumbor, Wabiri, Desai & Durand, 2019). The country has a generalized and maturing HIV epidemic, with the highest number of people (6.4 million) living with HIV in the world. The prevalence of HIV in South Africa remains high. It is estimated that approximately 3 million people are on antiretroviral treatment (ART), making it the largest programme in the world (Venter, Majam, Jankelowitz, Adams, Moorhouse & Carmona et al., 2017). The gender dynamics of HIV infection in South Africa can be traced back to the first national HIV survey in 2002 showing differential infection rates by gender with significantly higher prevalence among females (17.7%) than males (12.8%). This trend showing gender differences has been consistently found in subsequent surveys (Mabaso, Makola, Naidoo, Mlangeni, Jooste & Simbayi, 2019).

In South Africa, women of child-bearing age are disproportionately affected by HIV (Henegar, Westreich, Maskew, Miller, Brookhart & Van Rie, 2015; Naicker, Kharsany, Werner, van Loggerenberg, Mlisana & Garrett et al., 2015). The prevalence of HIV among young women is 3 times more than among young men and annual antenatal surveillance data for the country indicate that 30% of pregnant women between the ages of 15 and 49 are infected with HIV (Henegar et al., 2015). Majority of the HIV infections in South Africa are heterosexually acquired and the sentinel surveillance among pregnant women revealed that in 1990, HIV prevalence amongst pregnant women was 0.7% which then exponentially increased to 22.8% and 30.2% in 1998 and 2010 respectively (Naicker et al., 2015). The HIV prevalence in South Africa has

highlighted differences within and between South African provinces, with the province of KZN having the highest prevalence of HIV (Kharsany et al., 2015).

2.6 Association of HIV and termination of pregnancy

HIV-positive women confront difficult decisions related to their pregnancy (Kontomanolis, Michalopoulos, Gkasdaris & Fasoulakis, 2017; Cuinhane, Roelens, Vanroelen, Quive & Coene, 2018). Pregnancy and family planning among women living with HIV involves complex decision-making and clinical management (Haddad, Wall, Mehta, Golub, Rahangdale & Kempf et al., 2017). The impact of changing trend patterns on termination of pregnancy data needs to be determined (Abigail & Power, 2008). Globally, studies aiming to understand the relation between induced abortion and HIV are scarce and differ on the direction of the association (Pilecco, Teixeira, Vigo, Dewey & Knauth, 2014). Many studies have tried to assess the rate of induced abortion among HIV-positive women in high income countries, whereas little research has been carried out on this area in low- and middle-income countries (Chi et al., 2010). Therefore, data of abortion incidence and trends are needed to monitor progress toward improvement of maternal health and access to family planning (Boerma, Requejo, Victora, Amouzou, George & Agyepong et al., 2018).

Changes in women's age of having pregnancy terminations, for instance, can indicate changing fertility patterns (Chae, Desai, Crowell, Sedgh & Singh, 2017; Myers, 2017). A study conducted in Vietnam, involving the last pregnancy before and the first pregnancy after HIV diagnosis indicated an increase in induced abortion occurrence after diagnosis (Do, Tran, Nguyen, Van Vo, Baker & Dunne, 2019). However, a study conducted in Canada, analyzing pregnancies in women living with HIV/Aids (WLHA) conceived 20 weeks before HIV diagnosis and comparing them with pregnancies conceived 20 weeks after the diagnosis, pointed in the opposite direction (Pilecco et al., 2014). Sub-Saharan Africa is burdened by high rates of unintended pregnancy and HIV. Yet little is known about the relationship between these two health risks in the region. Understanding the associations between HIV status and pregnancy decision making may benefit strategies to reduce unintended pregnancy (Bankole,

Keogh, Akinyemi, Dzekedzeke, Awolude, & Adewole, 2014). The HIV epidemic is having a profound and complex effect on reproductive behavior in Africa (Bankole et al., 2014) and the HIV infected women are vulnerable to various reproductive health issues (Halli, Khan, Shah, Washington, Isac & Moses et al., 2015). A desire for fewer children among HIV-positive women than among HIV-negative women or women of unknown status has been documented both in cross-sectional studies and in longitudinal studies that followed women after they received their HIV diagnosis (Bankole et al., 2014).

Compared with intended pregnancies, unintended pregnancies are associated with greater health risks for both mother and baby, and these risks are magnified when the woman is HIV-positive (Grilo, Catallozzi, Heck, Mathur, Nakyanjo, & Santelli, 2018). Spontaneous abortion and stillbirths appear to be more common among HIV-infected women. In Western countries, HIV positive women, have higher rates of induced abortion (Halli et al., 2015). Therefore, understanding the relationship between HIV, unintended pregnancy and contraceptive use is a key element in developing programs and services that will enable HIV-positive individuals to achieve their reproductive goals. There is very little research looking specifically at the associations between HIV status and women's experience of unintended pregnancy, or their strategies to prevent it (Bankole et al., 2014).

2.7 Public health intervention to reduce termination of pregnancy and the spread of HIV

The Joint United Nations Programme on HIV and AIDS (UNAIDS) and partners during the year 2014 launched three ambitious 90-90-90 targets for 2020 as a commitment to improve access to ART as a life-saving treatment, a transmission prevention measure and a human right (Parra, 2016; UNAIDS, 2014). These targets are aimed to diagnose 90% of all HIV-positive persons, provide antiretroviral therapy (ART) for 90% of those diagnosed, and achieve viral suppression for 90% of those treated by 2020 (Levi, Raymond, Pozniak, Vernazza, Kohler & Hill, 2016; Bain, Nkoke & Noubiap, 2017). Early placement of patients on combined ART (cART) and

achievement of viral load suppression reduces mortality and HIV transmission and improves quality of life. Getting over 90% of people with HIV to know their status can therefore plausibly help achieve the 90–90–90 targets (Bain et al., 2017).

Unintended pregnancy is a serious problem worldwide; more than half of all pregnancies are unintended, and half of these unintended pregnancies result in abortion, miscarriage or unplanned births without suitable prenatal care. Unintended pregnancy and its outcomes can result in serious physical, psychological, financial, and/or ethical stresses on women and families, especially in countries and regions where abortion is not legally available (Sedgh, Singh & Hussain, 2014). Maternal deaths associated with pregnancy are a major public health concern (Reardon & Thorp, 2017) and Southern Africa is the epicentre of the HIV pandemic having the highest burden of HIV globally (Levi et at., 2016).

HIV prevention in young women in sub-Saharan Africa is a public health imperative (Mavedzenge, Doyle & Ross, 2011; Levi et al., 2016), and prevention efforts during pregnancy and postpartum should be particularly prioritized due to the increased risk of HIV acquisition in both women and infants (Levi et al., 2016). Therefore, HIV prevention efforts have included structural, biomedical and behavioural interventions. There are also health systems interventions which involves community-based workers which have been prioritised due to severe professional health worker shortages and the WHOs recommendations regarding task-shifting in sub-Saharan Africa (Mavedzenge et al., 2011).

2.8 CONCLUSION

The literature presented in this chapter covered the introduction on HIV and termination of pregnancy, the prevalence of HIV among pregnant women focusing on global burden, HIV in Africa and lastly in South Africa. The association between HIV and termination of pregnancy was described together with interventions to prevent and reduce termination of pregnancy and the spread of HIV. The next chapter describes the methodology used to conduct this study.

3 CHAPTER 3: RESEARCH METHODOLOGY

3.1 Introduction

Quantitative research method refers to the testing of objective theories by examining the relationship among the variables. It deals with the numbered data where they can be analyzed statistically (Creswell, 2013). In this study the researcher used the quantitative approach to determine the HIV prevalence and its association with termination of pregnancy.

3.2 Study area

The study was conducted at Seshego Zone 4 clinic which is in Capricon district, within Limpopo province (Figure 1 below).

Figure 1 Maps of South Africa and the Limpopo Province showing the 5 districts of Limpopo Province and Seshego in the Polokwane Municipality located in the Capricorn District (https://en.wikipedia.org/wiki/Seshego)

The Seshego Zone 4 clinic is situated next to Seshego shopping complex, which is approximately 14 Kilometers from Polokwane city in Polokwane Municipality. The Polokwane municipality constitutes 60% (797,127 population) of Capricorn District's population (Mphekgwana, Malema, Monyeki, Mothiba, Makgahlela & Kgatla et al., 2020). Seshego township is divided into eight residential zones (Mphekgwana et al., 2020). Seshego Zone 4 clinic has nine (9) catchment areas and is serving an estimated 38 000 population from the following areas Zone 4, Zone 8, Zone 5, Biko

Park, Kwena Moloto, Ext 133, Spook Park, Juju Valley and Letsoakoane (DOH, 2019). This clinic operates for 24 hours' service with 14 professional nurses including operational manager in which all professional nurses are qualified midwives. In addition, the clinic has 4 enrolled nurses and 2 assistant nurses as the part of the team. The clinic provides comprehensive package on Primary Health Care (PHC) services which includes minor ailments, child health, maternity cases, reproductive health, and chronic conditions, amongst others.

3.3 Study Design

The current study followed a descriptive correlational research design (Frain, Barton-Burke, Bachman, King, Klebert & Hsueh et al., 2014; Stangor & Walinga, 2014) which is aimed to describe the relationship among variables rather than to infer cause and effect relationships. Descriptive correlational studies are useful for describing how one phenomenon is related to another in situations where the researcher has no control over the independent variables, the variables that are believed to cause or influence the dependent or outcome variable. The current study used secondary data to identify the HIV exposed and unexposed individuals amongst women performing TOP from January 2015 to December 2019.

3.4 Study Population

A study population is a group of individuals having one or more characteristics of interest and it is therefore understandable why research findings are attributed to the population either by linking them to specific or all participants (Asiamah, Mensah & Oteng-Abayie, 2017). The defined population then will become the basis for applying the research results to other relevant populations. It is critical to clearly define a study population early in the research process as this helps to assure the overall validity of the study results (Eldredge, Weagel & Kroth, 2014). In this study, the population used was the records of all women who performed termination of pregnancy at Seshego clinic of Limpopo Province.

3.5 Sampling strategy and sample size

Sampling refers to a technique (procedure or device) which the researcher will employ to systematically select a relatively smaller number of representative items or individuals (a subset) from a pre-defined population to serve as subjects (data source) for observation or experimentation as per objectives of his or her study (Brink, 2015; Sharma, 2017). In the current study, non-probability sampling was used which is a sampling procedure that does not bid a basis for any opinion of probability that elements in the universe will have a chance to be included in the study sample (Etikan, & Bala, 2017). In this study, a Total Population Sampling (TPS) was used which is a technique where the entire population that meet the criteria (e.g. specific skill set, experience, etc.) are included in the research being conducted (Etikan et al., 2016). Total Population Sampling was used because the number of women who terminated pregnancies in Seshego Zone 4 clinic per year were relatively small. Therefore, all the records of women who terminated pregnancies from January 2015 to December 2019 which met the criteria were included in this study. This sampling method made it possible to get deep insights into the phenomenon which we were interested in and with such wide coverage of the population of interest, there was also a reduced risk of missing potential insights from members that are not included.

3.5.1 Inclusion Criteria

All records of women who terminated pregnancy at Seshego Zone 4 clinic from January 2015 to December 2019 were included in the study and have their HIV records documented

3.5.2 Exclusion Criteria

All records of women who terminated pregnancy at Seshego Zone 4 clinic from January 2015 to December 2019 with incomplete information such as evidence of HIV testing and HIV results were excluded.

3.6 Data Management

3.6.1 *Data Collection*

The researcher used a self-designed data extraction tool (see annexure 6) which was developed through reading the literature to get suitable variables to answer the research question and objectives. The data extraction tool covered the domains such as age of the women, educational status, marital status, occupational status, year and month of termination of pregnancy, gestational age, parity, and gravidity, method of contraceptive used, HIV status, ARV and ARV regimens. The data was collected from the clinic database of termination of pregnancy using the data extraction tool. The data was extracted into an excel spreadsheet then data cleaning began looking at the missing key variables.

3.6.2 *Data Analysis*

All collected data were double checked by researcher and the supervisor for quality assurance purposes before being analysed. The STATA statistical software version 12 for Windows (STATA Corporation, College Station, Texas) was used for data analysis.

3.6.2.1 *Frequency distributions*

Frequencies tables were used to display distributions of the variables as these provide a good overall picture of a large set of grouped data into different classes. This was used to determine the characteristics of the study sample and, subsequently, to estimate the prevalence of HIV amongst women who terminated pregnancy stratified by socio demographic factors.

3.6.2.2 *Coding of variables*

The number 1 was used for coding the event occurring (HIV positive which is the focus of the analysis/study) and 0 for coding the absence of an event (HIV negative which is the reference category) for the dependent variable.

3.6.2.3 *Categorical data*

The grouping of variables to describe categories of women who terminated pregnancy was used in the form of cross-tabulation to explain the relationship between two or more categorical variables. Pearson chi-square was used to appraise the data for independence.

3.6.2.4 *Logistic regression*

In order to analyse the association of HIV and termination of pregnancy, socio demographic factors within the framework of multiplicative model with the more obvious effect measure of odds ratio with an associated confidence interval were carried out using binary logistic regression analysis using a dependent variable (1 = yes, 0 = no) while other factors were independent variables. The *p-value* of less than 0.05 in the study results implied that there was a statistical significant difference in means between dependent variable and independent variables which were investigated.

3.6.2.4.1 *Independent variables*

In this study, the independent variables were socio demographic factors such as age of the women, educational status, marital status, occupational status, year and month of termination of pregnancy, gestational age, parity, and gravidity, method of contraceptive used, ARV and ARV regimens.

3.6.2.4.2 *Dependent variables*

The dependent variable was HIV status (HIV positive or negative)

3.7 Bias

Bias refers to systematic error in the design, conduct or analysis of a study which results in erroneous estimates (Vetter & Mascha, 2017). In the current study, quality was maintained during data extraction as well as following proper sampling procedures. The main source of bias in this study was related to the use of existing data and not being able to control self-report bias. Incomplete entries could also introduce non-response bias which are mostly difficult for the researcher to control. However, this was minimized by excluding the records with incomplete entries to minimize their potential effects on the results in the current study. Stratification and adjustment were used to deal with any other potential confounders during data analysis. The researcher also was cautious about what kinds of conclusions will be drawn from self-report measures.

Selection bias was minimized by following the inclusion criteria which was used to select the records of all women who performed termination of pregnancy during the study period. The data extraction tool aided in addressing the possibility of missing data obtained from a participant's medical records. To address unavoidable bias, the researcher adhered to the research methodology and engaged with a statistician together with supervisor to check the data analysis in order to ensure that the data analyzed was a true reflection of the data gathered from the database.

3.8 Reliability & Validity

3.8.1 *Reliability*

Reliability relates to the consistency of a measure (Watson, 2015). To ensure reliability of the collected data, internal consistency (Heale &

Twycross, 2015) was maintained by ensuring that the data extraction tool was not changed. In addition, the use of the data extraction tool was piloted at Seshego Zone 1 Clinic before it was used at the study site which was Seshego Zone 4 clinic in order to ensure that it measures what it is intended to measure.

3.8.2 *Validity*

Validity is defined as the extent to which a concept is accurately measured in a quantitative study (Heale & Twycross, 2015). Validity is when the instrument is able to produce results that reflect the purpose it was initially designed to measure (Bastos, Duquia, Ganzalez-Chica, Mesa & Bonamigo, 2014). In the current study, content validity was the category of validity which was used as it looked at whether the instrument adequately covers all the content that it should with respect to the variable. The data extraction tool was used to ensure that the entire domain related study variables which are designed to be measure are collected from the database consistently.

3.8.3 *Internal validity*

Internal validity is the degree to which a study is free from bias or systematic errors (A Dictionary of Epidemiology, 2014). Internal validity was ensured by making sure that the research findings are sound by doing everything in line with the approved proposal. Secondly, this was ensured by identifying confounding variables that may affect the findings. This in conclusion, assisted to make sure that the results are not influenced by other factors however are caused by only one independent variable. To ensure internal validity, the data collection tool was checked by the researcher's supervisor to ensure its validity. This is the extent to which the results of a study can be generalized to other populations and settings (Cozby & Bates, 2015). The sample size in this study afforded the data collection tool good external validity, as the size was representative of the women who terminated pregnancies in the population.

3.9 Ethical consideration

Ethics is a branch of philosophy that deals with the conduct of people and guides the norms or standards of behavior of people and relationships with each other. Researchers are professionals hence, research ethics as a branch of applied ethics has well established rules and guidelines that defines their conduct. Research ethics is important in our daily life research endeavors and requires that researchers should protect the dignity of their subjects and publish well the information that is researcher (Akaranga & Makau, 2016). The current study addressed the ethical issues such as the approval to conduct the study, principles of justice, consent for participation, autonomy, confidentiality, privacy and minimizing harm.

3.9.1 *Ethical approval*

The study proposal was presented at the Department of Public Health University of Limpopo then sent to the School of Healthcare Sciences and Faculty of Health Sciences for further review before it was sent to Turfloop Research Ethics Committee (TREC) at University of Limpopo for ethical clearance. The TREC then grant ethical approval to conduct the study.

3.9.2 *Permission to conduct the study*

The approved proposal together with the TREC certificate were sent to the gatekeepers of the secondary data being the Limpopo Provincial Department of Health, Capricorn District Department of Health, and the Seshego Zone 4 clinic. These gatekeepers governs the standards of conduct for scientific researchers. It was important to adhere to ethical principles in order to protect the dignity, rights and welfare of research participants.

3.9.3 *Principle of Justice*

The researcher used a total population sampling where the entire population that met the inclusion criteria was fairly selected. The inclusion and exclusion criteria were explicit within the research protocol and were followed to ensure equal opportunities to the participants, meaning all patient's records selected were included in the study. The principle of justice in the current study was also ensured by making consideration to who benefits and who bears the burden of the evidence generation. Proper determination of the appropriateness of proposed methods of selecting patient's records were done in such a way that the selection did not result in unjust distributions of the burdens and benefits of evidence generation. Such considerations are required to avoid the injustice that arises from social, racial, sexual, and cultural biases institutionalized in society.

3.9.4 *Consent form for participation*

The current study used secondary data and therefore, consent forms were not necessary. This was covered by the Promotion of Access to Information Act (PAIA) (Peekhaus, 2014).

3.9.5 *Autonomy and Confidentiality*

Confidentiality refers to the researcher's agreement to handle, store, and share research data to ensure that information obtained from and about research participants is not improperly divulged (Brink, 2015). To maintain autonomy and confidentiality in the current study, the researcher used the unique codes or numbers to ensure that the collected data remains anonymous and confidential by not using patients' personal identifiers. As the extracted data was for the research purpose, the information will remain protected from disclosure outside of the research setting or to unauthorized persons. Secure data storage was maintained by making use of passwords that were needed to gain access to the saved data records by the researcher and the supervisor. The password was made to be difficult to determine and be protected as carefully as confidential data. The password was never shared or left on slips of paper at work stations or desks.

3.9.6 Privacy

Privacy for research participants is a concept in research ethics which states that a person in human subject research has a right to privacy when participating in research (Brink, 2015). The current study used secondary data from the files obtained in the clinic and therefore, privacy of the data was maintained by making sure that the researcher and the supervisor do not release the database with approximate patient's personal identifiable information. Similarly, with the confidentiality, to maintain privacy of the extracted data, secure data storage was maintained by making use of passwords that were needed to gain access to the saved data records by the researcher and the supervisor. The password was made to be difficult to determine and be protected as carefully as confidential data. The password was never shared or left on slips of paper at work stations or desks.

3.9.7 Harm

No harm was anticipated as the current study used secondary data from the clinic.

4 CHAPTER 4: RESULTS

4.1 Introduction

This chapter describes the analysis of the data and the interpretation of the research findings, which were guided by the research question posed in the study. The data was analyzed to determine the prevalence of HIV and its association with termination of pregnancy. The data was extracted from the clinic database and a total of 1799 records were reviewed.

4.2 Data management and analysis

After the data collection process was finalized, the completed database was securely stored. The information was captured on a Microsoft Excel spreadsheet then stored on a compact disc for confidentiality and privacy reasons. Descriptive statistical analysis was undertaken using the STATA statistical software version 12 for Windows (STATA Corporation, College Station, Texas) in order to identify frequencies and percentages of answers to the research questions. The statistical significance of the relationships between the selected variables was determined using the t-test. The level of significance was set at 0.05.

Table 4.1 Accuracy and completeness of the records which were retrieved from the database

Year	Total TOP's	Complete records	% of Complete records	Incomplete records	% of Incomplete records
2015	442	413	23,0	29	6,6
2016	351	326	18,1	25	7,1
2017	247	159	8,8	88	35,6

2018	241	152	8,4	89	36,9
2018	750	749	41,6	1	0,1
Total	2031	1799	100,0	232	100,0

Table 4.1 below presents the accuracy of the records which were retrieved from the database. It was revealed that approximately 89% of the records had evidence of HIV testing and results of HIV tests were available. Majority of the incomplete records (no evidence of HIV testing and results) were found during the years 2017 and 2018 at 35.6% and 36.9% respectively. The least number of incomplete records were in the years 2018 at 0.1% followed by 2015 and 2016 at 6.6% and 7.1% respectively.

4.3 Research results

4.3.1 Socio-demographic characteristics of pregnant women with diabetes

Table 4.2 below presents the socio-demographics of the women who terminated pregnancy in the study area. The mean age was 24.98 years (standard deviation [SD] =14.4). The majority of women who terminated pregnancies were in the age group 20 – 24 years at 35.7% followed by age group 25 – 29 years, 15 – 19 years, 30 – 34 years and 35 – 39 years at 23.9%, 18.2% 12.9% and 6.7% respectively. The least number of women who terminated pregnancies were in the age groups ≥ 40 years and ≤ 14 years at 2.3% and 0.3% respectively. Majority of the women who terminated pregnancies were single 96.7% and majority had a tertiary education at 61.3% followed by secondary education and those with primary or no educational level at 33.3% and 5.4% respectively.

		No	(%)
Age in years			
	≤ 14	6	0.3
	15 – 19	327	18.2
	20 – 24	641	35.7
	25 – 29	430	23.9
	30 – 34	232	12.9
	35 – 39	120	6.7
	≥ 40	42	2.3
Marital status			
	Single	1740	96.7
	Married	57	3.2
	Divorced	1	0.1
	Widowed	1	0.1
Educational level			
	Primary or No education	97	5.4
	Secondary	599	33.3
	Tertiary	1103	61.3
Gestational age			
	1 – 8 weeks	886	49.3
	≥ 9 weeks	913	50.7
Parity			
	0	760	42.3
	1 – 2	852	47.4
	3 – 4	178	9.9
	≥ 5	9	0.5
Gravidity			
	1	769	42.8
	2	488	27.1
	3 – 4	485	26.9
	≥ 5	57	3.2
Method of contraception			
	Oral	49	2.7
	Implant	684	38.0
	Injection	601	33.4
	IUD	459	25.5
	Refused	6	0.3

Table 4.2: Demographics information of women who terminated pregnancy

Majority of the women who terminated pregnancies had approximately 1 – 2 number of pregnancies that have each resulted in the birth of an infant capable of survival (parity) at 47.4% followed by parity of zero at 42.3% and 3 – 4 number of pregnancies that have each resulted in the birth of an infant capable of survival at 9.9%. Majority of the women who terminated pregnancies were in their first pregnancies (gravida) at 42.8% followed by those who were pregnant for the second time at 27.1% and those who were pregnant between the 3rd and 4th time were 26.9% and those who had five or more pregnancies were at 3.2%. The current study revealed that majority of the women who terminated pregnancies used contraceptive implant is a flexible plastic rod about the size of a matchstick that is placed under the skin of the upper arm at 38.0% followed by those who used the contraceptive injection which is a shot that contains the hormone progestogen that stops the women body from releasing eggs and thickens the mucus at the cervix at 33.4%. Approximately 25.5% of women who terminated pregnancies used Intrauterine Device (IUD) which is a tiny device that's put into the women's uterus to prevent pregnancy and only 2.7% of women who terminated pregnancies used oral contraceptives while 0.3% refused to sued any form of contraceptive as illustrated in Table 4.2 above.

The current study findings how that there was a statistical significance difference (*p<0.001*) of the use of contraceptives by age groups. Of those women who used contraceptive implant, majority were in the age group 20 – 24 years at 37.7% followed by age groups 15 – 19 years, 25 – 29 years and 30 – 34 years at 26.9%, 19.9% and 10.4% respectively. Similarly, of those women who used contraceptive injection, majority were in the age group 20 – 24 years but at 41% followed by age group 25 – 29 years, 15 – 19 years and 30 – 34 years at 19.7% and 16% respectively. Of those women who used oral contraceptives, majority were in the age group 25 – 29 years at 40.8% followed by age group 20 – 24 years, 35 – 39 years and 15 – 19 years at 14.3% and 12.2% respectively. The current study findings show that there was a statistical significance difference (*p<0.001*) in relation to the number of pregnancies that have each resulted in the birth of an infant capable of survival (parity) and similarly to gravidity (Table 4.3 below).

Table 4.3: Distribution of methods of contraceptives, gestational age, parity and gravida stratified by age group for women who terminated pregnancy

Variables	Age group in years							
		15 – 19	20 – 24	25 – 29	30 – 34	35 – 39	≥ 40	
Method of contraception	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	*P value for trend*
Oral	0 (0.0)	6 (12.2)	14 (28.6)	20 (40.8)	2 (4.1)	7 (14.3)	0 (0.0)	
Implant	6 (0.9)	184 (26.9)	258 (37.7)	136 (19.9)	71 (10.4)	21 (3.1)	8 (1.2)	
Injection	0 (0.0)	96 (16.0)	246 (41.0)	118 (19.7)	82 (13.7)	43 (7.2)	15 (2.5)	
IUD	0 (0.0)	40 (8.7)	119 (25.9)	156 (34.0)	77 (16.8)	48 (10.5)	19 (4.1)	<0.001
Refused	0 (0.0)	1 (16.7)	4 (66.7)	0 (0.0)	0 (0.0)	1 (16.7)	0 (0.0)	
Gestational age								
0	4 (0.5)	137 (15.5)	329 (37.2)	215 (24.3)	117 (13.2)	60 (6.8)	23 (2.6)	
1	2 (0.2)	190 (20.8)	312 (34.2)	215 (23.6)	115 (12.6)	60 (6.6)	19 (2.1)	0.139
Parity								
0	6 (0.8)	293 (38.6)	400 (52.7)	50 (6.6)	8 (1.1)	2 (0.3)	0 (0.0)	
1 – 2	0 (0.0)	34 (4.0)	233 (27.4)	363 (42.6)	172 (20.2)	44 (5.2)	6 (0.7)	
3 – 4	0 (0.0)	0 (0.0)	8 (4.5)	17 (9.6)	49 (27.5)	71 (39.9)	33 (18.5)	<0.001
≥ 5	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	3 (33.3)	3 (33.3)	3 (33.3)	
Gravida								
1	6 (0.8)	293 (38.2)	400 (52.1)	54 (7.0)	12 (1.6)	2 (0.3)	1 (0.1)	
2	0 (0.0)	29 (5.9)	205 (42.0)	214 (43.9)	36 (7.4)	2 (0.4)	2 (0.4)	
3 – 4	0 (0.0)	5 (1.0)	34 (7.0)	161 (33.2)	172 (35.5)	93 (19.2)	20 (4.1)	<0.001
≥ 5	0 (0.0)	0 (0.0)	2 (3.5)	1 (1.8)	12 (21.1)	23 (40.4)	19 (33.3)	

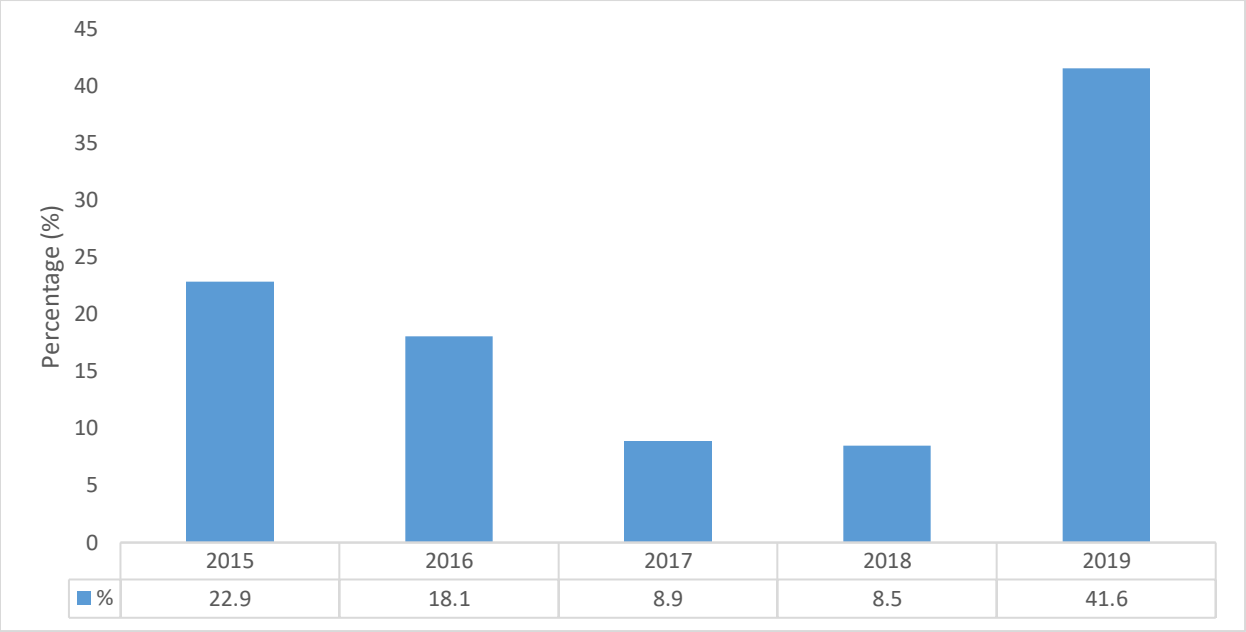

Figure 4.1: Proportion of women who terminated pregnancies per year, 2015 – 2019

Figure 4.1 above presents the proportion of women who terminated pregnancies per year starting from the year 2015 – 2019 at Seshego Zone 4 Clinic. Majority of women terminated pregnancies during the year 2019 at 41.6% followed by the year 2015 and 2016 at 22.9% and 18.1% respectively. During the year 2016 majority of women terminated pregnancies during the month of July while in 2015 majority terminated pregnancies during the month of May as illustrated in table 4.2 below. There was a statistical significance difference between the year's pregnancies were terminated per month at terminated pregnancies during the $p<0.001$.

Table 4.4 below presents the proportion of women who terminated pregnancy per year stratified by month. It shows that the termination of pregnancy rates has decreased from 22.9% in 2016 to 8.5% in 2018 and increased to 41.6% in 2019. The difference in rates of termination of pregnancies by year stratified by month has shown a statistical significant difference between the months per year.

Table 4.4: Proportion of women who terminated pregnancy per year stratified by month

	Period in years					
	2015 n (%)	2016 n (%)	2017 n (%)	2018 n (%)	2019 n (%)	*P value for trend*
Months						
Jan	35 (8.5)	0 (0.0)	57 (35.6)	1 (0.7)	60 (8.5)	
Feb	32 (7.8)	0 (0.0)	101 (63.1)	0 (0.0)	38 (5.1)	
March	26 (6.3)	0 (0.0)	0 (0.0)	0 (0.0)	65 (8.7)	
April	35 (8.5)	44 (13.5)	1 (0.6)	0 (0.0)	105 (14.0)	
May	51 (12.4)	44 (13.5)	0 (0.0)	0 (0.0)	72 (9.6)	
June	26 (6.3)	29 (8.9)	1 (0.6)	0 (0.0)	68 (9.1)	
July	29 (7.0)	53 (16.3)	0 (0.0)	37 (24.3)	0 (0.0)	<0.001
Aug	40 (9.7)	37 (11.4)	0 (0.0)	0 (0.0)	125 (16.7)	
Sep	34 (8.2)	37 (11.4)	0 (0.0)	0 (0.0)	91 (12.2)	
Oct	38 (9.2)	26 (8.0)	0 (0.0)	26 (17.1)	124 (16.6)	
Nov	36 (8.7)	28 (8.6)	0 (0.0)	62 (40.8)	1 (0.1)	
Dec	31 (7.5)	27 (8.3)	0 (0.0)	26 (17.1)	0 (0.0)	

4.3.2 Prevalence of HIV amongst women terminating pregnancy

The prevalence of HIV amongst women who terminated pregnancy in the current study was found to be 11.6% at confidence interval (10.2 – 13.1). As illustrated in Figure 4.2 below, the prevalence of HIV amongst women who terminated pregnancies high in 2018 at 10.5% followed by 2019, 2015 and 2016 at 10.3%, 9.2% and 9.1% respectively.

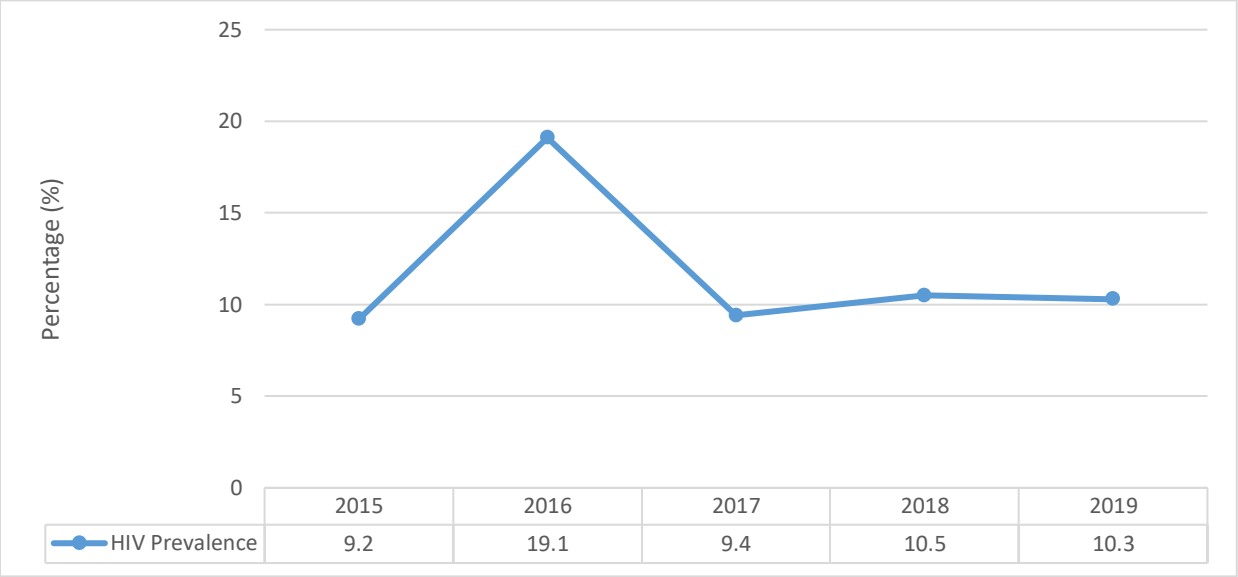

Figure 4.2: Prevalence of HIV amongst women who terminated pregnancy by year

The prevalence of HIV amongst women who terminated pregnancies increased with increasing age from 7.0% at age group 15 – 19 years to age group 40 years and above at 21.4% as illustrated in in Figure 4.3 below.

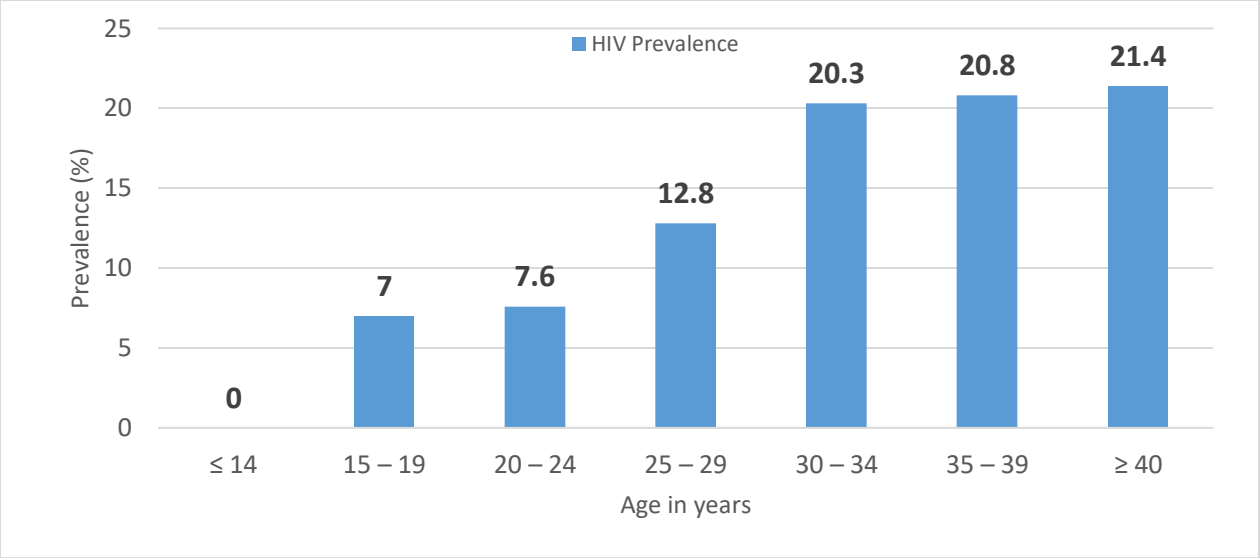

Figure 4.3: Prevalence of HIV amongst women who terminated pregnancy by age group

The prevalence of HIV amongst women who terminated pregnancies increased with increasing level of education from 4.1% amongst women who had primary or no educational level the followed by 9,0% and 13.6% in women who had secondary and tertiary educational level respectively as illustrated in in Figure 4.4 below.

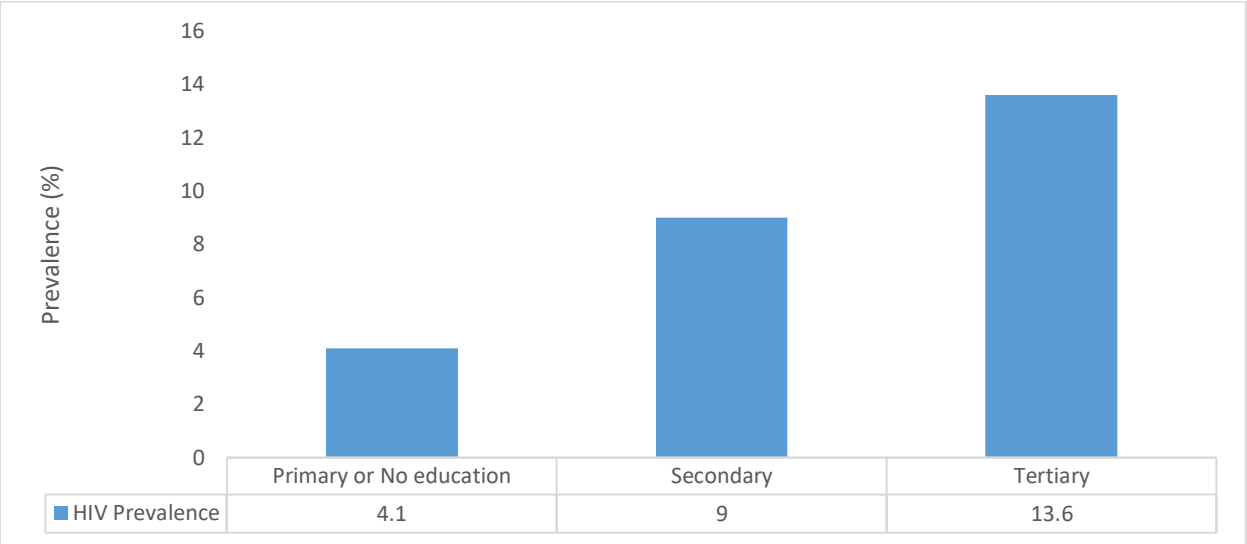

Figure 4.4: Prevalence of HIV amongst women who terminated pregnancy by level of education

Approximately 85% of women who terminated pregnancies did not know their HIV status while only 14.6% knew their HIV status before they terminate the current pregnancy as presented in Figure 4.5 below.

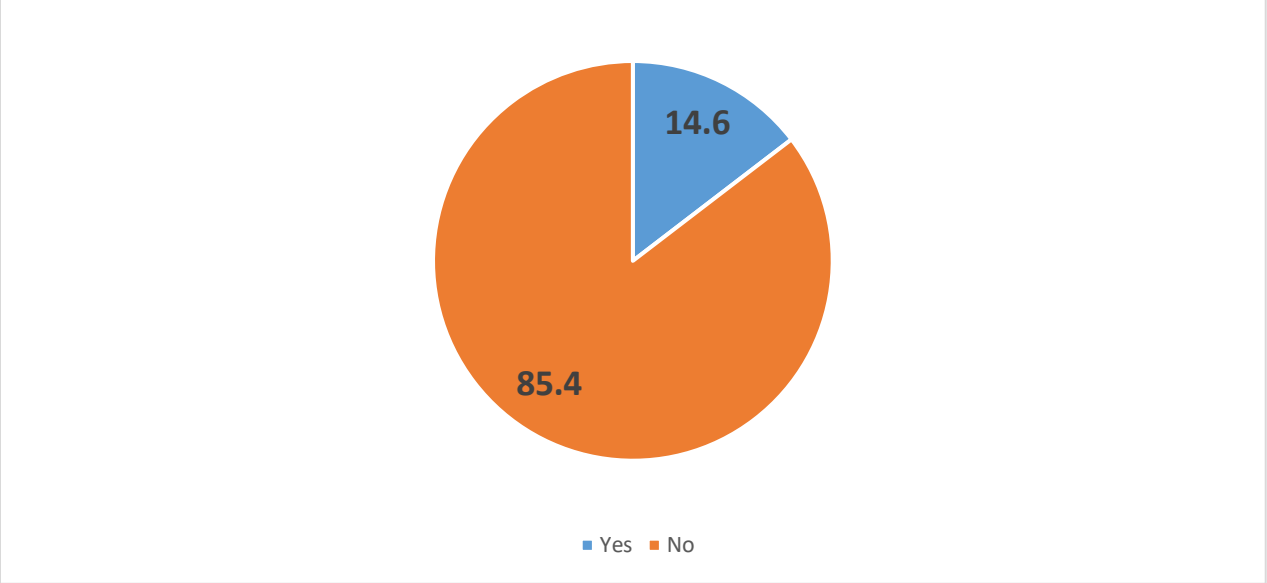

Figure 4.5: Proportion of women who terminated pregnancy knowing their HIV status

Considering women who terminated pregnancies and being HIV positive, approximately 10.1% were on ART while 89.9% had not been initiated on ART as presented in Figure 4.6 below.

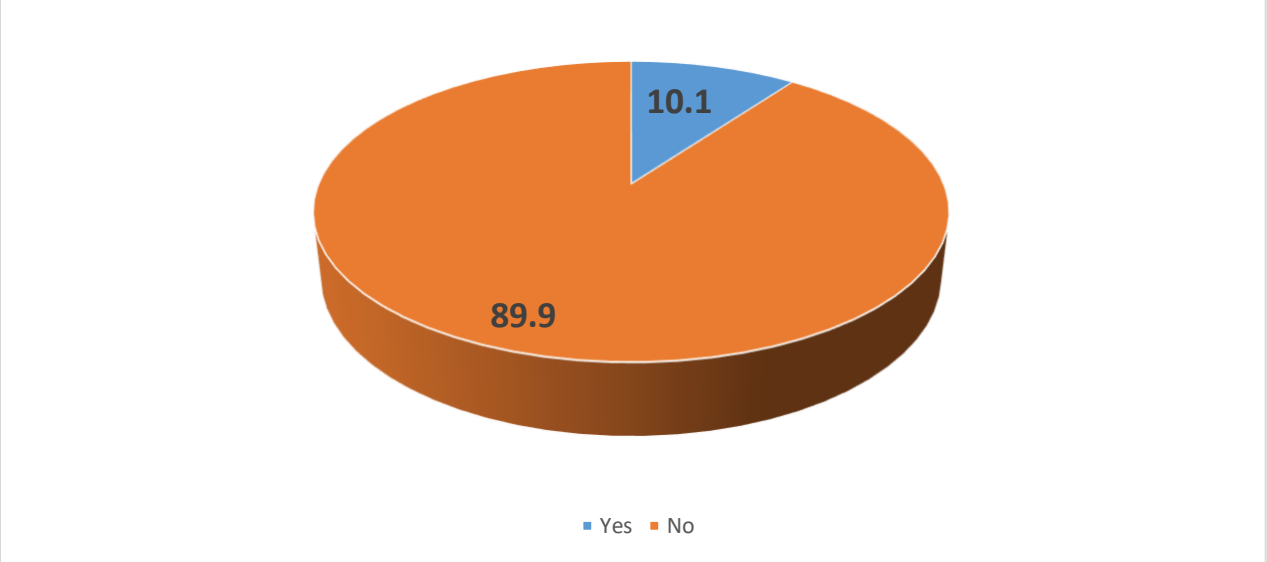

Figure 4.6: Women who terminated pregnancy being HIV positive and on ART

4.3.3 Association of HIV with termination of pregnancy

In the univariate logistic regression, the risk of women who terminated pregnancies being HIV positive increased significantly with age as older women (age 20 years and above) were 1.9 times more likely to be HIV positive as compared to younger ones (*p=0.004*). Women who were in age group 25 – 29 years were 1.9 times more likely to be HIV positive (p<*0.001*) and those in age group 30 – 34 years were 3.4 times more likely to be HIV positive (p<*0.001*). The women who were in age group 35 – 39 years were 3.5 time more likely to be HIV positive (p<*0.001*) and those in age group 40 years and above were 3.7 times more likely to be HIV positive (p=*0.003*) as compared to the younger ones as presented in Table 4.5 below.

The association of marital status of women who terminated pregnancies and HIV revealed that singe women were 2.3 times more likely to be HIV positive as compared to married women (*p=0.007*). Women who terminated pregnancies and been widowed were 0.4 times less likely to be HIV positive (p<*0.001*) as compared to married women. The educational levels of women who terminated pregnancies was significantly associated with been HIV positive as those with secondary educational level were 2.3 those who had tertiary educational level were 3.6 times more likely to be HIV positive as compared to those with primary or no educational level at p=*0.018* and *p<=0.001* respectively as presented in Table 4.5 below.

Table 4.5 Association of HIV with termination of pregnancy

	Univariate Logistic Regression	
Age in years	OR(95%CI)	p-value
≤ 19	Ref	
Older	1.9 (1.2 – 3.1)	0.004
Age group in years		
≤ 19	Ref	
20 – 24	1.1 (0.7 – 1.7)	0.677
25 – 29	1.9 (1.2 – 3.3)	<0.001
30 – 34	3.4 (2.0 – 5.8)	<0.001
35 – 39	3.5 (1.9 – 6.5)	<0.001
≥ 40	3.7 (1.6 – 8.6)	0.003
Marital status		
Married	Ref	
Single	2.3 (0.6 – 3.8)	0.007
Divorced	0.2 (0.06 – 0.5)	0.321
Widowed	0.4 (0.2 - 0.6)	<0.001
Level of education		
None or Primary	Ref	
Secondary	2.3 (0.6 – 6.5)	0.018
Tertiary	3.6 (1.3 – 10.1)	0.012
Parity		
0	Ref	
1 – 2	2.5 (1.8 – 3.5)	<0.001
3 – 4	2.8 (1.7 – 4.5)	<0.001
≥ 5	4.1 (0.8 – 20.0)	0.086
Gravida		
1	Ref	
2	2.0 (1.4 – 3.0)	<0.001
3 – 4	2.9 (2.1 – 4.3)	<0.001
≥ 5	2.9 (1.4 – 6.3)	0.004
Gestational age		
1 – 8 weeks	Ref	
≥ 9 weeks	1.2 (0.9 – 1.7)	0.092
Contraceptive use		
No	Ref	
Yes	1.5 (1.2 – 1.7)	<0.001
Known HIV status		
Yes	Ref	
No	0.03 (0.02 – 0.04)	<0.001

The association of parity of women who terminated pregnancies and HIV revealed that women with 1 – 2 and 3 – 4 number of pregnancies that have each resulted in the birth of an infant capable of survival were 2.5 and 2.8 times more likely to be HIV

positive as compared to zero number of pregnancies that have each resulted in the birth of an infant capable of survival married women at *p<0.001*. Women with five or more number of pregnancies that have each resulted in the birth of an infant capable of survival were 4.1 times more likely to be HIV positive as compared to zero number of pregnancies that have each resulted in the birth of an infant capable of survival but not significant (*p=0.086*). The association of gravida of women who terminated pregnancies and HIV revealed that women who were in their second pregnancies (gravida) were 2 times more likely to be HIV positive and those in either the third or pregnancy and fifth or more pregnancies were both 2.9 times more likely to be HIV positive (p<*0.001*) as compared to those in their first pregnancy. Gestational age was not significantly associated with HIV positive as presented in Table 4.4 above. The women who terminated pregnancies and been in the use of contraceptives were 1.5 times more likely to be HIV positive and those who did now know their HIV status were 0.03 times less likely to be HIV positive as presented in Table 4.5 above.

4.3.4 Overview of research findings

The prevalence of HIV amongst women who terminated pregnancies in the current study was found to be 11.6% (95% CI: 10.2 – 13.1). The prevalence of HIV increased with increasing age and majority (85%) of women who terminated pregnancies did not know their HIV status and of those who were HIV positive, approximately 10.1% were on ART. Age, marital status, educational level, parity and gravida were significantly associated with been HIV positive while gestational age was not significantly associated with HIV positive.

4.3.5 Conclusion

In this chapter, the results of the study were presented and interpreted. The next chapter discusses these findings and compares the findings of this study to the relevant literature.

5 CHAPTER 5: DISCUSSION AND CONCLUSION

5.1 Introduction

In the previous chapter, the findings of this study were presented and interpreted. In this chapter, the results of this study are discussed and compared to the relevant literature. The chapter is divided into the following sub-sections: (1) introduction (2) prevalence of HIV amongst women who terminated pregnancy and (3) the association between HIV and termination of pregnancy, (4) study limitations, (5) conclusion and (6) recommendation. The current study findings revealed that approximately 89% of the records had evidence of HIV testing and results of HIV tests were available. Majority of the incomplete records (no evidence of HIV testing and results) were found during the years 2017 and 2018 at 35.6% and 36.9% respectively. The least number of incomplete records were in the years 2018 at 0.1% followed by 2015 and 2016 at 6.6% and 7.1% respectively. This might be due to the community acceptance of HIV testing as the roll-out of ART is increased for community members to get access to treatment.

5.2 Socio-demographics of women who terminated pregnancies

The current study findings revealed that the mean age of women who terminated pregnancies was 24.98 which differs from the findings of a study conducted in Nigeria (Yaya, Amouzou, Uthman, Ekholuenetale, Bishwajit & Udenigwe et al., 2018) and also differs with findings from another study conducted in Greece (Dagklis, Papazisis, Tsakiridis, Chouliara, Mamopoulos & Rousso, 2016). Termination of pregnancies or abortion among adolescents and youth is a major public health issue, especially in developing countries (Frederico, Michielsen, Arnaldo & Decat, 2018). In a study conducted in Ethiopia, approximately 21.1% of women who terminated pregnancies were in the age group between 15 and 24 (Goshu & Yitayew, 2019) which is lower than the current study findings. In Nigeria, older women (40–49 years) had lower percentage of unintended pregnancy, but for women aged 15–19 years the prevalence was very high (Yaya et al., 2018).

Educated women had significant higher odds of terminated and unintended pregnancies compared with women with no formal education (Frederico et al., 2018) and this concurs with the findings of the current study. However, in a study conducted from six hospitals in Flanders, Belgium, women who were less educated (no education or primary) had a high rate of termination of pregnancy (Goossens, Van Den Branden, Van der Sluys, Delbaere, Van Hecke, Verhaeghe & Beeckman, 2016). The rate of termination of pregnancy was higher among women who had secondary school education and higher education than those who had no formal education (Seidu, Ahinkorah, Agbemavi, Amu & Bonsu, 2019) which concurs with the findings from the current study. The current study findings revelaed that single women had a high rate of termination of pregnancy which concurs with studies conducted in Belgium (Goossens et al., 2016) and Norway (Justad-Berg, Eskild & Strøm-Roum, 2015). Pregnancy termination was more prevalent among unmarried women than married women (Seidu et al., 2019) which concurs with the findings from the current study. There is a wealth of literature affirming the higher rate of unintended pregnancies among unmarried women and in married women who live in communities with increased prevalence of divorced or separated women (Masho, Rozario, Walker, & Cha, 2018).

The findings of the current study revealed that women with 1 – 2 children had a high rate of termination of pregnancy as compared to those with no children. These findings differ with a studies conducted in Ghana (Dickson et al. 2018; Seidu et al., 2019) as women with no children were more likely to have a terminated pregnancy than women with parity 1 and above. The possible social explanation is that women who have not given birth yet might not be ready to give birth and as a result may opt for an induced abortion to be able to prepare themselves adequately before giving birth (Dickson et al. 2018). Women with 4+ children had lower rate of terminating pregnancies than those with 0 parity (Seidu et al., 2019) which concurs with findings of the current study.

The South African Choice on Termination of Pregnancy (CTOP) Act, passed in 1996, replaced the previously restrictive Abortion and Sterilization Act of 1975. The CTOP Act

provides for abortion on request up to and including 12 weeks of gestation. This Act promotes woman's reproductive right to have an early, safe and legal abortion (Harries, Gerdts, Momberg & Foster, 2015). In the current study, the highest gestational age was at 12 weeks which support the implementation of the CTOP Act in South Africa. In a study conducted by Woolner et al., (2014) the majority of women underwent termination of pregnancy prior to 13 weeks of gestation which concurs with the current study findings. In the current study there was no women who terminated pregnancy at late gestational age of more than weeks. It is plausible that trauma caused by cervical dilatation and uterine evacuation during surgical termination of pregnancy could damage the cervix and it is possible that late gestational age terminations could lead to a greater risk of spontaneous preterm delivery in future pregnancies (Woolner, Bhattacharya & Bhattacharya, 2014).

Lack of access to contraceptive services may lead to unplanned pregnancies or pregnancy termination, which can in turn lead to increased maternal mortality, continued dependence on sex work to financially support children, or HIV transmission to children if prevention of mother-to-child transmission services are not utilized (Schwartz, Papworth, Thiam-Niangoin, Abo, Drame, Diouf & Bamba et al., 2015; Chanda, Ortblad, Mwale, Chongo, Kanchele & Kamungoma et al., 2017). In the current study, only 0.3% women refused to use contraceptives and majority were using implant which is a flexible plastic rod about the size of a matchstick that is placed under the skin of the upper arm. Almost all women who terminated pregnancies had use one form of contraceptive before which could be the result of the women-requested discontinuation which was not part of the study investigations. Pregnancy rates by 12 months postpartum were lower than previously reported in younger age group in both implant initiators and IUD initiators (Cohen, Sheeder, Arango, Teal & Tocce, 2016). Considering the proportion of women who terminated pregnancy per year stratified by month, the current study findings revealed that there has been a decrease in the rates of termination of pregnancies per year which concurs with a study conducted in United States (Jones & Jerman, 2017).

5.3 Prevalence of HIV amongst women who terminated pregnancy

Health and survival outcomes for people living with HIV have improved dramatically since the advent of combination antiretroviral therapy (cART) (Patterson, Cescon, Samji, Chan, Zhang & Raboud et al., 2015). HIV treatment with sustained viral suppression is also enabling safer reproductive options for women living with HIV (WLWH), including better maternal health, improved fertility, negligible risk of HIV transmission to partners during condomless sex (Rodger, Cambiano, Bruun, Vernazza, Collins & Van Lunzen et al., 2016; Rodger, Bruun, Cambiano, Vernazza, Strada & Van Lunzen, 2014), and dramatic reductions in perinatal HIV transmission risk (Okafor, Ugwu, Obi & Odugu, 2014). These improvements have transformed the reproductive health landscape for people living with or affected by HIV (Kaida, Matthews, Kanters, Kabakyenga, Muzoora & Mocello et al., 2013), with studies demonstrating that WLWH are more likely to become pregnant and have children in the modern cART era than in earlier years of the HIV epidemic (Salters et al., 2017).

Young women aged 15–24 years are members of key populations at higher risk for Human Immunodeficiency Virus (HIV) acquisition through sexual intercourse (Mabaso, Sokhela, Mohlabane, Chibi, Zuma & Simbayi, 2018). The prevalence of HIV 2.5 % (95 % CI: 1.3–4.7 %) amongst women who terminated pregnancies in a study conducted in Ethiopia (Mulu, Zenebe, Abera, Yimer & Hailu, 2016) which is much lower that the prevalence found in the current study of 11.6% (95 % CI: 10.2 – 13.1 %).

Within prevention of mother to child transmission (PMTCT) of HIV programs worldwide, the focus remains on providing antiretroviral medicines (ARVs) to the mother–baby pair although prevention of unwanted pregnancies among HIV-infected women has been suggested as an essential strategy (Darak, Hutter, Kulkarni, Kulkarni & Janssen, 2016). Studies from Sub-Saharan Africa, Europe, and the USA suggest higher rates of unwanted pregnancies and induced abortion among HIV-infected women compared to HIV-uninfected women (Ammassari, Cicconi, Ladisa, Di Sora, Bini & Trotta et al., 2013.; Decker, Yam, Wirtz, Baral, Peryshkina & Mogilnyi et al., 2013; Darak et al., 2016)

The current study findings revealed that very few women (10.1%) who terminated pregnancies while HIV positive were on ART which concur with findings of a study conducted in Cape Town, South Africa highest in women who were known HIV positive but not on ART (53%) (Iyun, Brittain, Phillips, Le Roux, McIntyre & Zerbe et al., 2018). This signifies that more women who are HIV positive are not initiated on ART and this pose a risk on HIV transmission to their sexual partners.

5.4 The association between HIV and termination of pregnancy

The risk of women who terminating pregnancies being HIV positive in the current study increased significantly with increasing age as older women were 1.9 times more likely to be HIV positive as compared to younger ones (*p=0.004*) which differs from the findings by Jacobs et al., (2016) were older women were less likely to be HIV positive and terminate pregnancies (OR 0.35, 95% CI 0.28, 0.42) (Jacobs, Cooper, McGowan, Nelson & Pell, 2016). The association of marital status of women who terminated pregnancies was significantly associated with HIV positive status as singe women were 2.3 times more likely to be HIV positive as compared to married women (*p=0.007*). This concurs with findings from a study by Goossens et al., (2016) which reported that single or having a non-cohabiting relationship was significantly associated with being HIV positive and terminanting pregnancies. Masho et al., (2018) also reported that unmarried women who HIV positive are also at risk for unintended pregnancy.

Parity of women who terminated pregnancies was found to be significantly associated with HIV positive status in the current study which is similar to a study by Jacobs et al., (2016) and Justad-Berg et al., (2015). The current study findings revealed that women who were multigravida were significantly associated with HIV positive status which is supported by findings from a study by Goossens et al., (2016).

The women who terminated pregnancies and been in the use of contraceptives were more likely to be HIV positive and those who did not know their HIV status were less likely to be HIV positive which concurs with a study conducted in Nigeria and Zambia (Bankole et al.,2014). The current study findings concur with findings from a study conducted in Ghana were in contraceptive use, level of education and parity are associated with pregnancy termination and HIV positive status (Seidu et al., 2019)

5.5 LIMITATIONS OF THE STUDY

The main limitations might be that necessary information to determine the association of HIV positive status with termination of pregnancy was not available, as data collection is not done by the researcher, confounder information has been lacking and there might be missing information on data quality.

5.6 CONCLUSION

The findings of this study highlight the need to address the structural socio-economic drivers of the HIV epidemic among women of child-bearing age. Women of child-bearing age in this setting have large unmet reproductive health needs. Structural interventions, such as increasing contraceptive use which may be useful for reducing the burden of unplanned pregnancies.

5.7 RECOMMENDATIONS

5.7.1 Policies

These findings suggest the need for targeted interventions for women of child-bearing age to access reproductive health interventions to prevent unintended pregnancies and the associated risk of termination.

5.7.2 Health facilities

Many women are still having unintended pregnancies at young age and considering the spread of HIV, there is a need for integrated services to prevent unintended pregnancies and reduce the preconception-related risks for HIV-infected women choosing to conceive. The resources that are required to drive and sustain the HIV prevention response require effective cross-sector partnerships with a regional vision and country-led processes enabled through strong participation and accountability from all stakeholders.

5.7.3 Research

The global commitment to ending the AIDS epidemic by 2030 invariably places HIV prevention at the heart of the response. Reducing the new tide of infections in young populations is integral to the prevention response if this ambitious target is to be achieved. However, a number of challenges lie ahead. These challenges include the increase in rates of termination of pregnancies, gaps in epidemiological and behavioral profiles of young populations terminating pregnancies and complexities in HIV research with adolescents and young people. Future studies examining patterns of termination of pregnancies and complications related to termination of pregnancies among HIV-positive populations should be conducted.

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Annexure 1: Approval from Turfloop Research Ethics Committee (TREC)

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TURFLOOP RESEARCH ETHICS COMMITTEE

ETHICS CLEARANCE CERTIFICATE

MEETING: 21 October 2020

PROJECT NUMBER: TREC/312/2020: PG

PROJECT:

Title:	The prevalence of HIV and its association with termination of pregnancy at Seshego Zone 4 clinic, Capricorn District, Limpopo Province
Researcher:	AM Molepo
Supervisor:	Dr E Maimela
Co-Supervisor/s:	Dr TS Ntuli
School:	Health Care Science
Degree:	Master of Public Health

PROF P MASOKO
CHAIRPERSON: TURFLOOP RESEARCH ETHICS COMMITTEE
The Turfloop Research Ethics Committee (TREC) is registered with the National Health Research Ethics Council, Registration Number: **REC-0310111-031**

Note:
i) **This Ethics Clearance Certificate will be valid for one (1) year, as from the abovementioned date. Application for annual renewal (or annual review) need to be received by TREC one month before lapse of this period.**
ii) **Should any departure be contemplated from the research procedure as approved, the researcher(s) must re-submit the protocol to the committee, together with the Application for Amendment form.**
iii) **PLEASE QUOTE THE PROTOCOL NUMBER IN ALL ENQUIRIES.**

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Annexure 2: Approval from Limpopo Department of Health

LIMPOPO
PROVINCIAL GOVERNMENT
REPUBLIC OF SOUTH AFRICA

Department of Health

Ref : LP_2020_10_042
Enquiries : Ms PF Mahlokwane
Tel : 015-293 6028
Email : Kurhula.Hlomane@dhsd.limpopo.gov.za

Avian Molepo

PERMISSION TO CONDUCT RESEARCH IN DEPARTMENTAL FACILITIES

Your Study Topic as indicated below;

THE PREVALENCE OF HUMAN IMMUNODEFICIENCY VIRUS AND ITS ASSOCIATION WITH WOMEN WHO TERMINATE PREGNANCY AT SESHEGO CLINIC, CAPRICORN DISTRICT LIMPOPO PROVINCE

1. Permission to conduct research study as per your research proposal is hereby Granted.
2. Kindly note the following:
    a. Present this letter of permission to the institution supervisor/s a week before the study is conducted.
    b. In the course of your study, there should be no action that disrupts the routine services, or incur any cost on the Department.
    c. After completion of study, it is mandatory that the findings should be submitted to the Department to serve as a resource.
    d. The researcher should be prepared to assist in the interpretation and implementation of the study recommendation where possible.
    e. The approval is only valid for a 1-year period.
    f. If the proposal has been amended, a new approval should be sought from the Department of Health
    g. Kindly note that, the Department can withdraw the approval at any time.

Your cooperation will be highly appreciated

Director Research
Dr. Ramalivhana NJ

16/11/2020
Date

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Annexure 3: Data collection tool

Rec No	Age	Marital status	Employment Status	Educational Status	Methods of contraceptive	Year	Month	Gestational age	Parity	Gravidity	HIV status	ART	Duration on ART in months	Type of regimen
1														
2														
3														
4														
5														
6														
7														

Annexure 4: Evidence of language editing

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Date: 16 December 2020

To Whom it May Concern

I hereby confirm that I have proof-read the document entitled: "The prevalence of human immunodeficiency virus and its association with women who terminate pregnancy at Seshego clinic, Capricorn district, Limpopo Province" authored by Avian Mantoa Molepo, and have suggested a number of changes which the author may, or may not, accept, at her discretion.

Each of us has our own unique voice as far as both spoken and written language is concerned. In my role as proof-reader I try not to let my own "written voice" overshadow the voice of the author, while at the same time attempting to ensure a readable document.

Please refer any queries to me.

Andrew Scholtz