(COMPLETED RESEARCH)

PREVALENCE AND DETERMINANTS OF STILLBIRTHS IN DILOKONG HOSPITAL OF THE LIMPOPO PROVINCE

by

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MINI- DISSERTATION

Submitted in partial fulfilment of the requirements for the degree of

MASTER OF PUBLIC HEALTH

In the

FACULTY OF HEALTH SCIENCES

(School of Healthcare Sciences)

at the

UNIVERSITY OF LIMPOPO

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November 2021

DEDICATIONS

I dedicate this dissertation to my parents Mr P.A Dibakwane and Mrs M.J Dibakwane for the love and support since the beginning of this academic journey.

DECLARATION

I declare that this dissertation hereby submitted to the University of Limpopo, for the degree of Master in Public Health, has not previously been submitted by me for a degree at this or any other institution; that is my work in design and in execution, and that all material contained herein has been duly acknowledged.

Signature…….

ACKNOWLEDGEMENTS

I hereby acknowledge the following people for their contribution and encouragement towards the completion of this dissertation.

- Special thanks to the learner clerks at Dilokong Hospital , Nurse Susan Maile, Sr Mashego and Sr Malaza for their assistance with file retrieval.
- To my receptionist Ms Dineo Tjie for the overtime she put in.
- To my supervisor, Prof E Maimela, for the support, encouragement and supervision.
- To my co- Supervisors Dr TS Ntuli and Dr PM Mamogobo for the support and encouragement.
- My special thanks to my husband and kids for their love and support.

ABSTRACT

Background: Stillbirth rates are a health problem and they cause distractions in the families. There are more than 5 million perinatal deaths occurring each year, ending preventable stillbirths and neonatal deaths continues to form a significant part of the international public health agenda beyond 2015. There are several risk factors which are associated with stillbirths and this could be classified as maternal, foetal and external risk factors. Therefore, the focus of the study was on the prevalence and determinants of stillbirths in Dilokong Hospital of the Limpopo Province.

Methods: A retrospective descriptive study was conducted which followed a quantitative approach. This study used secondary data from patient clinical records from the maternity ward in Dilokong Hospital. Comparison between groups for continuous and categorical variables was performed using student t-test, and chi-square test, respectively. P-value less than 0.05 at 95% confidence level was regarded as significant.

Findings: The prevalence of stillbirth amongst women who delivered at Dilokong hospital between period 2016 and 2019 was 13.5 % (CI: 0.12 – 15.2). The prevalence of stillbirth is stratified by year and it shows that highest prevalence was in 2018 at 42.5% followed by 2017, 2019 and 2016 at 23.2%, 19.7% and 14.6 respectively. The prevalence of stillbirth increased with increasing maternal age from 0.4% in the age group ≤14 years to 26.2% then decreased to 21.5% in the age group 30 – 34 years. The prevalence of macerated stillbirth between period 2016 and 2019 was 11.0%, for fresh stillbirth was 2.6 %. There was significant association of age, marital status of pregnant women, level of education, parity, gravidity, syphilis and HIV status. Older women at age 18 years and above were 1.4 times more likely to have stillbirth and 1.9 times more likely to have fresh stillbirth at $p<0.05$. Single women were 3.3 times more likely to have stillbirth and 3 times more likely to have macerated stillbirth as compared to married women. Fresh stillbirth was not significantly associated with marital status of pregnant women. Educational level was significantly associated with both stillbirth and macerated stillbirth as those women with no education or having primary educational level were 12.3 times more likely to have stillbirth and 14 times more likely to have macerated stillbirth as compared to women with tertiary educational level.

Women who had pregnancies that have each resulted in the birth of an infant capable of survival (parity) for four or more times were 2.4 times more likely to have stillbirth and women who were in their fifth or more pregnancies (gravida) were 1.8 times more likely to have stillbirth and 3 times more likely to have fresh stillbirth. Lastly, women who had tested positive for syphilis were 4.1 times more likely to have stillbirth and 3.7 times more likely to have macerated stillbirth and women who were HIV positive were 3.1 times more likely to have stillbirth and 2.3 times more likely to have macerated stillbirth.

CONCLUSION: The prevalence of stillbirth was very high in the current study and there is a need for studies on stillbirth and related factors in rural areas of Limpopo Province. This study showed that maternal age, low educational level, marital status of pregnant women, high parity, gravidity, syphilis and HIV status were statistically associated with stillbirth. The factors associated with stillbirth in the current study are preventable if quality focused antenatal care, intrapartum care is provided. Therefore, identification of pregnancy complications and facilitation of proper method of delivery is key to improve quality of care. Efforts to reduce unacceptably high stillbirth in the current study are needed. This study recommends that pregnant mothers need to be educated about the dangers in pregnancy and importance of antenatal visits.

Ker words: Stillbirths, macerated, fresh stillbirths, Prevalence, Maternal risk factors

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DEFINITION OF CONCEPTS

Antepartum death is the death of the foetus that occurred before the onset of labour (Yakoob, Lawn, Darmstadt & Bhutta, 2010). In this study antepartum death will be death that occurred before labour starts.

Determinants is defined as a factor which determines the nature or outcome of something (Kenneth & Rothman, 2012). In this study, determinants will be factors that will be identified as influencing or contributing to the outcome of the pregnancy.

Fresh stillbirths are defined as deaths at birth without signs of skin disintegration or maceration (Kupka, Kassaye, Saathoff, Hertzmark, Msamanga et al., 2009). In the context of this study, fresh stillbirth will be a foetus who died during labour.

Intrapartum is defined as the time period spanning childbirth, from the onset of labour through delivery of the placenta. Intrapartum can refer to both the woman and the foetus (Yakoob et al., 2010). In the context of this study intrapartum will be defined as the time when labour starts to the delivery of the placenta.

Macerated stillbirth are defined as stillbirths with signs of maceration at delivery including skin and soft-tissue changes such as skin discoloration, redness, sloughing of skin, and overriding of cranial sutures (McClure, Saleem, Goudar, Moore, Garces et al., 2015) and they occur more than 12 hours before delivery (equivalent to antepartum death) (Yakoob et al., 2010). In the context of this study, macerated stillbirths will be defined as death of a foetus that occurs before delivery and shows degeneration of the skin.

Prevalence is a statistical concept referring to the number of cases of a disease that are present in a population at a given time (Medicinenet, 2019). In this study, prevalence will refer to the number of stillbirths in Dilokong hospital that occurred within the study period.

Stillbirth is defined as a baby born with no signs of life at or after 28 weeks' gestation (WHO, 2010). In this study, stillbirth will be a baby who is born without signs of life at 28 weeks and above.

ABBREVIATIONS

ARR	:	The average annual rate of reduction
ENAP	:	Every Newborn Action Plan
HICs	:	High-income countries
LMICS	:	Low middle income countries
MDGs	:	Millennium Development Goals
SBR	:	Stillbirths rate
SGA	:	Small for gestational age
WHO	:	World Health Organization

1. CHAPTER 1 ORIENTATION TO THE STUDY

1.1. Introduction

Stillbirth is the birth of a viable baby without any signs of life (Bamber & Malcomson, 2015). Stillbirth rate is a key indicator of women's health and quality of care in pregnancy and childbirth (Flenady, Wojcieszek, Middleton, Ellwood, Erwich et al., 2016). Classification of stillbirths is important for the purpose of prevention, counseling and comparison of health care as assigning a single cause of stillbirth can be challenging because of interaction between pathophysiological processes in the mother, placenta and foetus (Helgadóttir, Turowski, Skjeldestad, Jacobsen, Sandset et al., 2013). Stillbirths can be sub-classified according to the gestational age at birth, typically into early stillbirths (20–28 weeks' gestation) and late stillbirths (after 28 weeks). Stillbirths are also sub-classified by whether death occurred before or after the onset of labour—termed antepartum and intrapartum, respectively (Smith & Fretts, 2007).

Therefore, we have fresh stillbirths which are characterized as death at birth without signs of skin disintegration or maceration (Kupka et al.,2009) and macerated stillbirths which are deaths with signs of skin disintegration or maceration. The macerated stillbirths they occur more than 12 hours before delivery (equivalent to antepartum death) and have signs of maceration at delivery including skin and soft-tissue changes such as skin discoloration, redness, sloughing of skin, and overriding of cranial sutures (Yakoob et al., 2010; McClure et al., 2015). Historic achievements have been made for women's and children's health in the past 15 years (Frøen, Friberg, Lawn, Bhutta, Pattinsonet al., 2016). However, women experience the death of their babies in stillbirth in the last trimester of pregnancy or during labour (Frøen et al., 2016) and these deaths are associated with a number of risk factors, the most important of which are maternal and placental factors (Bamber & Malcomson, 2015).

Worldwide, more than 3.3 million stillbirths occur each year (Kupka et al.,2009) and also constitute one of the main causes of mortality worldwide (Bukowski, Hansen, Willinger, Reddy, Parker et al., 2014). Developing countries account for over 97% of these deaths, while sub-Saharan Africa, the geographic region with the highest

incidence of stillbirth in the world, contributes more than one-fourth to the worldwide total (Kupka et al.,2009). Stillbirth 1 in 160 births at ≥20 weeks' gestation in the United States is stillborn, resulting in over 25,000 stillbirths each year (Bukowski et al., 2014). Although rates for high-income countries (HICs) are relatively low compared with low- income and middle-income countries (LMICs), stillbirth is a major health burden, with rates of more than double neonatal mortality, and often equal to all deaths of infants younger than 1 year (Flenady et al., 2016).

Approximately 98% of the global 2.6 million stillbirths reported at a rate of 18.4 per 1000 births is in low and middle-income countries and 75% in sub-Saharan Africa and south Asia (WHO, 2016). The stillbirth rate in Africa is 29 per 1000 births and 13.5 per 1000 in South Africa (Statistic South Africa, 2016). There is slow progress in reduction of stillbirth rate in sub-Saharan Africa to meet Every Newborn Action Plan (ENAP) national targets of 12 or fewer stillbirths per 1000 births by 2030 which was endorsed by the World Health Assembly in 2014 (Lawn, Blencowe, Waiswa, Amouzou, Mathers et al., 2016).

The major contributory factors or determinants of stillbirth are inadequate antenatal care, post-term pregnancy, maternal infections in pregnancy including malaria, syphilis and HIV, maternal disorders and foetal growth restriction (Lawn et al., 2016). Ending preventable stillbirths formed part of the international public health agenda beyond 2005 (Liu, Oza, Hogan, Perin & Rudan, 2015). The first step to take is by having accurate capture and classification of the causes of death, using globally applicable and comparable systems (WHO, 2012).

1.2. Problem statement

In South Africa, the stillbirth rate was 13.5% per 1000 births in 2016 as reported by Statistics South Africa. Stillbirth continues to pose serious challenges in rural provinces of South Africa especially in Limpopo province. A study conducted at a provincial tertiary hospital in Limpopo, recorded a stillbirth rate of 38.9 per 1000 births between 2009 and 2010, and it found that 71% of these stillbirth were macerated and 29% were fresh stillbirths (Ntuli & Malangu, 2012). The local newspaper reported an ever-increasing rate of newborn deaths in Dilokong Hospital between 2016 and 2018 (Mahopo, 2018). The newspaper clearly stated that most of these deaths occurred as a result of pregnant women drinking a variety of concoctions which resulted in stillbirths. However, there is a paucity of scientific information on the prevalence and determinants of stillbirths in rural areas of Limpopo province. In Mpumalanga province, the rate of macerated stillbirths was higher than that of fresh stillbirths at 38.7% and 21.8% respectively (Allanson, Muller & Pattinson, 2015). In both developed and developing countries, these deaths are often among the uncounted or somehow, they "mean less." It is certainly true that, in proportion to the number of deaths, there has been little research on the specific determinants of stillbirth. Moreover, the needed studies to guide clinical practice have not been done. Therefore, the researcher is doing the study to find out how the prevalence and the determinants of stillbirth are in Dilokong Hospital of the Limpopo province.

1.3. Preliminary literature review

A literature review is a process that involves finding, reading, understanding, and forming conclusions about the published research and theory on a topic (Brink, 2012). The researcher reviewed the following topics: prevalence, types and risk factors associated with stillbirth, from articles written globally, continentally, and locally to know the extent of the problem. The topics reviewed in the study are discussed in detail in Chapter 2.

1.4. PURPOSE OF THE STUDY

The purpose of this study was to determine the prevalence and determinants of stillbirths in Dilokong district hospital of the Limpopo province from 01 January 2016 to 31 December 2019.

1.5. Objectives of the study

- To describe the socio-demographic characteristics of mothers in Dilokong Hospital from 01 January 2016 to 31 December 2019.
- To determine the prevalence of stillbirths in Dilokong Hospital from 01 January 2016 to 31 December 2019.
- To compare determinants of stillbirths in Dilokong Hospital from 01 January 2016 to 31 December 2019.

1.6. Research question

What is the prevalence and the determinants of stillbirths in Dilokong district hospital of the Limpopo province from 01 January 2016 to 31 December 2019?

1.7. Research methodology

The current study used a quantitative method which involved the process of collecting, analysing, interpreting, and writing the results of a study (Creswell & Creswell, 2018). This study used secondary data from patient clinical records to produce descriptive analysis which was retrospective in nature. The section will be detailed more in Chapter 3.

1.8 Significance of the study

Not all stillbirths can be prevented, but there are some things that can be done to reduce the risk of the occurrence of stillbirths. Therefore, understanding the determinants of contributory factors to stillbirths in this area could help the Department of Health in developing interventions to prevent and reduce the incidence of stillbirths. In this rural hospital in Limpopo Province, the findings of this study highlights the importance of increasing public awareness about stillbirth by providing clear information to women and their partners that there are risk factors associated with stillbirth that can be identified and monitored. The information or the outcome of the study will also help the health professionals involved with care of mothers to be on how to identify and act timeously to prevent stillbirths. In conclusion, the results of this study may advise policy makers in the development of antenatal preparation classes and public health campaigns in the communities.

2. CHAPTER 2: LITERATURE REVIEW

2.1. Global prevalence of stillbirths

Worldwide, stillbirths rate (SBR) has declined by 47% from 28·1 per 1000 births in 1990 to 14·9 per 1000 births in 2015 (Wang, Bhutta, Coates Coggeshall, Dandona et al., 2016). The number of stillbirths has reduced more slowly than has maternal mortality or mortality in children younger than 5 years, which were explicitly targeted in the Millennium Development Goals (MDGs) (Lawn et al., 2016). The average annual rate of reduction (ARR) improved from 1.2% (1990–1995) to 4% (2005–2013) was recorded. However, in 2015, an estimated 2.6 million babies died before birth during the last trimester of pregnancy, a worldwide rate of 18.4 stillbirths per 1000 total births. In 2000, the estimated worldwide SBR was 24.7, implying an ARR of 2.0% between 2000 and 2015 (Lawn et al., 2016).

A study done in Latin American countries shows stillbirth rate of about 8.1 per 1000 births (Pingray, Althabe, Vazquez, Corea, Pajuelo et al., 2018) as compared to reviews done in Australia that found the stillbirth rate to be 6.8 per 1000 births (Guy, 2019). In a cross- sectional study carried out in Bhopal India, the highest stillbirth rates of 44.3 per 1000 births (Rawat, Toppo & Pal, 2015). A prospective population-based observational study conducted among five different countries reported the mean stillbirth rates of 25.3 per 1000 births in India, 56.9 per 1000 births in Pakistan and 19.9 per 1000 births in Guatemala (Saleem, Tikmani, McClure, Moore, Azam et al., 2018). This study showed that the mean stillbirth rate declined from 31.7 per 1000 births to 26.4 per 1000 births across all sites between 2010 and 2016. This reduction was said to be due to the adoption of the Every Newborn Action Plan (ENAP) at the WHO Geneva Assembly in 2014, which called for a global target of less than 12 per 1000 births in every country by 2030.

2.2. Prevalence of stillbirths in Africa

Within the African region, countries in West and Central Africa generally have higher rates of maternal mortality and under-5 mortalities than Eastern and Southern African countries. Nigeria alone, as the most populous country in the region and the eighth most populous country in the world, accounts for a quarter of all maternal, newborn, and child deaths in sub-Saharan Africa (Kinney, Kerber, Black, Cohen, Nkrumah et

al., 2010). Sub-Saharan Africa has the highest SBRs and the slowest rates of progress worldwide, especially in countries with conflicts and emergencies. This is evidenced by an estimated 880,000 stillbirths that occur each year in sub-Saharan Africa (Lawn et al., 2016.).

A prospective population-based observational study conducted among five different countries reported the mean stillbirth rates of 21.3 per 1000 births in African states (Saleem et al., 2018). A pooled analysis of Demographic and Health surveys in Burundi, Kenya, Rwanda, Tanzania, and Uganda showed an average stillbirth rate of 18 per 1000 births in 2015 (Akombi, Ghimire, Agho & Renzaho, 2018). In Zimbabwe, the stillbirth rate was 15.6 per 1000 births in 2014 (Chaibva, Olorunju, Nyadundu & Beke, 2019). Another study in Zimbabwe reported the rate of 30.5 per 1000 births in 2016 (Ngwenya, 2018). A retrospective study conducted in Ghana, recorded the stillbirth rate of 22.2 per 1000 births with (57%) of the stillbirths being macerated (Abass, Ayikai, Alidu & Yakong, 2016). In Ethiopia, the prevalence rate of stillbirth was 85 per 1000 births (Lakew, Tesfaye & Mekonnen, 2017). Retrospective review of records was done in Ghana which found a stillbirth rate of about 22 per 1000 births and with a high rate of maceration at 57% (Abass, Ayikai, Alidu & Yakong, 2016).

2.3. Prevalence of stillbirths in South Africa and Limpopo Province

The largest category of perinatal deaths in South Africa is unexplained stillbirths. A quarter of these foetuses are small for gestational age (SGA), two-thirds of the deaths occur in the antenatal period, and most of the mothers are healthy and classified as having low-risk pregnancies (Nkosi, Makin, Hlongwane, & Pattinson, 2019). A South African study revealed that approximately 50% of SGA stillbirths occur between 33- and 37-weeks' gestation. These stillbirths in South Africa occur with a seemingly healthy mother who does not present with any clinical complications related to antenatal care (Lavin, Pattinson, Nedkoff, Gebhardt, & Preen, 2019).

In 2013, South Africa had an estimated stillbirth rate of 21 per 1000 births, which showed a reduction from 27 per 1000 births in 2001 (Michalow, Chola, McGee, Tugendhaft, Pattinson et al., 2015). Similarly, the report published by Statistics South Africa indicated a decrease in stillbirth rate from 22.7 per 1000 births in 2010 to 17.6

per 1000 births in 2014 (Stats SA, 2015). A retrospective study was done looking at the stillbirth rate between 2013 to 2015 which indicated 17.2 per 1000 births in Limpopo (Lavin & Pattison, 2018),this showed a reduction as compared to a study done earlier which reported the stillbirth rate of 38.4 per 1000 births, and most (71%) of these stillbirths were macerated (Ntuli & Malangu, 2012). In Mpumalanga province, the rate of macerated (38.7%) stillbirths were higher than that of fresh stillbirth (21.8%) (Allanson, Muller & Pattinson, 2015).

2.4. Risk factors associated with stillbirths

With more than 5 million perinatal deaths occurring each year, ending preventable stillbirths and neonatal deaths continues to form a significant part of the international public health agenda beyond 2015 (Allanson, Tunçalp, Gardosi, Pattinson, Francis et al., 2016). There are several risk factors which are associated with stillbirths and this could be classified as maternal, foetal and external risk factors.

2.4.1. Maternal risk factors

There are various maternal risk factors associated with stillbirths which includes advanced maternal age, multiple pregnancies; lack of education, lack of antenatal care (ANC), history of stillbirth, hypertensive disorders in pregnancy, preeclampsia or antepartum haemorrhage, smoking, obesity, and diseases such as syphilis, positive HIV status with low CD4 count, malaria and diabetes (Aminu, Bar-Zeev & van den Broek., 2017; Welegebriel, Dadi, & Mihrete, 2017; Saleem et al., 2018; Sinha et al., 2016; Lawn et al., 2016).

According to Flenady et al.2016, in low- and middle-income countries major risk factors for stillbirths are preterm labour, postdates and suboptimal care, and whereas in the high-income countries' obesity, smoking and suboptimal care are identified as the common risk for stillbirths (Flenady et al., 2016). In Canada, a prospective study showed an increased risk of stillbirths with gestational age of 38 weeks and above (Wood, Tang, Ross & Sauve, 2014). A similar study done in Bhopal listed nulliparity, lack of antenatal care, antenatal haemorrhage, pregnancy induced hypertension and maternal condition as risk factors for stillbirths (Rawat, Toppo & Pal, 2015).

In Ethiopian study, child spacing of less than 24 months was found to be a major risk factors for stillbirths (Lakew et al., 2017). In rural areas of South Africa, nulliparity, unexplained intrauterine foetal deaths, hypertensive diseases, and placenta abruptio were found to be the major risk factors for stillbirths (Ntuli & Malangu, 2012). In India, one study reported younger maternal age of less than eighteen years as a major risk factor for stillbirths (Sinha, Aggarwal, Osmond, Fall, Bhargava & Sachdev, 2016).

2.4.2 Foetal risk factors:

Lawn et al. (2016) in their study found congenital abnormalities as high risk factors for stillbirths. Small for gestational age (SGA) was reported by a study done in Canada and Japan as a contributing factor for stillbirths (Ota, Ganchimeg, Morisaki, Vogel, Pileggi et al., 2014, Haruyama, Gilmour, Ota, Abe, Rahman et al., 2018). In Tanzania, one study found that non-cephalic presentation and low birth weight as the major risk for stillbirths (Chuwa, Mwanamsangu, Brown, Msuya, Senkoro et al., 2017). A retrospective audit of perinatal death data using South Africa's Perinatal Problem Identification Programme found that stillbirth risk peaked at 38 weeks of gestation in Limpopo province (Lavin & Pattinson, 2018).

2.4.3 External risk factors:

The external risk factors which have been identified as the biggest contributors in LMICs are lack of low-cost technologies to evaluate the placenta and early identification of complications and management, delay in reaching health facility due to lack of transport and distance to the facility (McClure & Goldenberg, 2019; Neogi, Sharma, Negandi, Chauhan, Reddy et al., 2018). Failure to act timeously and lack of funds in developing countries were also found to contribute to the higher stillbirth rates (Flenady et al., 2016). Bhusal et al. (2019) in their study indicated that stillbirth is common in women belonging to poor socio-economic class, residing in rural areas, and who used polluting cooking fuels such as wood (Bhusal, Gautam, Lim & Tongkumchum, 2019). One study reported that women who live in a place with open defecation and those working in agriculture are more likely to report higher stillbirths (Ghimire, Agho, Renzaho, Christou, Nisha et al., 2017).

The proportion of deaths for which a cause of death cannot be determined remains a major concern particularly in developing countries. Several systematic reviews found that 5-50% of the causes of stillbirths were unknown and/or unclassified (Aminu et al., 2017; Reinebrant, Leisher, Coory, Henry & Wojcieszek, 2018). An earlier retrospective review of records of women who had stillbirths at a tertiary hospital of the Limpopo Province found that unexplained intrauterine foetal death as one of the leading causes of stillbirth (Ntuli & Malangu, 2012).

3 CHAPTER 3: RESEARCH METHODOLOGY

3.1 Introduction

This chapter explains the steps that the researcher has taken in selecting the study population and the method used to select the sample including the type of systems the researcher is going to use when analysing the data collected. An emphasis is also placed on the significance of the study, ethical clearance, and study limitations.

3.2 Research methods

The current study is a quantitative method which involves the process of collecting, analysing, interpreting, and writing the results of a study (Creswell & Creswell, 2018) and retrospective descriptive in nature using secondary data from clinical records of all women that delivered between January 2016 to December 2019.

3.3 Research design

The research study design is a design used for conducting a study that maximises control over factors that could interfere with the validity of the findings (Burns & Grove, 2001). The current study followed a descriptive research design which is a scientific method which involves observing and describing the behaviour of a subject without influencing it in any way (Bruce, Pope & Stanistreet, 2017). The current study was retrospective descriptive in nature to describe and determine the prevalence including the investigation of the factors associated with stillbirths (Bruce, Pope & Stanistreet, 2017) from January 2016 to December 2019.

3.4 Study setting

The study setting refers to the actual place and conditions or circumstances where and within which the research study takes place (Pilot & Beck, 2012). The research was conducted at the maternity ward in Dilokong Hospital, which is a district hospital located in Driekop area in Fetakgomo/Greater Tubatse Municipality of the Sekhukhune District, which is about 22km from Burgersfort town along the R37 road. Services rendered at the hospital include emergency

cases, surgical cases inclusive of orthopaedic cases, medical cases, paediatric cases, maternity cases and Human Immunodeficiency Virus-Tuberculosis cases. The hospital is a referral centre for 17 clinics.

Figure 1 Maps of Africa, South Africa, Limpopo Province and Sekhukhune District showing the Dilokong Hospital in the Driekop Village located in the Fetakgomo/Greater Tubatse Municipality.

3.5 Study population

Study population refers to an aggregate or totality of all the objects, subjects or members that conform to a set of specifications from which the researcher sample is drawn (Taherdoost, 2016). Population in the current study included all clinical records of pregnant women who delivered in Dilokong Hospital between January 1, 2016 and December 31, 2019.

3.6 Sampling methods and sample size

Sampling is a subset chosen from a sampling frame or entire population and it can be used to make inference about a population or to make generalization in relation to existing theory (Taherdoost, 2016). This depends on the choice of sampling technique. In the current study, probability sampling techniques were used which means that every item in the population had an equal chance of being included in the sample. Probability sampling has the greatest freedom from bias but may represent the costliest sample in terms of time and a complete frame (a list of all units in the whole population) were available and the sample was collected from all the clinical records with the complete information during the study period. Systematic random sampling was used in the current study.

The minimum sample size required for each year of the study was calculated based on sampling error of 5% and 10% non-response rate. The sample size

was calculated using Yamane's population proportion approach formula (Louangrath, 2014) in which five percent sampling error provision.

The total deliveries for the period 2016 to 2019 were 16483 with a distribution of 3830 deliveries in 2016, 4037 deliveries in 2016, 4027 deliveries in 2018 and 4589 deliveries in 2019. Therefore, the sample was distributed proportional to the size of the population in each year as per Table 3.2

Table 3.2: Distribution of Sample Size per year.

2016	2017	2018	2019
$n = \frac{3830}{1+3830(0.05)^2}$ $n = \frac{3830}{1+9.58}$ n=**362**	$n = \frac{4037}{1+4037(0.05)^2}$ $n = \frac{4037}{1+10.1}$ n=**363**	$n = \frac{4027}{1+4027(0.05)^2}$ $n = \frac{4027}{1+10.1}$ n=**363**	$n = \frac{4589}{1+4589(0.05)^2}$ $n = \frac{4489}{1+11.5}$ n=**367**

The principle which was used to select the deliveries from the maternity registers was systematic random sampling. The deliveries were selected at regular intervals based on a sampling fraction. The sampling fraction was 11 which were calculated as (population size ÷ sample size). Therefore, the first delivery in the maternity register was selected at random, based on the sampling fraction then subsequent units were chosen at equal intervals of 11. If the sampled record did not meet the inclusion criteria, then that record was excluded, and the next record was selected. The systematic sampling process continued until the required sample size of 1455 was achieved for the study period.

3.7 Inclusion and exclusion criteria

3.7.1 Inclusion criteria

All clinical records of women who delivered in Dilokong Hospital between January 1, 2016 and December 1, 2019 were included for selection in the study. The hospital clinical records were used because they represented a facility-based pregnancy outcome registry and provided detailed information in relation to basic health information at enrolment, record the date of last menstrual period, or early ultrasound report to assess gestational age of the pregnant woman.

3.7.2 Exclusion criteria

All clinical records with incomplete key information were excluded in this study.

3.8 Data collection

In this study, the researcher got the file of all mothers that delivered between January 2016 to December 2019 in Dilokong Hospital and all needed data was collected. The data collection tool (**Appendix 1**) that was developed based on the literature from several studies was used by the researcher to collect data (Flenady et al., 2016; Bhusal et al., 2019; Aminu et al., 2017; Nzeribe, Onyegbule & Onwube, 2019; Ntuli & Malangu, 2012; Welegebriel et al., 2017). The data collection tool was divided into three sections been Section A for Maternal demographics, Section B for characteristics of macerated stillbirths and Section C for characteristics of fresh stillbirths to collect the following information: maternal age, parity, booking status, educational level, maternal comorbidities, previous history of stillbirth, gestational age, antenatal bloods, and antenatal haemorrhage, Foetal weight, age, intrapartum complications and congenital abnormalities.

3.9 Data analysis

Data Analysis is the process of systematically applying statistical and/or logical techniques to describe and illustrate, condense and recap, and evaluate data. This process is used to develop answers to questions through the examination and interpretation of data (Sharma, 2018). The basic steps in the analytic process consist of identifying issues, determining the availability of suitable data, deciding on which methods are appropriate for answering the questions of interest, applying the methods, and evaluating, summarizing and communicating the results. In the current study, all collected data were analysed using STATA statistical software version 12 for Windows (STATA Corporation, College Station, Texas). Comparison between groups for continuous and categorical variables was performed using student t-test, and chi-square test, respectively. P-value less than 0.05 at 95% confidence level was regarded as significant. Reflect on both descriptive and inferential statistics.

3.10 Reliability and validity

Reliability and validity are closely related, but they mean different things. Reliability relates to the consistency of a measure and the likelihood of obtaining the same results when the researcher measures the same variable more than once, or when more than one person measures the same variable (Heale & Twycross, 2015). Validity is defined as the extent to which a concept is accurately measured in a quantitative study (Heale & Twycross, 2015).

3.10.1 Reliability

As reliability relates to the consistency of a measure (Watson, 2015), in the current study the reliability of the collected data will be ensured through internal consistency which will be maintained by ensuring that the data collection tool is not changed throughout data collection. The data collection tool was developed based on the literature from several studies (Flenady et al., 2016; Bhusal et al., 2019; Aminu et al., 2017; Nzeribe, Onyegbule & Onwube, 2019; Ntuli & Malangu, 2012; Welegebriel et al., 2017).

3.10.2 Validity:

In the current study, validity was be ensured by using content validity which looked at whether the instrument adequately covers all the content that it should with respect to the variable. Therefore, the data collection tool in this study covered the aspects which were related to stillbirth case definition. A subset of content validity is face validity, where experts are asked their opinion about whether an instrument measures the concept intended. The experts included amongst others the supervisors and midwifery nurses or doctors at Dilokong hospital.

Internal validity refers to the type of validity where there is a causal relationship between the variables. It signifies the causal relationship between the dependent and the independent type of variable. Internal validity refers to those factors that are the reason for affecting the dependent variable, therefore in the current study this will be ensured by using regression analysis to determine the risk factors associated with stillbirths. This was used to achieve statistical conclusion validity which is defined as

whether there is statistically significant covariance between the variables the researcher is interested in, and whether the relationship is sizable.

Construct validity has to do with how valid the inferences of the data are for the theory (or constructs) that the researcher is evaluating (Devroe, 2016.). External validity examines whether or not an observed causal relationship can be generalized to and across different measures, persons, settings and times. This ensured that the data collection tool was validated through the conduct of a pilot study. The pilot study will be done at Dilokong hospital, where ten maternity case records will be used and these records will be excluded from the main study. The researcher made sure that the study will be reliable by ensuring that data collected is correct and analysed correctly. And that the same data and study design will yield the same results or same conclusion if used by a different researcher.

3.11 Measures minimize bias

Bias refers to systematic error in the design, conduct or analysis of a study which results in erroneous estimates (Gail & Sullivan 2011). According to Noble and Smith (2014), statistical bias is a feature of a statistical technique or of its results whereby the expected value of the results differs from the true underlying quantitative parameter being estimated. Therefore, statistical bias correction was done by adhering to the case definition for stillbirths. Sampling bias which is a bias in which a sample is collected in such a way that some members of the intended population have a lower or higher sampling probability than others. This type of bias was minimised by using probability or random sampling technique which ensured that every clinical record at maternity Dilokong hospital during the study period had an equal chance of being included in the sample.

Again to avoid selection bias, a restrictive time interval for the occurrence of stillbirths between January 2016 and December 2019 was adhered to as per inclusion criteria. The study protocol clearly describes the inclusion and exclusion criteria which should be utilized consistently throughout data collection and analysis to ensure data comparability and a better understanding

of this adverse pregnancy outcome. Observational bias was minimised by making sure that the researcher remains neutral and reports what is in the clinical records without adding or omitting any information to suit the research. The researcher will bracket any information known by the researcher. The researcher will not allow any information known by him/her to cloud their judgement or to influence the study.

3.12 Ethical consideration

Research ethics refers to a system of moral values that is concerned with the degree to which research procedures adhere to professional, legal, and sociological obligations to the study participants (Polit & Beck, 2004). Confidentiality was always maintained, as patient's real names were not used.

3.12.1 Permission to conduct the study

Permission to conduct the study was granted by Limpopo Department of Health, Sekhukhune District office and sub-district and from the Chief Executive Officer (CEO) of Dilokong Hospital after submitting the approved proposal with ethical clearance certificate (**Appendix 4 and Appendix 5** respectively).

3.12.2 Informed consent and voluntary participation

Informed consent was not obtained as the study used secondary data from patients' clinical records.

3.12.3 Confidentiality

According to Mboniswa (2005) confidentiality refers to the respect of the information provided by other people as private by ensuring limited access to the information. The researcher ensured that all data collected was kept safe and secure in a computer with password protected so that only the people involved in the study will have access to the clinical records. Confidentiality clauses were signed by all the individuals involved with the data collection to keep the information safe and confidential.

3.12.4 Anonymity

The clinical records were assigned unique identifier numbers to maintain

anonymity and hospital numbers or patient's personal identifiers were not used.

3.13 Conclusion

This chapter elaborate more on the methodology used in the current study which is about the prevalence and determinants of stillbirths in Dilokong Hospital. It presented information about the method used as well as the justification for using this method.

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 and determinants of stillbirths in Dilokong district hospital of the Limpopo province. The data was extracted from the hospital database and a total of 1721 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 an EpiData 3.1 software then exported to Microsoft Excel spreadsheet for cleaning and later 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. All live births and stillbirths during the reproductive irrespective of age range were eligible for inclusion in the current study as this was a retrospective review of records. The accuracy of the records which were retrieved from the database was assessed and it was found that the majority of the records did not have educational status (91.6%), employment status (26.1%), marital status (16.4%) and antenatal bookings (11.7%).

4.3 Research results

4.3.1 Socio-demographic characteristics of pregnant women

Table 4.1 below presents the socio-demographics of the women who were pregnant and visited Dilokong hospital for delivery during the period 2016 and 2019. The mean age was 26.9 years (standard deviation [SD] =6.87) and the majority of deliveries were in amongst women aged 25 – 29 years at 25.2% followed by age group 20 – 24 years, 30 – 34 years, 15 – 19 years and 35 – 39 years at 23.9%, 25%%, 19.8%, 13.8 and 3.7% respectively. The least number of deliveries were in the age groups ≤ 14 years and ≥ 45 years at 09% and 0.8% respectively. Majority of the women who delivered at Dilokong hospital were single 73.4% and the majority had a primary or no education at 41.3%.

Majority of the women who delivered at Dilokong hospital had had not given birth before at 32.7% followed by those who had 2 – 3 previous pregnancies that have each resulted in the birth of an infant capable of survival (parity) and those who had given birth once (*primiparous women) at 31.8% and 29.4% respectively.* Majority of the women were pregnant for the 3rd and 4th time (gravida) at 33.3% followed by women who were in their first pregnancies; those who were pregnant for the second time and those who had five or more pregnancies were at 32.4%, 26.6% and 7.8% respectively. The current study revealed that the majority of the women had booked for antenatal care services at 92.7% and only 0.8% had tested positive for syphilis and 7.4% tested positive for HIV as presented in Table 4.1 below.

Table 4.1: Demographics of study participants

	No	(%)
Age in years		
≤ 14	16	0.9
15 – 19	234	13.8
20 – 24	425	25.0
25 – 29	428	25.2
30 – 34	337	19.8
35 – 39	62	3.7
40 – 44	13	0.8
≥45		
Marital status		
Single	1056	73.4
Married	128	8.9
Divorced	170	11.8
Widowed	85	5.9
Educational level		
Primary or No education	62	43.4
Secondary	59	41.3
Tertiary	22	15.4
Parity		
0	553	32.7
1	497	29.4
2 – 3	537	31.8
≥ 4	103	6.1
Gravidity		
1	549	32.4
2	450	26.6
3 – 4	564	33.3
≥ 5	132	7.8
Antenatal booking		
Un-booked	120	7.3
Booked	1520	92.7
Syphilis		
Positive	13	0.8
Negative	1708	99.2
HIV		
Positive	127	7.4
Negative	1594	92.6

The current study findings how that there was a statistical significance difference ($p<0.001$) between parity and gravida of women as presented in Table 4.2 below. the majority of pregnancies that have each resulted in the birth of an infant capable of survival (parity) were in age group 25 – 29 years for *primiparous women* (parity=1) at

38% followed by age group 15 – 19 years for nulliparous women (parity=0), age group 30 – 34 years for parity 2 – 3, age group 35 – 39 years for parity ≥ 4 and age group 20 – 24 years for *primiparous women* at 36.7%, 35%, 32.4% and 29.2%. Majority of women who were pregnant for the 1st time were in age group 20 – 24 years at 41.4% followed by age group 15 – 19 years, and 25 – 29 years at 36.7% and 16.3% respectively. Majority of women who were pregnant for the 2nd time were in age group 25 – 29 years at 39.3% followed by age group 20 – 24 years, 30 – 34 years, 15 – 19 years and 35 – 39 years at 31.8%, 19.3%, 4.7% and 3.6% respectively. The majority of women who were pregnant for the 3rd and 4th time were in age group 30 – 34 years at 34.8% followed by age group 25 – 29 years, 35 – 35 years and 40 – 44 years at 28%, 21.6%, 9.6% and 4.4% respectively. Lastly, majority of women who were pregnant for the 5th time or more were in age group 35 – 39 years at 35.1% followed by age group 40 – 44 years, 30 34 years, 25 – 29 years and 45 years and above at 33.7%, 27.5%, 7.6% and 5.3% respectively as presented in Table 4.2 below.

Table 4.2: Distribution of parity and gravida stratified by age group for pregnant women

Variables	Age group in years								*P-value*
	≤ 14	15 – 19	20 – 24	25 – 29	30 – 34	35 – 39	40 – 44	≥ 45	
Parity									
0	7 (1.3)	203 (36.7)	230 (41.6)	90 (16.3)	19 (3.4)	2 (0.4)	1 (0.8)	1 (0.8)	<0.001
1	7 (1.4)	23 (4.6)	145 (29.2)	189 (38.0)	101 (20.3)	27 (5.4)	5 (1.0)	0 (0.0)	
2 – 3	2 (0.4)	4 (0.8)	46 (8.6)	138 (25.8)	187 (35.0)	122 (22.8)	30 (5.6)	6 (1.1)	
≥ 4	0 (0.0)	1 (0.9)	1 (0.9)	9 (8.8)	26 (25.5)	33 (32.4)	26 (25.5)	6 (5.8)	
Gravida									
1	11 (2.0)	208 (38.0)	227 (41.4)	81 (14.8)	17 (3.1)	0 (0.0)	2 (0.4)	2 (0.4)	<0.001
2	2 (0.4)	21 (4.7)	143 (31.8)	177 (39.3)	87 (19.3)	162 (3.6)	4 (0.9)	0 (0.0)	
3 – 4	2 (0.4)	3 (0.5)	54 (9.6)	158 (28.0)	196 (34.8)	122 (21.6)	25 (4.4)	4 (0.7)	
≥ 5	0 (0.0)	0 (0.0)	1 (0.8)	10 (7.6)	36 (27.5)	46 (35.1)	31 (33.7)	7 (5.3)	

4.3.2 Prevalence of stillbirth

The prevalence of stillbirth amongst women who delivered at Dilokong hospital between period 2016 and 2019 was 13.5 % (CI: 0.12 – 15.2) as presented in Figure 4.1 below.

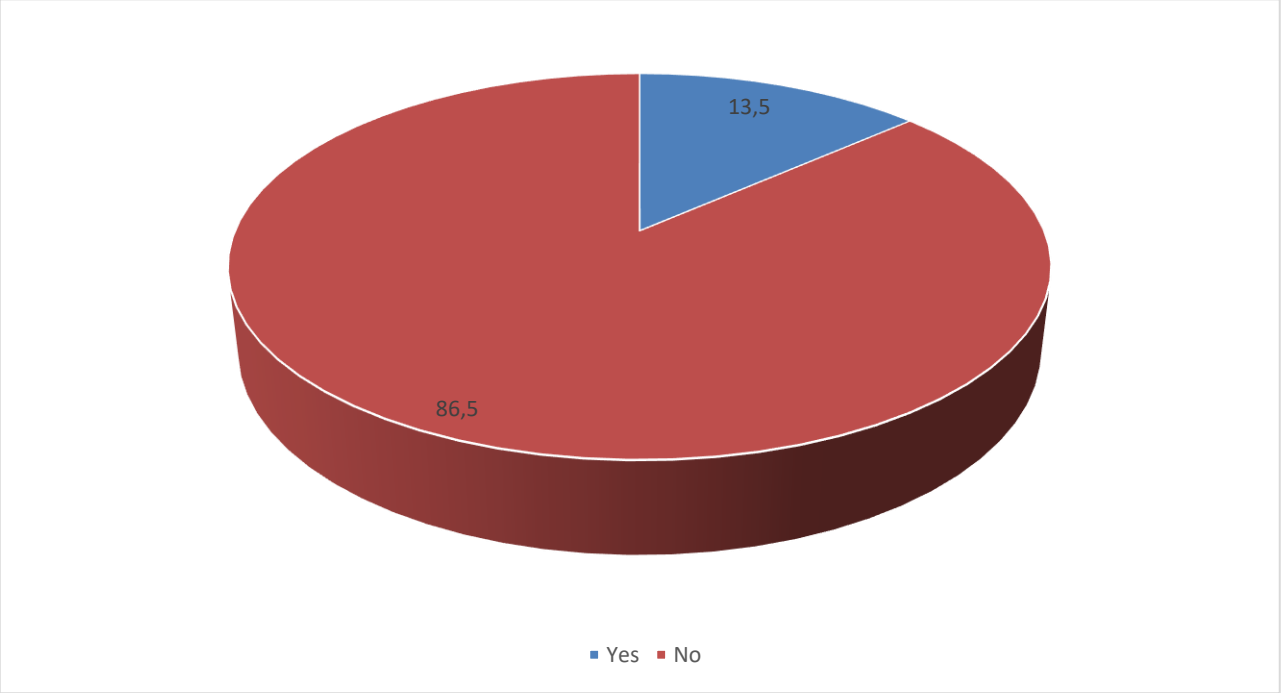

Figure 4.1: Overall prevalence of stillbirth

Figure 4.2 below presents the prevalence of stillbirth stratified by year and it shows that highest prevalence was in 2018 at 20.9% followed by 2017, 2019 and 2016 at 13.0%, 11.1% and 8.1 respectively.

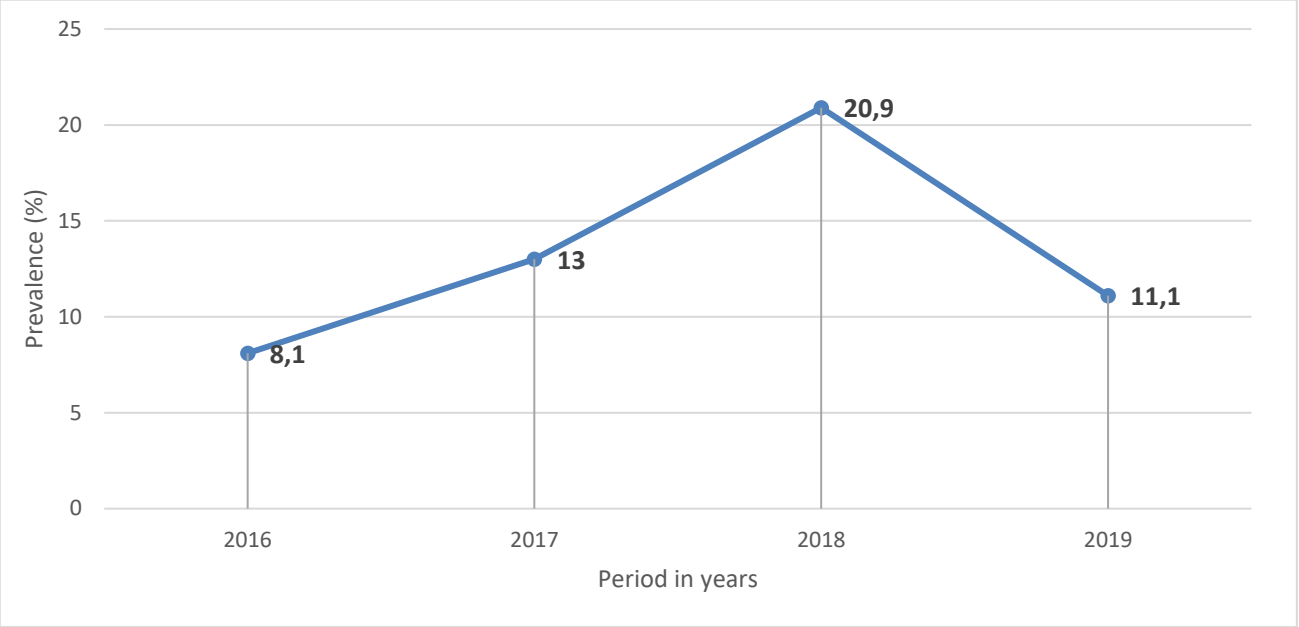

Figure 4.2: Prevalence of stillbirth stratified by year

Figure 4.3 below presents the prevalence of stillbirth stratified by maternal age and it shows that the prevalence of stillbirth increased with increasing age from 0.4% in age group ≤14 years to 26.2% then decreased to 21.5% in age group 30 – 34 years. A sharp decrease has been reported from 11.6% at age group 35 – 39 years to 2.1% in age group 45 years and above.

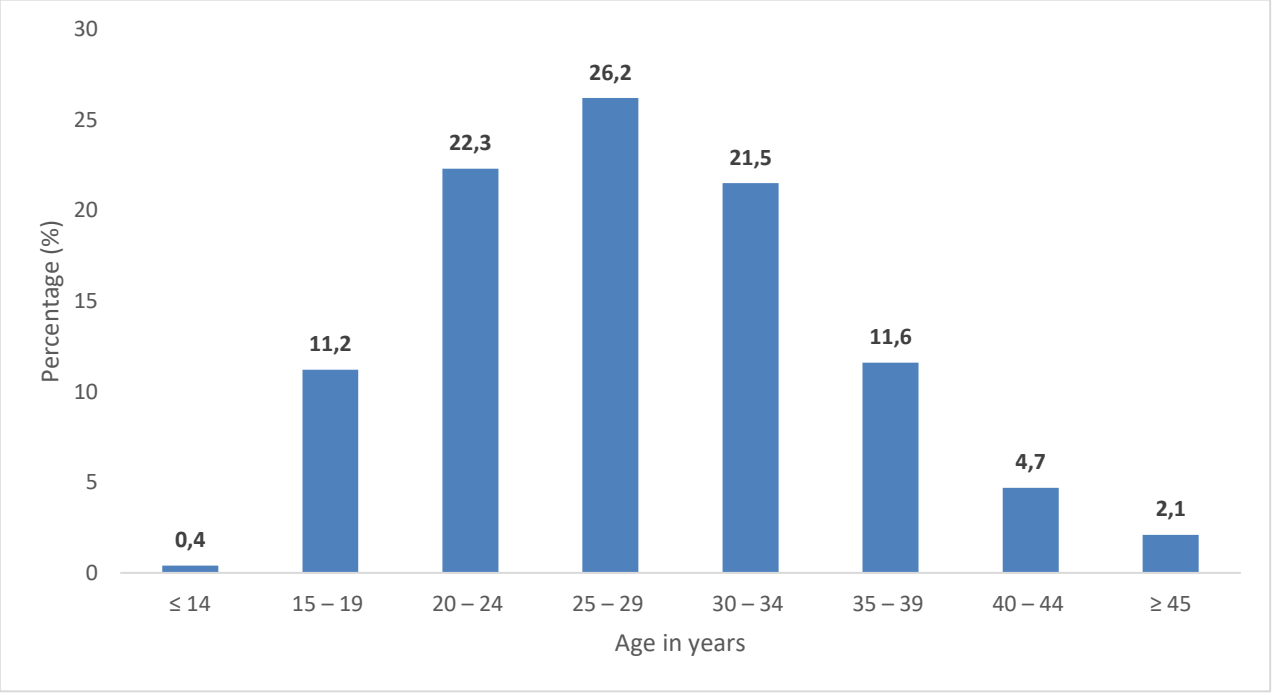

Figure 4.3: Prevalence of stillbirth stratified by maternal age groups

4.3.3 Prevalence of macerated stillbirth

The prevalence of macerated stillbirth amongst women who delivered at Dilokong hospital between period 2016 and 2019 was 11.0 % (CI: 0.1 – 12.5) as presented in Figure 4.4 below.

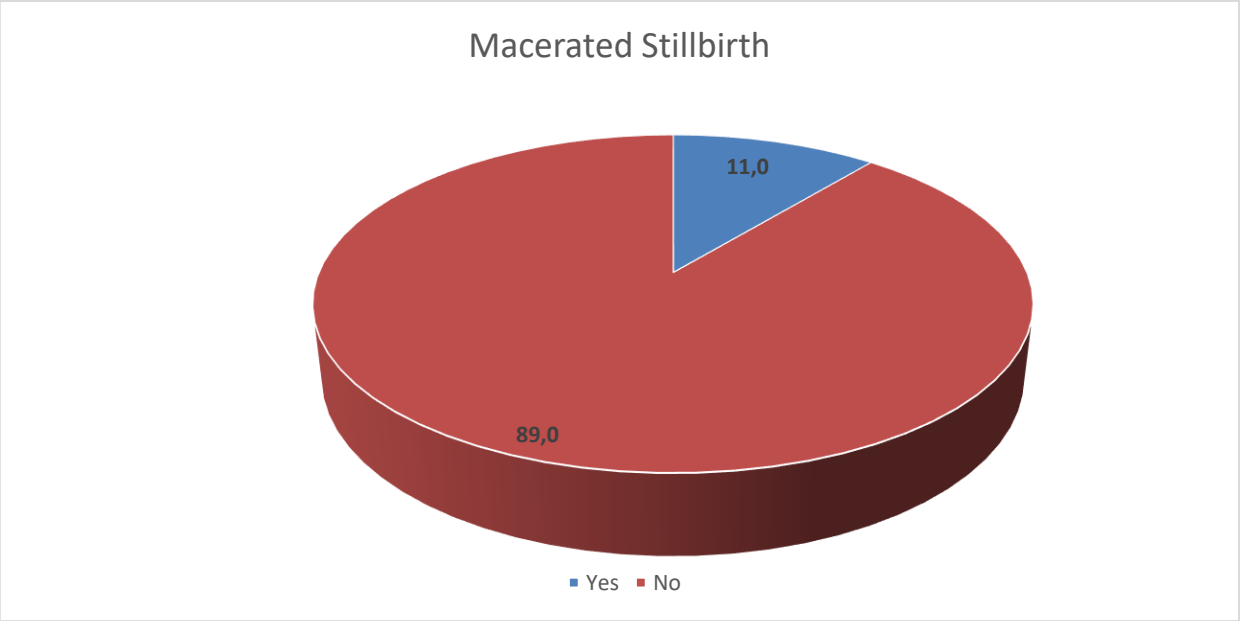

Figure 4.4: Overall prevalence of macerated stillbirth

The 2x2 table below revealed that 81.1% of the stillbirths were macerated stillbirths (Table 4.3).

Table 4.3: Proportion of stillbirth which were macerated stillbirth

Stillbirth	Macerated stillbirth			*P-value*
	Yes	No	Total	
Yes	189 (81.1)	44 (18.9)	233	*<0.001*
No	0 (0.0)	1488 (100.0)	1488	
Total	189 (11.0)	1532 (89.0)	1721	

Figure 4.5 below presents the prevalence of macerated stillbirth stratified by year and it reveals that the prevalence has increased from 6.6% in 2016 to 21.6% in 2018 then dropped to 8.9% in 2019 respectively.

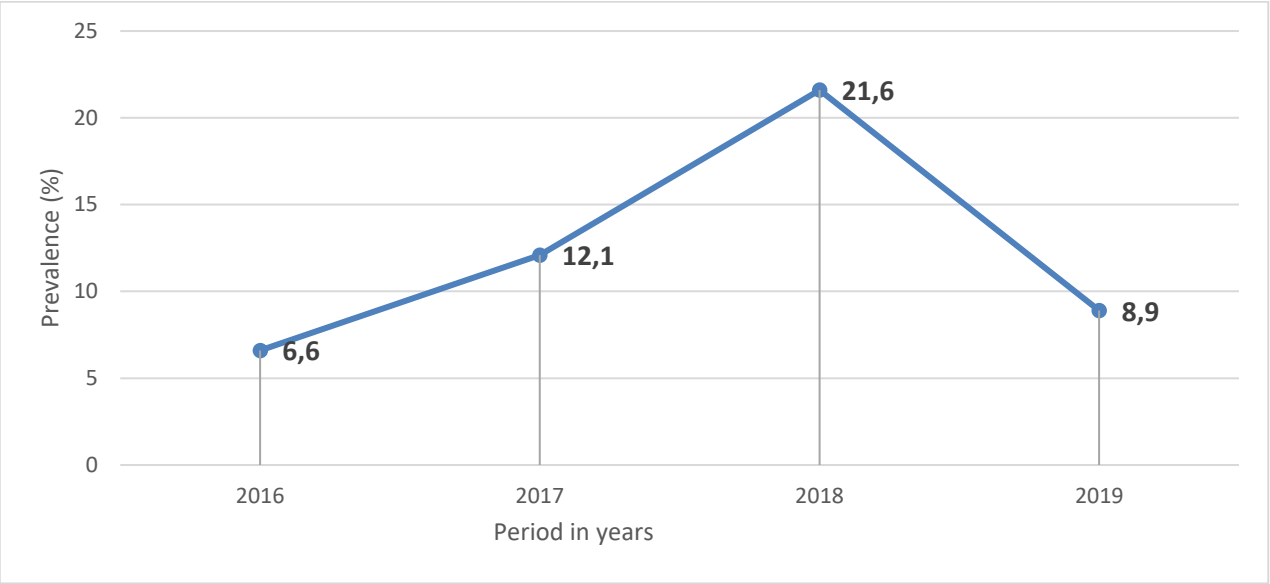

Figure 4.5: Prevalence of macerated stillbirth stratified by year

Figure 4.6 below presents the prevalence of macerated stillbirth stratified by age of the pregnant women. A similar trend with prevalence of stillbirth has been reported as the prevalence of macerated stillbirth increased with increasing age from 0.5% in age group ≤14 years to 27% in age group 25 – 29 years, then decreased to 21.2% in age group 30 – 34 years. A sharp decrease has been reported from 11.1% at age group 35 – 39 years to 2.1% in age group 45 years and above.

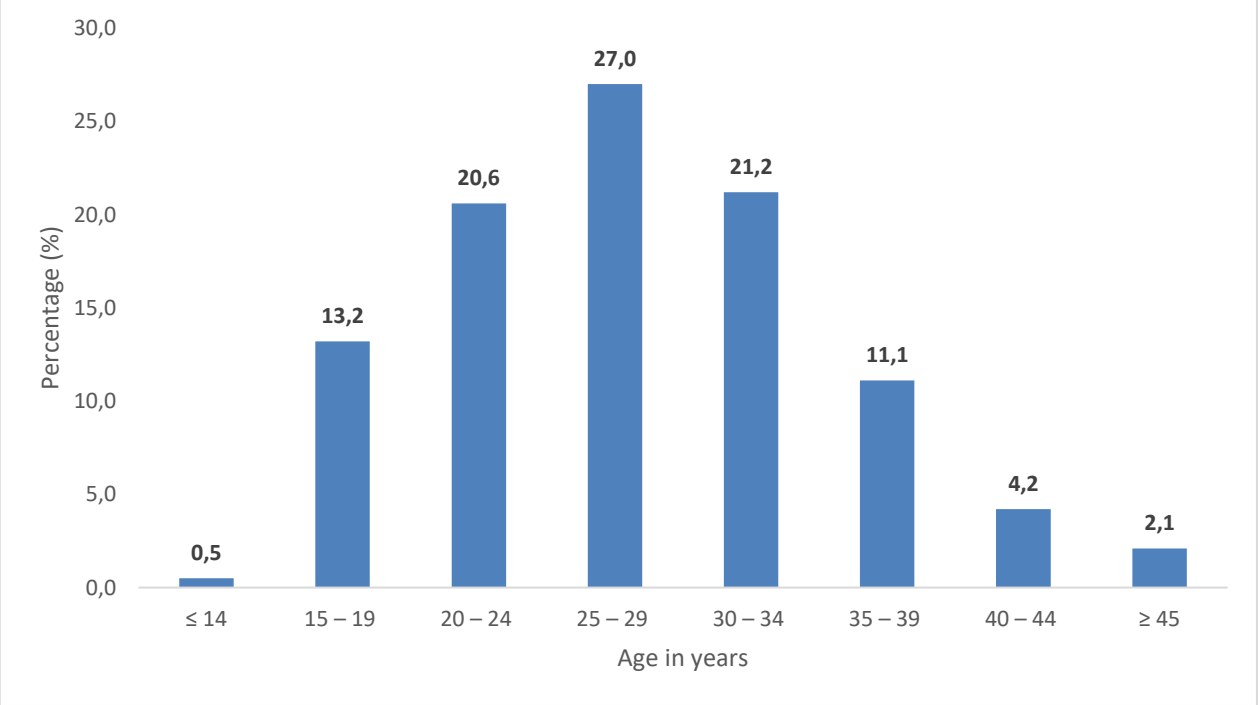

Figure 4.6: Prevalence of macerated stillbirth stratified by age groups in year

4.3.4 Prevalence of fresh stillbirth

The prevalence of fresh stillbirth amongst women who delivered at Dilokong hospital between period 2016 and 2019 was 2.6 % (CI: 0.02 – 0.3) as presented in Figure 4.7 below.

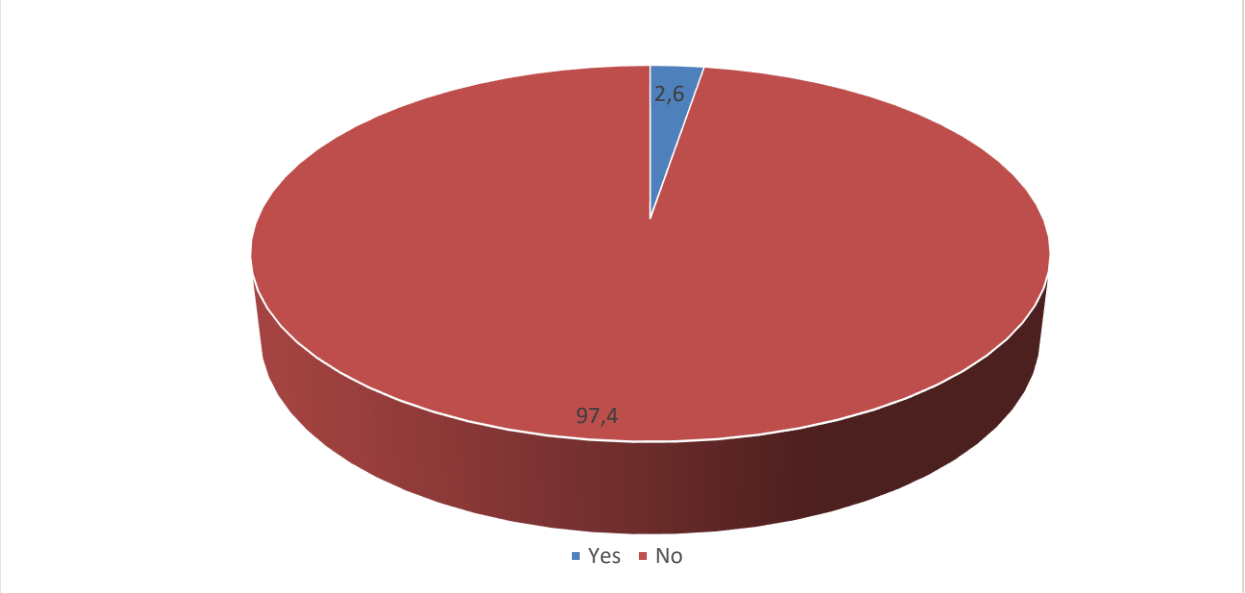

Figure 4.7: Overall prevalence of fresh stillbirth

The 2x2 table below revealed that 18.9% of the stillbirths were fresh stillbirths (Table 5.6)

Table 4.6: Proportion of stillbirth which were fresh stillbirth

Stillbirth	Fresh stillbirth			*P-value*
	Yes	No	Total	
Yes	44 (18.9)	189 (81.1)	233	*<0.001*
No	0 (0.0)	1488 (100.0)	1488	
Total	44 (2.6)	1677 (97.4)	1721	

Table 4.4 below presents the prevalence of fresh stillbirth stratified by year and it reveals that the prevalence of fresh stillbirth is showing different trend with prevalence of stillbirth and that of macerated stillbirth as the highest prevalence was in 2018 at 34.1% but followed by 2019, 2017 and 2016 at 27.3%, 20.5% and 18.2 respectively.

Table 4.4: Prevalence of fresh stillbirth stratified by year

Fresh stillbirth	2016	2017	2018	2019	*P value*
No	410 (24.5)	407 (24.3)	458 (27.3)	402 (24.0)	0.601
Yes	8 (18.2)	9 (20.5)	15 (34.1)	12 (27.3)	

Figure 4.8 below presents the prevalence of fresh stillbirth stratified by age of the pregnant women. The prevalence of fresh stillbirth has revealed a decreasing trend with increasing age of pregnant women from 29.6% at age group 20 – 24 years to 2.3% at age group 45 years and above.

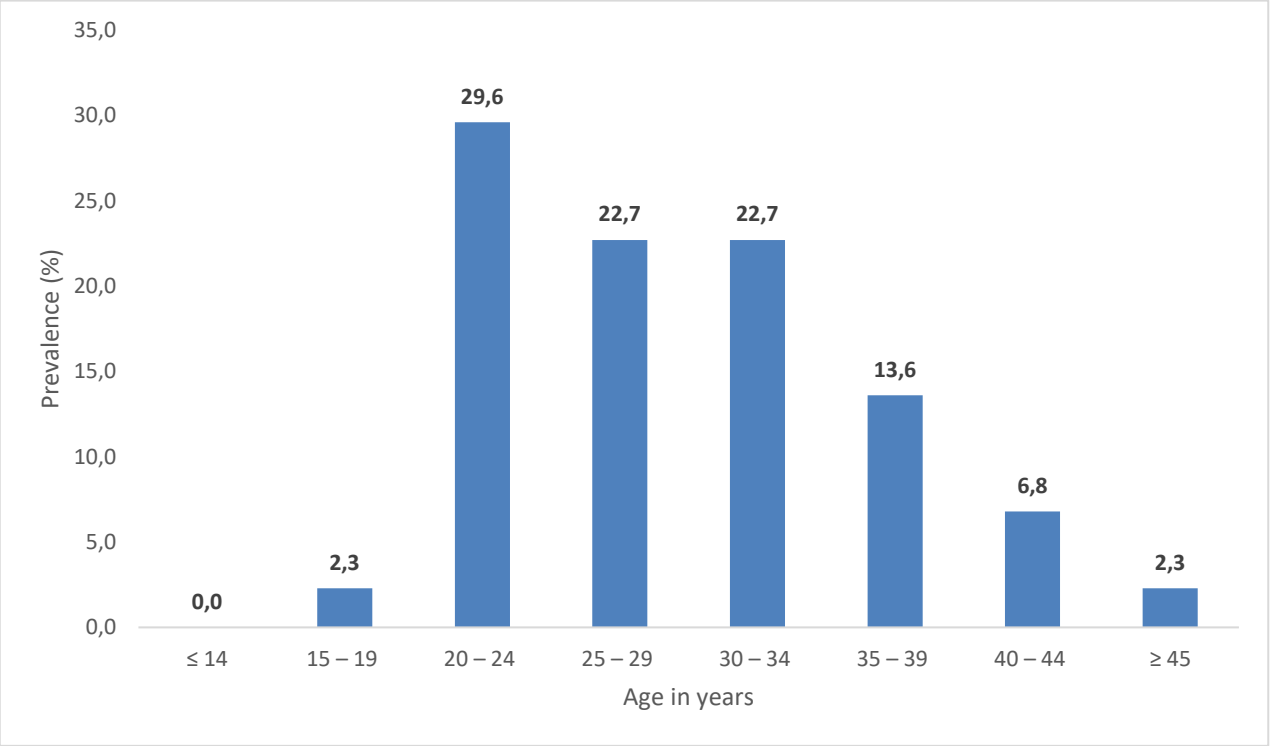

Figure 4.8: Prevalence of fresh stillbirth stratified by age groups in year

4.3.5 Association of HIV with termination of pregnancy

In the univariate logistic regression, the association of socio-demographics of pregnant women with stillbirth revealed that there was significant association of age, marital status of pregnant women, level of education, parity, gravidity, syphilis and HIV status. Older women at age 18 years and above were 1.4 times more likely to have stillbirth at *p<0.05*

and 1.9 times more likely to have fresh stillbirth at *p<0.05*. Therefore, pregnant women aged 18 – 30 years were 3.3 times more likely to have stillbirth at *p<0.05* and 2.6 times more likely to have macerated stillbirth at *p<0.05*. Lastly, pregnant women aged 31 years and above were 3.7 times more likely to have stillbirth at *p<0.05* and 2.7 times more likely to have macerated stillbirth at *p<0.05* respectively as presented in Table 4.8 below.

Single women in the current study were 3.3 times more likely to have stillbirth and 3 times more likely to have macerated stillbirth as compared to married women at *p<0.005* and *p<0.05* respectively. A similar association was reported amongst divorced women while widowed women were 4.3 times more likely to have stillbirth and 4 times more likely to have macerated stillbirth as compared to married women at *p<0.005* and *p<0.05* respectively. Fresh stillbirth was not significantly associated with marital status of pregnant women. Educational level was significantly associated with both stillbirth and macerated stillbirth as those women with no education or having primary educational level were 12.3 times more likely to have stillbirth and 14 times more likely to have macerated stillbirth as compared to women with tertiary educational level at *p<0.001*. Lastly, women with secondary educational level were 4.5 times more likely to have stillbirth and 5.4 times more likely to have macerated stillbirth as compared to women with tertiary educational level at *p<0.05* as presented in Table 4.8 below.

The association of parity of parity and stillbirth revealed that women who had pregnancies that have each resulted in the birth of an infant capable of survival (parity) for four or more times were 2.4 times more likely to have stillbirth at *p<0.005*, and 2 times more likely to have macerated stillbirth at *p<0.05* and 3.4 times more likely to have fresh stillbirth at *p<0.05* as compared to women who had parity of zero. The association of gravida and stillbirth revealed that women who were in their fifth or more pregnancies (gravida) were 1.8 times more likely to have stillbirth and 3 times more likely to have fresh stillbirth at *p<0.00*. The association of syphilis and stillbirth revealed that women who had tested positive for syphilis were 4.1 times more likely to have stillbirth and 3.7 times more likely to have macerated stillbirth at *p<0.001.* Women who were HIV positive were 3.1 times more likely to have stillbirth and 2.3 times more likely to have macerated stillbirth at *p<0.001* as presented in Table 4.8 below.

Table 4.8 Association of socio-demographics of pregnant women with stillbirth

	Univariate Logistic Regression		
Age in years	Overall stillbirth	Macerated stillbirth	Fresh stillbirth
	OR(95%CI)		
< 18	Ref	Ref	Ref
Older	1.4 (1.1 – 1.8)*	1.2 (0.9 – 1.6)	1.9 (1.1 – 3.3)*
Age group in years			
< 18	Ref	Ref	Ref
18 – 30	3.2 (1.3 – 7.9)*	2.6 (1.0 – 6.4)*	–
≥31	3.7 (1.5 – 9.4)*	2.7 (1.1 – 6.9)*	0.6 (0.3 – 1.1)
Marital status			
Married	Ref	Ref	Ref
Single	3.3 (1.5 – 7.3)**	3.0 (1.3 – 7.0)*	4.2 (0.5 – 31.1)
Divorced	3.3 (1.4 – 7.8)*	3.0 (1.2 – 7.7)*	3.8 (0.4 – 33.4)
Widowed	4.3 (1.7 – 10.9)**	4.0 (1.5 – 10.9)*	4.6 (0.5 – 45.4)
Level of education			
Tertiary	Ref	Ref	Ref
None or Primary	12.3 (4.7 – 31.6)***	14.0 (4.5 – 43.6)***	2.6 (0.7 – 10.8)
Secondary	4.5 (1.4 – 14.5)*	5.4 (1.4 – 21.6)*	1.9 (0.3 – 12.6)
Antenatal			
Booked	Ref	Ref	Ref
Not booked	0.9 (0.5 – 1.6)	1.1 (0.6 – 2.0)	0.3 (0.04 – 2.1)
Parity			
0	Ref	Ref	Ref
1	1.2 (0.8 – 1.7)	1.2 (0.8 – 1.7)	1.3 (0.6 – 3.1)
2 – 3	0.9 (0.6 – 1.3)	0.8 (0.6 – 1.2)	1.6 (0.7 – 3.5)
≥ 4	2.4 (1.4 – 3.9)**	2.0 (1.2 – 3.5)*	3.4 (1.2 – 9.5)*
Gravida			
1	Ref	Ref	Ref
2	1.3 (0.9 – 1.9)	1.2 (0.9 – 1.9)	1.5 (0.6 – 3.5)
3 – 4	0.9 (0.6 – 1.3)	0.8 (0.5 – 1.2)	1.5 (0.7 – 3.3)
≥ 5	1.8 (1.1 – 2.9)*	1.5 (0.9 – 2.6)	3.0 (1.1 – 8.0)*
Syphilis			
Negative	Ref	Ref	Ref
Positive	4.1 (1.3 – 12.5)*	3.7 (1.1 – 12.0)*	3.2 (0.4 – 25.4)
HIV			
Negative	Ref	Ref	Ref
Positive	3.1 (2.0 – 4.6)***	2.3 (2.1 – 5.0)***	1.6 (0.6 – 4.2)

Values are reported as odds ratios (95%CI); * significant *at p<0.05;* ** significant *at p<0.005;* *** significant *at p<0.001*, [a]Not significant

4.4 Overview of research findings

The prevalence of stillbirth in the current study was found to 13.5% which is high and this increased with increasing age. Stillbirth was significantly age, marital status, level of education, parity, gravidity, syphilis and HIV positive status.

4.5 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, RECOMMENDATION AND CONCLUSION

5.1 Introduction

In the previous chapter, the findings of the current study were presented and interpreted. In this chapter, the results of this study are discussed and compared to the relevant literature to address the study objectives which were:

- To describe the socio-demographic characteristics of mothers in Dilokong Hospital from 01 January 2016 to 31 December 2019.
- To determine the prevalence of stillbirths in Dilokong Hospital from 01 January 2016 to 31 December 2019.
- To determine the association of stillbirths with socio-demographics of mothers

Therefore, this chapter will be divided into the following sub-sections:

- Introduction
- Socio-demographic characteristics of mothers who had stillbirths
- Prevalence of stillbirths
- Determinants of stillbirths
- Study limitations,
- Conclusion and recommendation.

5.2 Socio-demographics of women who terminated pregnancies

The current study revealed that the mean maternal age of the sample population was 26.9 years which is similar to the findings from a studies conducted in Nigeria and Ghana (Ugwa & Ashimi, 2015; Nonterah, Agorinya, Kanmiki, Kagura, Tamimu & Ayamba et al., 2020.) but less than the mean maternal age of those conducted in Califonia which was 28.8 years (Mayo, Lu, Stevenson, Shaw & Eisenberg, 2019). The current study findings also revealed that the majority of deliveries were in amongst women aged 25 – 29 years which concurs with findings from a study conducted in Ghana (Nonterah et al., 2020). Majority of the women in the current study were single which differs from the findings of the study conducted in Eastern Uganda (Kujala, Waiswa, Kadobera, Akuze, Pariyo & Hanson, 2017) and had a primary or no educational which concurs with findungs from study conducted in Nigeria and Bangladesh (Ugwa & Ashimi, 2015; Abir, Agho, Ogbo, Stevens, Page, Hasnat & Dibley et al., 2017). Majority of the women in the current study

had not given birth before which differs from the findings of the study conducted in Ghana as the majority of women were multiparous (Nonterah et al., 2020).

5.3 The prevalence of stillbirths, macerated stillbirths and fresh stillbirths

Stillbirth is a common adverse outcome of pregnancy that contributes considerably to poor maternal health (Bhusal, Gautam, Lim & Tongkumchum, 2019). It remains a severely understudied and grossly underreported problem in low-income countries (Gold, Abdul-Mumin, Boggs, Opare-Addo & Lieberman, 2014). According the findings of this study prevalence of stillbirth was 13.5% which is much higher and inconsistent with findings from several studies such as in Ethiopia of 8.5% (Lakew, Tesfaye & Mekonnen, 2017) Brazil and Ghana of 1.5% and 3.5% respectively (Carvalho, Pellanda & Doyle, 2018). The huge differences in the stillbirth's prevalence raise a significant concern for Dilokong hospital in Limpopo Province to carefully consider what might be the contributory factors to high prevalence of stillbirths. Stillbirth is one of the adverse birth outcomes and represents a major problem in both developing and developed countries (Berhe, Gebreyesus & Teklay, 2019). The high stillbirth prevalence in the current study could be a reflection of quality of care during pregnancy and childbirth; skilled deliveries are increasing but stillbirth is not well reduced as required in the Dilokong hospital of Limpopo Province. A study conducted in Gondar university hospital in Northwest Ethiopia has reported almost similar stillbirth prevalence to the current study of 14% (Berhe et al., 2019).

Women of advanced maternal age (AMA) are a growing population, with higher obstetric risks (Nieto, Barrabes, Martínez, Prat & Zantop, 2019). The current study findings revealed that the prevalence of stillbirth was increasing with increasing maternal age 0.4% in age group ≤14 years to 26.2% then decreased to 21.5% in age group 30 – 34 years. This trend is similar to a trend reported in a study conducted in California (Mayo, Lu, Stevenson, Shaw & Eisenberg, 2019) and also concurs with a systematic review and meta-analysis conducted by Lean et al., (2017). The reasons that stillbirth rates increase with maternal age are currently unclear (Berhe et al., 2019) but this could be associated with the fact that an increasing number of women are getting educated and

entering the workforce, therefore there is an upshift in the average age at which couples have their first child (Dongarwar, Aggarwal, Barning & Salihu, 2020). Advanced maternal age (AMA) is defined as childbearing in a woman over 35 years of age (Lean et al., 2017) and in the current study AMA had a lower risk of having stillbirths as the prevalence of stillbirths decreased from age 35 years and above. This concurs with several studies (Lean et al., 2017; Bhusal, Gautam, Lim & Tongkumchum, 2019; Mayo et al., 2019; Nieto et al., 2019).

In the current study, the prevalence of macerated stillbirths and fresh stillbirths was reported to be 11% and 2.6% respectively which are both higher than the reported prevalence of macerated stillbirths and fresh stillbirths in Ghana, Guinea and Nigeria. In Ghana, Guinea and Nigeria the prevalence of macerated stillbirths was 0.7%, 1.8% and 0.8% respectively while the prevalence of fresh stillbirths was 0.4%, 3.2% and 0.3% respectively (Sacks, Mehrtash, Bohren, Balde, Vogel & Adu-Bonsaffoh et al., 2021). This results shows that the prevalence of fresh stillbirth was higher than the current study by 0.6%. In the current study, 81.1% of the stillbirths were macerated stillbirths while 19.9% of the stillbirths were fresh stillbirths. This is in contrary to the findings of a study conducted in Nigeria as Macerated stillbirths were lower than the fresh stillbirths (Okonofua, Ntoimo, Ogu, Galadanci, Mohammed & Adetoye et al., 2019)

5.4 The association between HIV and termination of pregnancy

There are several common risk factors for stillbirth in developing and developed countries (Bhusal et al., 2019). In the current study it was revealed that age, marital status of pregnant women, level of education, parity, gravidity, syphilis and HIV status were significantly associated with stillbirths. This concurs with findings from a study conducted in Ghana as marital status and parity were identified as factors associated with stillbirths (Ahinkorah, Seidu, Ameyaw, Budu, Bonsu & Mwamba, 2021). Similar to a study conducted in Nepal (Bhusal et al., 2019), maternal age, lack of education or low education and lack of antenatal care were some common factors significantly associated with stillbirth. In Nigeria and Brazil (Okonofua et al., 2019; Carvalho, Pellanda & Doyle, 2018), other determinants of stillbirth which were found to be relevant were high and low maternal age, with a higher risk of stillbirth for mothers younger than 20 and a tendency to increased risk of stillbirth in those older than 40. Lastly, in the current study, high parity

was significantly associated with stillbirths which concurs with findings from a study conducted in Brazil (Carvalho et al., 2018; Chaibva, Olorunju, Nyadundu & Beke, 2019).

5.5 LIMITATIONS OF THE STUDY

The present study had several limitations. First, the quality of medical records was variable and some key information was often not recorded, so this made it difficult for some questions to be answered. Therefore, confounder information has been lacking and there might be missing information on data quality. The information related to morbidities such as obesity, hypertension and other pregnancy related morbidities were not available and therefore it was not possible to determine the association between the rate of stillbirth in AMA mothers and the prevalence of maternal morbidities.

5.6 CONCLUSION

The prevalence of stillbirth was very high in the current study and there is a need for studies on stillbirth and related factors in rural areas of Limpopo Province. This study showed that maternal age, low educational level, marital status of pregnant women, high parity, gravidity, syphilis and HIV status were statistically associated with stillbirth. The factors associated with stillbirth in the current study are preventable if quality focused antenatal care, intrapartum care is provided. Therefore, identification of pregnancy complications and facilitation of proper method of delivery is key to improve quality of care. Efforts to reduce unacceptably high stillbirth in the current study are needed.

5.7 RECOMMENDATIONS

5.7.1 Policies

The current study revealed that there is a paucity of primary data on cause of stillbirth to inform effective interventions. The study strongly recommends future researchers to do an interventional study which could yield results to address factors influencing stillbirth which will facilitate the development of better public health interventions to reduce these preventable deaths and to improve maternal health.

5.7.2 Health facilities

The current study revealed that there are still pregnant women who do not attend antenatal care. As antenatal care improves the survival and health of babies directly by reducing stillbirths and neonatal deaths and indirectly by providing an entry point for health contacts with the woman at a key point in the continuum of care, it is recommended that Dilokong hospital should develop strategies to encourage pregnant women to attend antenatal care regularly.

5.7.3 Research

Since stillbirths involve loss of life, they can be viewed as tragic. Furthermore, many parents face psychological effects after stillbirth, including anxiety and depression, post-traumatic stress disorder, and stigmatization. In addition, women who have experienced stillbirth are more likely to experience it again in later pregnancies. Therefore, scientific studies should be conducted to assess the psychosocial impacts of stillbirths on mothers. Lastly, a provincial or national study is needed to provide knowledge on the relative importance of the various factors affecting stillbirth

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APPENDIX A: APPENDIX 1: DATA COLLECTION TOOL

SECTION A: MATERNAL DEMOGRAPHICS

ID	

A1 Age _____ **years**

A2 Parity _____

Yes No

A3 Antenatal visits _____ **Unbooked**

Booked

A4 Marital status
- Single or never married
- Married or co-habiting
- Divorced or separated
- Widowed

A5 Educational Level
- No schooling
- Primary
- Secondary
- Tertiary

A6 Work status — Working Not working

A7 Maternal comorbidities — Hypertension,Diabetes Mellitus

SECTION B: CHARACTERISTICS OF MACERATED STILLBIRTHS

YES NO

Blood results-

syphilis

HIV

Anaemia

Gestational age

Above 40 weeks

Between 37 - 40

Between 32 - 36

Between 28 – 31

Antepartum Haemorrhage

Abruption placenta

Placenta praevia

Foetal movements

< 8 Hours' time to death

≥8 Hours' time to death

Grade of Maceration	Features	Duration of Intrauterine Demise
0	● "parboiled" reddened skin	< 8 hours
I	● skin slippage and peeling	> 8 hours

II	● extensive skin peeling • red serous effusions in chest and abdomen due to hemoglobin staining	2-7 days
III	● liver yellow-brown • turbid effusion • may be mummified	>= 8 days

Birth weight
1000g to 1499g
1500g to 2499g
2500g to 4200g
above 4200g
Duration of labour
Less than 24 hours
More than 24 hours
Congenital abnormalities

SECTION C: CHARACTERISTICS OF FRESH STILLBIRTHS			
		YES	NO
Blood results-			
	syphilis		
	HIV		
	Anaemia		
Gestational age			
	Above 40 weeks		
	Between 37 - 40		
	Between 32 - 36		
	Between 28 – 31		
Antepartum Haemorrhage			
Abruption placenta			
Placenta praevia			
Intrapartum complications			
	Cord prolapse		
	Cephalopelvic disproportion		
	Other, specify		
Birth weight			
	1000g to 1499g		
	1500g to 2499g		
	2500g to 4200g		
	above 4200g		

Duration of labour			
	Less than 12 hours		
	More than 12 hours		
Congenital abnormalities			

APPENDIX B: LETTER OF REQUEST FOR PERMISSION TO CONDUCT RESEARCH IN LIMPOPO PROVINCE – LIMPOPO DEPARTMENT OF HEALTH

PO BOX 1238

BURGERSFORT
1150
14 July 2019

Head of Department
Department of Health Limpopo
Private bag x 9302
Polokwane
0700

Request for permission to conduct research at Dilokong Hospital: Total number of deliveries between January 2016 to December 2018.

Dear Madam/Sir

My name is Lesibe Portia Dibakwane, I am a student at the University of Limpopo. I am in my first year studying towards a Master of Public Health, I request permission to conduct the research in Dilokong Hospital. My title is **Prevalence and factors**

associated with stillbirth in Dilokong Hospital between January 2016 and December 2018.

The study will help to analyse the prevalence and risk factors associated with stillbirth. Thanks in advance.

Regards

Dibakwane Lesibe Portia

0769422858

Drdibkwane@gmail.com

APPENDIX B: LETTER OF REQUEST FOR PERMISSION TO COLLECT DATA AT DILOKONG HOSPITAL

PO BOX 1238
BURGERSFORT
1150
14 July 2019

Head of Department
Department of Health Limpopo
Private bag x 9302
Polokwane
0700

Request for permission to conduct research at Dilokong Hospital: Total number of deliveries between January 2016 to December 2018.

Dear Madam/Sir

My name is Lesibe Portia Dibakwane, I am a student at the University of Limpopo. I am in my first year studying towards a Master of Public Health, I request permission to conduct the research in Dilokong Hospital. My title is **Prevalence and factors associated with stillbirth in Dilokong Hospital between January 2016 and December 2018.**

The study will help to analyse the prevalence and risk factors associated with stillbirth. Thanks in advance.

Regards

Dibakwane Lesibe Portia

0769422858

Drdibkwane@gmail.com

APPENDIX C: Approval from Turfloop Research Ethics Committee (TREC)

University of Limpopo
Department of Research Administration and Development
Private Bag X1106, Sovenga, 0727, South Africa
Tel: (015) 268 3935, Fax: (015) 268 2306, Email: anastasia.ngobe@ul.ac.za

TURFLOOP RESEARCH ETHICS COMMITTEE

ETHICS CLEARANCE CERTIFICATE

MEETING: 12 August 2020

PROJECT NUMBER: TREC/173/2020: PG

PROJECT:

Title:	Prevalence and Determinants of Stillbirths in Dilokong Hospital of The Limpopo Province
Researcher:	LP Dibakwane
Supervisor:	Dr E Maimela
Co-Supervisor/s:	Dr PM Mamogobo Dr TS Ntuli
School:	Health Care Sciences
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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APPENDIX D: Approval from Limpopo Department of Health

LIMPOPO
PROVINCIAL GOVERNMENT
REPUBLIC OF SOUTH AFRICA

Department of Health

Ref : LP_2020_11_022
Enquires : Ms PN Motimele
Tel : 015-293 6028
Email : Phoebe.Mahlokwane@dhsd.limpopo.gov.za

Lesibe portia Dibakwane

PERMISSION TO CONDUCT RESEARCH IN DEPARTMENTAL FACILITIES

Your Study Topic as indicated below;

Prevalence and determinants of stillbirths in Dilokong hospital of the 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

08/02/2021

a/Director Research
Dr. Ramalivhana NJ

Date

Private Bag X9302 Polokwane
Fidel Castro Ruz House, 18 College Street. Polokwane 0700. Tel: 015 293 6000/12. Fax: 015 293 6211.
Website: http/www.limpopo.gov.za

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APPENDIX E: Approval from Dilokong Hospital, Limpopo Province

LIMPOPO
PROVINCIAL GOVERNMENT
REPUBLIC OF SOUTH AFRICA

Private Bag X9119
DRIEKOP
1129

DEPARTMENT OF HEALTH
SEKHUKHUNE DISTRICT
DILOKONG HOSPITAL

Ref: S10/3
Enq: Mafogo G.A
Tel: 013 214 7265

02/03/2021

Lesibe Portia Dibakwane
University of Limpopo

APPROVAL TO CONDUCT RESEARCH AT DILOKONG HOSPITAL (MATERNITY WARD)

1. We acknowledge the receipt of your application to conduct research on the 02/03/2021.
2. Kindly be informed that the Chief Executive Officer has granted you the permission to conduct research study in prevalence and determinants of stillbirths at Dilokong Hospital as per approval attached from provincial office.
3. You are requested to inform the HREC office about the commencement of your research at the institution.
4. Your positive contribution during your research will be highly appreciated.
5. Thanking you in advance.

LIMPOPO PROVINCE
DHO
2021 -03- 02
DILOKONG HOSPITAL
PRIVATE BAG X9119 DRIEKOP 1129
DEPARTMENT OF HEALTH

CHIEF EXECUTIVE OFFICER

02/03/2021
DATE

Tel: +27 13 214 7265, 7269, 7005, 7037
Fax: +27 13 214 7201, +27 13 214 7261

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APPENDIX F: Evidence of language editing

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Plot 48, Palmietfontein, Polokwane, 0699
Postnet Suite 226 • Private Bag X9307 • Polokwane • 0700
Tel: 076 079 0214 • Fax: 086 216 7380

Date: 03 August 2021

To Whom it May Concern

I hereby confirm that I have proof-read the document entitled: "**Prevalence and determinants of stillbirths in Dilokong Hospital of the Limpopo Province**" authored by Dibakwane LP, and have suggested a number of changes which the student may, or may not, accept, at her discretion and the supervisor.

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