

**MATERNAL AND FETAL RISK FACTORS FOR STILLBIRTH IN
OTJOZONDJUPA REGION, NAMIBIA: A CASE CONTROL STUDY**

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ABSTRACT

Background: Stillbirth is defined as a baby born with no signs of life (WHO). Globally, around 3.2 million stillbirths occur annually, of which, 98% are experienced in low and middle-income countries. By 2009, Namibia's stillbirth rate was 15 per 1000 deliveries. Otjozondjupa Region topped the list of regions with high burden of stillbirth in Namibia in 2016. Like many other countries, stillbirths are not prioritized and fewer resources are mobilized to curb them in relation to neonatal and maternal deaths. This study was aimed at determining risk factors associated with stillbirth in Otjozondjupa Region of Namibia

Methods: An unmatched case control study was conducted. A pilot tested questionnaire was used for data extraction. A sample of 285, 95 cases and 190 controls were chosen using simple random sampling method. Data was analyzed using Epi info 7. Whereby bivariate and multivariate analyses were done to assess the risk factors of stillbirth. Odds ratio with 95% Confidence Intervals were calculated. Statistical significance was set at the p value of 0.05.

Results: In this study, no significant association was observed between socio-economic factors and stillbirth. However, stillbirth was significantly associated with some maternal medical and obstetric factors including, premature delivery (aOR 0.13 95% CI 0.05 – 0.33, p value 0.0001), gestational age (aOR 0.04, 95% CI 0.00 – 0.25, p value 0.0001), high-risk pregnancy (aOR 3.59, 95% CI 1.35 – 9.55, p value 0.01), duration of labour (aOR 4.04, 95% CI 1.56 – 10.43, p value 0.003) and ANC attendance (aOR 0.07, 95% CI 0.00 – 0.79, p value 0.03). On the other hand, only low birth weight of ≤ 2500 g was associated with stillbirth amongst fetal related factors (aOR 16.58, 95% CI 8.71 – 31.55, p value 0.0001). Some variables could not be assessed due to incomplete records.

Conclusion: Stillbirth rate is high in Otjozondjupa Region hence a major concern. Stillbirth appeared to be mostly associated with maternal medical and obstetric factors.

Importance of thorough Antenatal Care (ANC) examination and exhaustive obstetric care for all cases need to be emphasized. Emergency Obstetric and Newborn Care training is recommended for midwives is recommended.

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LIST OF ABBREVIATIONS AND ACRONYMS

AIDS	Acquired Immune Deficiency Syndrome
ANC	Antenatal Care
BBA	Born Before Arrival
CDC	Center for Disease Control and prevention
CD4	Cluster of Differentiation 4
CRS	Congenital Rubella Syndrome
C/S	Caesarean Section
DHIS	District Health Information System
EPI	Expanded Program on Immunization
EmONC	Emergency Obstetric and Newborn Care
HAART	Highly Active Antiretroviral Therapy
HIC	High Income Countries
HIV	Human Immunodeficiency Virus
ICD	International Classification of Diseases
ITN	Insecticide Treated Bed Nets
LGA	Large for Gestational Age
LMIC	Low and Middle Income Countries
MCV	Measles Containing Vaccine
MDG	Millennium Development Goals
MNCH	Maternal, Newborn and Child Health
MoHSS	Ministry of Health and Social Services

NVD	Normal Vaginal Delivery
PMTCT	Prevention from Mother To Child Transmission
RCV	Rubella Containing Vaccine
SGA	Small for Gestational Age
UK	United Kingdom
USA	United States of America
WCBA	Women of Child Bearing Age
WHO	World Health Organization

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DECLARATIONS

I, Rebekka Ndatolewe Shikesho, hereby declare that this study is my own work and is a true reflection of my research, and that this work, or any part thereof has not been submitted for a degree at any other institution.

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Name of Student

Signature

Date

CHAPTER 1: INTRODUCTION

1.1 Background of the study

Stillbirth is a distressing outcome of pregnancy that needs to be evaded at all costs. It is a traumatic experience for the mother, the family and obstetrician as well (1,2). The World Health Organization (WHO, 1992) defines stillbirth as “death before the complete expulsion or extraction from its mother of a product of conception, irrespective of the duration of pregnancy; the death is indicated by the fact that after such separation, the fetus does not breathe or show any other evidence of life, such as beating of the heart, pulsation of the umbilical cord, or definite movement of voluntary muscles” (3). In agreement, the Centers for Disease Control and prevention (CDC) (4) also defines still birth as the death of a baby before or during delivery. To date, there is no unanimously accepted definition of stillbirth that includes the criteria for gestational age or birth weight at which loss of life occurs (3). Meanwhile different countries use different gestational age. The socio-economic status of the country and presence of neonatal intensive care plays an important role in the determination of the ‘cut off weeks’ of the gestational age for stillbirth. Fewer babies below 30 weeks gestational age survives in countries without neonatal intensive care hence the cut off gestational weeks are much lower in High Income Countries (HICs) as compared to Middle Income Countries (MICs) and Low Income Countries (LICs) (5,6). Examples can be derived

from HICs such as the USA and Canada that uses 20 gestational weeks as a cut off (4,7), The United Kingdom (UK) is not far behind using 24 weeks (7). The International Classification of Diseases (ICD) prefers birth weight as criteria to identify a late fetal death as opposed to gestational age that is an additional requirement for reporting for international comparative purposes (5). Because of the various stillbirth definitions, WHO recommends 28 gestational weeks and or 1000 grams or having at least 35 cm body length (8). Therefore, for the purpose of this study, this (WHO) definition will be used.

As stated by Bhutta et al. (9) and Embargo (10), globally, about 3.2 million stillbirth are experienced yearly. Whilst this number is overwhelming, it is exhilarating to note that 98% of these occur in LMICs. Some studies have argued that rates of perinatal and neonatal mortality have decreased much slower than infant mortality rates in the 2000s, on the contrary to stillbirths, which were stated to be increasing and accounts for more than 50% of perinatal deaths globally (11–14). Based on those findings, it can be affirmed that no significant improvement on stillbirth has been achieved. High parity, lack of Antenatal Care (ANC), Infection such as syphilis, HIV/AIDS & Malaria, birth trauma, prematurity and placental problems have all been termed as potential causes of stillbirth (15,16). Namibia is not spared from the high burden of this misfortune. Embargo (10) & Quandl (17) pointed out that by 2009, out of every 1000 births experienced in Namibia 15.00 were stillbirths. The top five Namibian regions with highest burden of stillbirth are highlighted in Table 1.

In the past decade, significant amount of research focused on stillbirths were

implemented (5). Nevertheless, there is consensus that stillbirths are understudied and under reported (18–21). Studies also claim that, stillbirth data from less developed countries are grossly incomplete making them unreliable and subsequently leading to inconclusive evidence (14,22,23). Incomplete data may be due to lack of resources, shortage of staff and high burden of work and or lack of knowledge. There may be several other reasons attributed to it too.

It remains unclear why stillbirths seem to be an invisible misfortune despite the available evidence proving the magnitude of the problem. A canopy eye has been paid to it as few resources are mobilized to combat this burden. Lawn et al. (5) argue that, unlike maternal health and child mortality, the millennium development goals do not include stillbirth neither are there global policies catering for it.

Risk factors for stillbirth can be described as those attributes, characteristics or exposure that increases the likelihood of stillbirth (24). It is worth noting that, risk factors do not guarantee the outcome. In other words, not every pregnant women exposed to a certain risk factor will have a stillborn. There are numerous risk factors that may increase the likelihood of stillbirth. Such risk factors can be divided into: maternal risk factors and fetal risk factors. Maternal risk factors are those that are associated with the mother while fetal are associated to the fetus development. Whilst some risk factors for stillbirth remain dominant, others may vary from one place to the next. Studies have found that maternal age, maternal obesity, smoking, asphyxia, fetal growth restriction and placenta abruption are but a few that have been termed as significant risk factors for stillbirth (23,25). There is limited information on risk factors for stillbirth in Namibia. This is one

of the few studies done on stillbirths in Namibia and possibly the first to explore the risk factors of stillbirth in Otjozondjupa region.

Table 1: Top 5 regions with a high burden of stillbirth in Namibia

#	Region	Stillbirths per 1000 births
1	Otjozondjupa	25.8
2	Kunene	23.2
3	Omaheke	21.7
4	Karas	20.3
5	Oshikoto	19.8

Source: MoHSS, District Health Information System 2017

1.2 Problem statement

Stillbirth is a growing concern in Sub Saharan countries that have attracted attention of governments and media alike. In January 2016, the Namibian newspaper (26) reported that 7000 babies are stillborn everyday in Africa, putting emphasis on how much of a burden it is to Africa.

As illustrated in MoHSS DHIS2 (27), Otjozondjupa is topping the list of regions with a high burden of stillbirths in Namibia in 2016, with 25.8 stillbirths per 1000 births. Over the past five years, cases of stillbirths in Otjozondjupa have been fluctuating in numbers.

In 2016 particularly, the region saw the highest number of stillbirths ever reported since 2012 (27). This is despite effort to improve overall obstetric health and antenatal care. Otjozondjupa is a vast region with diverse residents. It is also very sandy making some of the places hard to reach. The community sometimes travels very long distances to get health care amidst dire transport needs. Meanwhile other places have bad road infrastructures and are hence only reachable with vehicles designed to drive off road. The high number of cases could be attributed to lack of access to health care due to long distances, lack of knowledge, poverty or perhaps the presence and lifestyle of the marginalized San people residing in the region.

It is against this background that this study was proposed. It is aimed to determine possible risk factors that are associated with the rising number of cases in the region, in attempt to implement, modify and strengthen control measures, ultimately improving quality of obstetric and gynecology care.

1.3 Purpose and objectives of the study

1.3.1 Purpose of the study

The purpose of this study is to determine maternal and fetal risk factors associated with high stillbirths rates in Otjozondjupa Region, Namibia.

1.3.2 Hypothesis of the study

Three hypotheses were formulated for the purpose of this study. They are as follows:

Hypothesis 1:

H₀: Socio-demographic factors are not significantly associated with stillbirth in Otjozondjupa Region, Namibia.

H₁: Socio-demographic factors are significantly associated with stillbirth in Otjozondjupa Region, Namibia.

Hypothesis 2:

H₀: Maternal medical and obstetric factors are not significantly associated with stillbirth in Otjozondjupa Region, Namibia.

H₁: Maternal medical and obstetric factors are significantly associated with stillbirth in Otjozondjupa Region, Namibia.

Hypothesis 3:

H₀: Fetal related factors are not significantly associated with stillbirth in Otjozondjupa Region, Namibia.

H₁: Fetal related factors are significantly associated with stillbirth in Otjozondjupa Region, Namibia.

1.3.3 Objectives of the study**The general objective of this study is to:**

- To elucidate risk factors for stillbirth in Otjozondjupa Region, Namibia

The specific objectives of the study are to:

- Assess the maternal socio-demographic risk factors for stillbirth in Otjozondjupa

Region, Namibia.

- Determine the maternal medical and obstetric risk factors for stillbirth in Otjozondjupa Region, Namibia.
- Determine the fetal related risk factors for stillbirth in Otjozondjupa Region, Namibia.

1.4 Significance of the study

Understanding of risk factors is crucial to the enforcement and modification of stillbirth control measures. Not only does it hint where the major gaps are but it also assist in development of new appropriate interventions and strengthening the existing ones (28). The results of this study will underline risk factors associated with stillbirth. This will successively inform budgeting and resource allocation by policy makers. Elucidating the risk factors will also help to prioritize for programmes that promote obstetric health and antenatal care. When programmes are prioritized, they receive much needed enforcement in terms of resources. Adequate resources mean they are better modified to improve the chances of their success in reaching set objectives and ultimately predetermined goals. However, limited studies have been conducted on the topic in Namibia. There is a need for more studies to set new basic knowledge for action and improve the possessed knowledge.

1.5 Limitations of the study

Otjozondjupa is a vast region; some areas are dispersedly populated, it also has areas that are hard to reach. Due to this, logistical problems in terms of transport to various

districts were experienced. Lack or shortage of other resources was also observed during the data collection stage.

Since this study only included state healthcare facilities, women who delivered at private healthcare facilities did not have a chance to participate in the study. Due to the above mentioned, the outcome of the study can also not be generalized to private healthcare facilities but only to state healthcare facilities in the region.

The study focused only on Otjozondjupa region. This means that the results of the study cannot be generalized to other regions unless standardization is done. However, various regions may adapt the study recommendations.

1.6 Delimitation of the study

The study was carried out solely in Otjozondjupa Region and not in other regions of the country. The study site was selected due to its overwhelming stillbirth rate. Otjozondjupa region is vast hence some residents travel long distances to healthcare facilities. The region is also home to the San people, who are regarded as marginalized citizens. Due to the lifestyle of the San people, the findings of this study might be slightly different as compared to other areas.

The case control study design was chosen because of its ability to help determine if an exposure, in this case risk factors is associated with an outcome, which is stillbirth for this study (29). Hence it is deemed the appropriate study design to fulfill the research objectives. The study objectives focused on maternal socio-demographic and medical and obstetric risk factors plus fetal related risk factors because they can be easily

obtained using recorded data.

1.7 Definitions and operational concepts

1.7.1 Risk factors

Any attribute, characteristic or exposure of an individual that increases the likelihood of developing a disease or injury (24).

1.7.2 Stillbirth

A baby born at 28 gestational weeks and or weighing ≥ 1000 grams or having at least 35 cm body length, but without any sign of life such as heart beat, pulsation of the umbilical cord, or definite movement of voluntary muscle (13).

1.7.3 Live birth

Complete expulsion or extraction from its mother of a product of conception, which after such separation, breathes or shows any other evidence of life, such as beating of the heart, pulsation of the umbilical cord, or definite movement of voluntary muscles, whether or not the umbilical cord has been cut or the placenta is attached (13).

1.7.4 Maternal Socio-demographic factors

Matters pertaining to or involving a combination of social and demographic characteristic of the mother (24).

1.7.5 Maternal clinical factors

Matters related to the mother's medical history (24).

1.7.6 Fetal factors

Matters associated to the fetus development (24).

1.7.7 Perinatal mortality

The number of stillbirths and deaths in the first week of life (early neonatal mortality) (13).

1.7.8 Antepartum hemorrhage

Bleeding from or into the genital tract, occurring from 28 weeks of pregnancy and prior to the birth of the baby (30,31).

1.7.9 High risk pregnancy

A high-risk pregnancy is one that threatens the health or life of the mother or her fetus (32).

1.7.10 Parity

The number of times a female is or has been pregnant (gravidity) and carried the pregnancies to a viable gestational age (33).

1.7.11 Pre-eclampsia

A condition in pregnancy characterized by high blood pressure, sometimes with fluid retention and proteinuria with or without pathological edema (33).

1.8 Conclusion

Stillbirth rates are higher in LICs and MICs than HICs. Otjozondjupa region observed the highest burden of stillbirth in 2016 in Namibia. This chapter presented the background of stillbirths and highlighted the gap in knowledge due to insufficient similar studies undertaken in Namibia. The study delimitation was further explained and lastly, the operational concepts were defined.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

Enlightening of research with existing knowledge in that specific field is a vital part of every study foundation. The objective of literature review is to sum up what is already known and identifies knowledge gap alluring more studies (34). It is done by focusing the review on relevant existing secondary sources, analyzing and critiquing their results (35). This chapter brings about the review of existing literature on stillbirth and factors generally associated with it.

Stillbirth is a detrimental result of pregnancy. Not only is it detrimental to the bereaved parents but to the family and occasionally, the obstetrician too (1,21,36). Sometimes also referred to as invisible death (1), simply put, it is the birth of a dead fetus (13). It is estimated that 98% of all stillbirths happens in developing countries (22). Stillbirth accounts for more than 50% perinatal mortality. Although many factors are assumed to be causes of stillbirth, the cause of up to one third of stillbirths is unknown (14,22,37). Stillbirths are divided into two types: fresh stillbirth and macerated stillbirth. These types are also used to classify stillbirths in developing countries (38). A stillbirth is considered fresh when there are no visible changes to the skin. Herein, the fetus still looks fresh, hence the name. Fresh stillbirths are considered to have occurred shortly before birth. These are also considered to be preventable with improved midwifery skills, enhanced access to medical care, continuous education and resources mobilization. They can therefore serve, as a vital indicator of skills and medical care quality (39). On the other hand, macerated stillbirth suggests a death that took place

more than 12 hours before delivery and there is a visible change to the skin. The name is derived from a Latin word “macerare” which means to soften something by soaking it (39). Thorough examination of the cutaneous maceration can provide useful information to estimate the time of death (19,39). Skin slipping, which is the earliest form of maceration becomes visible on the skin roughly 6 hours after death and definite at 12 hours. In this stage, applying oblique pressure can easily separate the dermis from the epidermis (39). Not only do high stillbirth rates imply poor obstetric and antenatal care, they also contribute to increased perinatal mortality.

Literature seems to agree that little attention is paid to stillbirth and its burden ignored despite the troubling evidence. In the same vein, it is believed that stillbirths are understudied and underreported (18,19). Amongst the neonatal factors, several studies are in consensus that fetal growth restriction is a major cause of stillbirth (7,40,41). The risk of stillbirth also increased in preterm deliveries.

Maternal age has been termed one of the maternal factors influencing stillbirth. Being of younger age (≤ 25 years) is said to increase the chances of stillbirth, but whilst Kavanagh et al. (7) found a significant association, Gordon et al. (20) and Gardosi et al. (41) state how its association had no significance. However, both three studies found a statistical significance between increased maternal age (≥ 35 years) and stillbirth. As a result, Gordon et al. (20) has recommended stillbirth counseling to 35 years and older nulliparas. They also suggested that 40 years and older nulliparous be inducted for labor to reduce the rate of stillbirths. Parity joins the list, as null parity and increased parity were also associated with increased stillbirth (15). Women with history of previous

stillbirths have an increased chance of having a stillbirth compared to those who had none (40,42). Medical and obstetric factors such as Diabetes Mellitus, history of mental illness, hypertension, pre-eclampsia, antepartum hemorrhage, and no history of ante natal care were also found to have association with stillbirth (41). Obesity (BMI \geq 30) is one of the lifestyle factors that stood out. Studies are in covenant that, pre pregnancy obesity doubles the risk of stillbirth (7,41,43). These factors prompt for excess healthcare plus adequate health education to pregnant women who fall in one or more of the abovementioned categories.

2.2 Stillbirth on a global perspective

In an executive summary for the BioMed Central Pregnancy and Childbirth Supplement, Save the children an organization from the United States of America (USA) that invest in the livelihood of children reported that, globally, about 3.2 million stillbirths occur every year (9). Of the 3.2 million, 2.2 million occur before delivery whilst 1.0 million occur during delivery. It also pointed out that 98% of all stillbirths happen in LMICs. Adding that, even though 98% occurs in LMICs, stillbirths are a huge burden in both HICs and LMICs. They conducted a systematic review of electronic libraries and published papers to elucidate the major risk factors for stillbirth, evaluate potential interventions to counter them and strategies effective in delivering these interventions. This review has found association between syphilis and malaria infection and stillbirth. They also established that syphilis screening and treatment during ANC yielded proven

benefits in the reduction of stillbirths in the former and the use of ITNs in malaria endemic areas for the latter. Some other risk factors associated with stillbirth by save the children included hypertensive diseases of pregnancy including pre-eclampsia, maternal conditions including clotting disorders and deliveries conducted by unskilled persons. The interventions proven to have benefits for the above mentioned are emergency obstetric care and planned caesarian section, heparin administration for certain maternal conditions and improved obstetric care respectively. Moreover, save the children (9) claims that, there is evidence that perinatal audit could improve the quality of care and perinatal outcomes subsequently. Perinatal audits are also supported by the WHO (44), that believes that results generated by the audits are useful in guiding action to prevent similar deaths in the future. WHO (44) also pointed out that the same results may compel policy and decision makers to pay due attention to stillbirths. Save the children (9) emphasized that numerous beneficial interventions for stillbirths prevention can be successfully delivered via or alongside prevailing maternal, newborn and child health (MNCH) programmes. However, this review involved reviewing secondary information so it might have suffered similar bias as the original studies.

In a release by Embargo (10) in 2011, it was cited how over 2.6 million stillbirths occur in the third trimester of pregnancy adding that 7300 babies are stillborn everyday. They also reaffirmed that, 98% of stillbirths occur in LMICs. Statistics have further shown that, the incidence in developing countries remains high compared to developed countries. Similarly, they reiterate how stillbirth remains a huge burden in HICs despite that they have much lower rates than LICs and MICs. Embargo (10) also stated that

stillbirths globally have only declined by 1.1 per cent yearly, reducing from 3 million in 1995 to 2.6 million in 2009. This is a relative sluggish decline contrast to child and maternal mortality. The release points out delivery complications, maternal infections during pregnancy, maternal disorders & chronic infections, fetal growth restriction and congenital abnormalities as some of the main causes of stillbirth. Embargo conducted face-to-face and telephonic interviews with stillbirth experts. Some of the experts acknowledge how stillbirth is painful to women and their families although they “often go unrecorded, and are not seen as a major public health problem”, hence the dire necessity to attempt preventing them. Equally important, they indicated that 1.2 million stillbirths are intrapartum and 1.4 million antepartum. Intrapartum deaths can be directly attributed to the lack of skilled care during delivery. This basically means that improvement of care during delivery alone can significantly reduce the amount of intrapartum stillbirths.

Embargo (10) and Quandl (17) are but a few that rated stillbirths by country. These rates sharply differ from country to another. Although a slight difference is observed between the two publications, the countries ranking pretty might remain constant. The lowest rates are noted in Finland and Singapore, who clocks 2 stillbirths per 1000 births. The results provide confirmatory evidence that rates are greater in lower and middle-income countries in comparison to higher income countries. Sub Saharan African countries observed the highest rates. In agreement with save the children, Embargo suggests syphilis detection and care, comprehensive emergency obstetric care, malaria prevention and treatment, hypertension screening and management in pregnancy and detection and

Diabetes screening and management in pregnancy to name but just some. It is worth noting that these considerably doable interventions can improve the quality of care, avert deaths subsequently reducing the perinatal mortality. Having pointed that out, emphasis should be placed on prioritizing stillbirths and mobilizing essential resources globally. Special emphasis should be placed on LMICs to accelerate the much-needed results.

A study by Stanton et al. (45) estimates that, the stillbirth incidence rates in developing countries are as high as 25.5 per 1000 deliveries compared to developed countries whose incidence is about 5.3 per 1000 deliveries. They estimated that the rates in developing countries might be underestimated due to inadequate data. Often, stillbirths also go unrecorded due to the setting in which they happen hence underreporting remain a huge challenge. The Population Reference Bureau (46) supported the aforementioned. They recited how stillbirths go unaccounted in various national and international statistics. They also claim that, available evidence suggests stillbirths to constitute a sizeable portion to loss of life, yet invisible. Misclassification is a problem in it's own term, as early neonatal deaths are often misclassified as stillbirths whilst fresh stillbirths as neonatal deaths (45). This may be a result of several reasons namely, lack of knowledge, insufficient examination for signs of life and or work overload. They expressed how improving data quality could be the first step towards making stillbirths visible to public health action.

Liu et al. (47) studied the major risk factors for stillbirths in distinctive trimesters of pregnancy, in Taiwan. They found maternal age to be amongst these risk factors. Increasing age at delivery has been found to increase the risk of stillbirth. An association

backed up by Kavanagh et al.(7), Gordon et al.(20) and Gardosiet al. (41). Kavanagh et al. (7) also found that women younger than 25 years are at higher risk of delivering stillborn. Meanwhile, several other studies also pointed towards the same direction however, they found no significant association between the two (20,41). Other factors linked to stillbirth by Liu et al. (47) were, obesity, smoking, prematurity, umbilical cord pathologies and unexplained causes. Obesity increases the likelihood of stillbirth. Pre pregnancy obesity was said to be more hazardous in relation to pregnancy-induced obesity. Smoking, a lifestyle factor that is well preventable also made the list. Interestingly, smoking in the 3rd trimester was said to have more significant influence than smoking in the 2nd trimester. Also, longer durational exposure to cigarette has a sever impact than shorter durational exposure (47). But while this study seem to have only observed maternal smoking, another study in India observed the effect of smokeless tobacco use in pregnancy where they also found a significant association between the use of smokeless tobacco products in pregnancy and stillbirth (14). Liu et al. (47) noted that nearly half of all stillbirths are small for gestational age . This condition that could have resulted from several conditions such as maternal malnutrition and Intra-uterine growth restriction (IUGR). They recommend early diagnosis and management to bear favorable results. On another note they pointed out that, 25 – 50% stillbirths are of unknown causes. They however agree that the statistics may be overrated due to inadequate diagnostic tools and experience (47).

A cohort study done in the United Kingdom (UK) states that, UK is amongst the HICs with highest stillbirth rates and that there has been slow progress since early 1990s (41). They explored the maternal and fetal risk factors for stillbirth. The risk factor with the

strongest association was fetal growth restriction, with a relative risk of 4.0 (95% CI 2.8 - 5.7) when detected during the antenatal period and doubled to 8.0 (95% CI 6.5 - 9.9) when not detected. Whilst the stillbirth rate of pregnancies without fetal growth restriction were as high as 2.4 per 1000 deliveries, it rose to 4.2 per 1000 deliveries in pregnancies without fetal growth restriction. Due to interaction of smoking and fetal growth restriction, the rates were found to increase amongst mothers who had fetal growth restriction and smoked. The dangers of smoking whilst pregnant were affirmed when the study results showed that both active and passive smoking elevated the risk of stillbirth (41). Just like studies previously mentioned, the association of smoking was once more confirmed by a study done in USA (48) and another in Canada (49). Both studies established that smoking indeed increases the risk of stillbirth. Erickson et al. (49) focused on the number of cigarettes taken, they found heavy smoking in early pregnancy to be of significant association adding that, this information may not only be helpful in interventions for smoking cessation but also in other supportive services such as pregnancy health education. On the other hand, Varner et al. (48) in a case control study assessed the association between stillbirth, smoking and the use of illicit drugs. Apart from backing up the association made by other studies between smoking and stillbirth, they also revealed that the use of cannabis and other illicit drugs increased the chances of stillbirth. They expressed worry that stillbirths associated with cannabis use might rise in America following the legalization of cannabis in the states. Ethnicity was also alleged to have an association with stillbirth, as African, African-Caribbean and South Asian women were found to be more at risk than European women (41). Nulliparity and parity ≥ 3 increased the risk for stillbirth. Pre-eclampsia and antepartum

hemorrhage in current pregnancy was strongly associated as well as history of previous stillbirth (41). This study seized a more preferred study design by conducting a cohort study, however cohort studies can be timely and expensive hence the use of data might have helped to cut costs. Another essential point is the exclusion of congenital anomalies and multiple pregnancies. Due to the confounding effects of the two on stillbirth, the exclusion was meant to avoid possible confounding.

A case control study done in Nepal specified how Nepal have reduced intrapartum stillbirths with a huge margin in the last 15 years but have not substantially reduced antepartum stillbirth (40). This study suggests lack of ANC to be a major risk factor for stillbirth. Women who did not attend ANC had a higher risk of delivering stillborn (OR 4.2, 95% CI 3.2 - 5.4). In addition, they found that most women without history of ANC attendance were older, from poor background, had high parity and had received little or no formal education. This forms an intertwine between the five factors. Though age and parity of these women are non-modifiable factors, education and wealth index barely modifiable, ANC attendance is modifiable. Hence, increasing access to ANC services and continuous mobilization to even the poorest in the population to ensure utilization of services might lower the occurrence of stillbirth. Another case control study done in Mexico also dubbed lack of ANC a culprit for stillbirth (18). Although this study did not link lack of ANC to some other factors, they highlighted its importance, whilst suggesting that it could be the cornerstone to the prevention of stillbirths. Although both studies associated parity with stillbirth, Gutierrez et al. (18) associated nulliparity (aOR 1.3, 95% CI 1.1-1.5) as opposed to Ashish et al. who found increasing parity to increase

the risk of stillbirth (OR 1.2, 95 % CI 1.0 - 1.3). Other factors associated by Ashish et al. (40) are, previous stillbirth, antepartum hemorrhage (aOR 3.7, 95% CI 2.4 - 5.7), hypertensive disorders during pregnancy (aOR 2.1, 95% CI 1.5 - 3.1) and small for gestational age babies (aOR 1.5, 95% CI 1.2 - 2.0). Previous stillbirth has been pin pointed to the risk of sub-sequential stillbirth by numerous studies in both HICs and LMICs (50–52). Lamont et al. (50), in a cohort study in UK found that women who have had stillbirths in their first pregnancy are five times likely to have stillbirth in their second pregnancy. McPherson (51) was in agreement with the association however, she found the subsequent stillbirth to occur more during the second trimester than the third. Meanwhile, Gordon et al. (52) found an association that had no significance. Instead they found that previous preterm or a small for gestational age delivery posed significant risk of stillbirth in the subsequent pregnancy (52).

A related study was done in the slums of Bangladesh by researchers who thought that the stillbirth rate report did not provide adequate information pertaining to the poor population that lived in slums (53). This case control study also focused on singleton pregnancies. It is one of few studies identified by the researcher, that used records although data from face to face interviews with the women was used to complement information obtained from the records. In the study, 61.4% stillbirths were found to have resulted from obstetric complications. Factors associated to stillbirth by this study include: poor formal education, maternal age of 35 years and older, preterm deliveries, prolonged labor and failure to progress. Fetal factors including decreased fetal movement, fetal malpresentation and fetal distress were also linked to increased risk of

stillbirth. Although done in a ‘different’ setting, the results of this study pretty much mirrors those of studies done in ‘wealthier’ settings in different parts of the globe. The study pointed out that most of these factors are responsive to interventions thus recommend proper health education on the risk factors for stillbirth during ANC, delivery at a health facility, monitoring of progress of labor, prompt diagnosis of complications and effective management.

Numerous infections including HIV, Syphilis and Malaria were associated with increased risk of stillbirth by numerous studies, especially in LMICs (54–61). Fifty per cent or more stillbirths in LMICs are infection related. On the contrary, only 10 – 25% of stillbirths are caused by infections in HICs (55,62). Infections cause stillbirths via various mechanisms. Goldenberg et al. (62) relates that many stillbirths are accounted to viral infections but it remains blurred how they may be prevented. Despite this, viral infections stillbirth are scarcely studied and defined (63). Studies agrees that, syphilis is the cause of majority of infection related stillbirths (58–62,64). Adding that, if left untreated, maternal syphilis can lead up to 40% stillbirth amongst infected mothers. In some sub-Saharan countries, syphilis is associated with as high as 25% to 50% stillbirth. There is hope in eliminating syphilis related stillbirths, as syphilis is curable. The challenge however remains lack of access to ANC services, lack of resources, poor system’s output and other competing priorities e.g. HIV/AIDS screening. To address these issues, Goldberg et al. (62) recommends a cost effective point of care screening and treatment. But while this suggestion is valid, it does not address the issue of lack of access to ANC services plus, in a setting that is already hard hit by lack of resources,

acquiring point of care screening machines might prove futile.

On another note, Malaria also accounts for a large portion of stillbirths and especially in Malaria endemic areas due to its high prevalence and extensive placental damage (62). Malaria during pregnancy can also lead to placental malaria, which is known to lead to fetal growth restriction, a known risk factor for stillbirth (65,66). The use of Insecticides Treated Nets (ITNs) and mosquito repellents is once again encouraged to prevent malaria. Malaria screening and prompt treatment at ANC is also of vital importance. Other infections such as Zika Virus and Hepatitis B virus, Group B Streptococcus and many others have also been associated to stillbirth (63,67,68).

2.3 Stillbirth in Africa and Namibia

Africa, compared to other continents has high rates of stillbirth. Sub Saharan countries experience much higher stillbirth rates as compared to other African countries. However, Namibia has much lower rates amongst Sub Saharan Countries, trailing just behind Mauritius, which has 9.00 stillbirths per 1000 births. Nigeria, Senegal, Sierra Leone and Somalia fall in the top three highest rates with 42/1000 for Nigeria, 34/1000 for Senegal whilst Somalia and Sierra Leone have 30/1000 (17).

A study carried out in Nigeria states how the outcome of pregnancies is a major yet overlooked public health issue (69). According to Omo-Aghoja et al. (69), Nigeria, like numerous other developing countries use a gestational age of ≥ 28 weeks or 1000 g birth weight to define stillbirth, in line with the recommended WHO definition for

international comparison. Like other countries in different continents, Nigeria suffers a deficit of adequate reliable data on stillbirth mainly due to underreporting and poor documentation (69). Twenty five to sixty percent stillbirths are reportedly not associated with an obvious cause. The study underlined the importance of knowledge on causes and risk factors of stillbirth, highlighting that it will aid on designing appropriate preventive measures to reduce incidence. This study associated increasing maternal age with stillbirth, where they found progressive increase in stillbirth at the age of 30 years and older. Stillbirth rates at 30 years was found to be 11/1000 and increased to 19/1000 at ≥ 35 years. Parity was also a factor. Stillbirth increased in nulliparous mothers with stillbirth rate of 23/1000 followed narrowly by grand-multiparous mothers with stillbirth rate of 10/1000. Most mothers in this study were booked; this means they have attended ANC. They found that stillbirth rate in unbooked mothers was about 4 folds higher as compared to booked mothers. Another study done in Nigeria seconded this finding, validating the important role of ANC services in reducing the incidence of stillbirth (70). Omo-Aghoja et al. (69) also found Malaria infection to increase the likelihood of stillbirth. Prolonged labor was also found to increase the risk of stillbirth. Although most mothers in this study delivered by NVD, increased stillbirths were observed amongst fetuses delivered by instruments. Being single, primary level or no formal education and unemployment were also associated with stillbirth (69).

Another study done in Harare, Zimbabwe acknowledged that perinatal mortality remains a challenge for developing countries, noting that to properly address this problem, major contributing factors must be clearly understood (22). The study agrees with various other

studies that up to 1/3 stillbirth are of unexplained causes. Stillbirth is an important indicator of the quality of antenatal and obstetric care. This study took note that of the studies done, the frequency and risk factors for fresh and macerated stillbirth was seldom differentiated. Adding that understanding the different risk factors may help assess the quality of antenatal and obstetric care accessible to pregnant women. They pointed out that macerated stillbirth is typically linked to glitches occurring in the uterus antenatal whereas fresh stillbirth may point towards poor quality care during labor and delivery. This retrospective cross sectional study that was carried out in Zibwambwe's largest referral hospital also touched on the risk factors of early neonatal death. The results of this study aren't far fetched, as they are in agreement with other study's findings. Similar to the study by Omo-Aghoja et al. (69), this study found that fetuses delivered using instruments are more likely to be stillborn. However, the outcome of assisted deliveries might also be linked to the duration of labor. Prolonged labor and difficult deliveries are an indication for assisted deliveries. Breech presentations were also found to be at higher risk of being stillborn. Caesarean Section (C/S) was found to be a protective factor against stillbirth. Validating as to why delivering in healthcare facilities is crucial should complication arise. This study population reported more macerated stillbirths than fresh stillbirths. This could be an indicator of more problems in the antenatal period. It can also be an indicator of poor ANC or poor attendance of ANC by pregnant women. This could also be influenced by other numerous factors such as poverty, lack of health education, inaccessibility to services and many more. Smoking, a factor commonly associated with stillbirth was not significant in this study. Lack of ANC, which has been consistently associated with stillbirth, was once again

strongly associated with stillbirth by this study. The study suggests that ANC may help ensure timely interventions (22).

Two studies done in Zambia related the high rates of stillbirth in Zambia to economical status of country (37,71). According to Turnbull et al. (37), Zambia has one of the world's highest perinatal and early childhood mortality rates. The researchers stated that, similar to many low resources countries, the causes of death often are unavailable. Turnbull et al. (37) articulates numerous factors contribute to elevated stillbirth incidence. Staff shortages, poor data collection and disease surveillance systems and lack of resources are just but to name a few. These factors result in causes of death misclassification as no proper examination is done to inform decision on cause of death (37). The studies also agree that many Zambian pregnant women delivers outside health care facilities for respective reasons, contributing to gross underreporting of deliveries and stillbirths. Kasengele et al. (71) carried out a retrospective audit where they reviewed 115 delivery files in an initial audit; they then introduced and implemented strategies to change practice and re-audited a further 31 files. They found that only 33.3% women were managed using a partograph initially. This number increased to 65% in the re-audit. Obstructed labor, although reduced in the re-audit was the main cause of intrapartum stillbirth (55.7% & 38.7%). This was somewhat confirmed by Turnbull et al. (37) who found breech presentation, twin pregnancy and prolonged labor, which are both interlinked with obstructed labor, to increase the risk of stillbirth. Kasengele et al. (71) also found that APH accounted for 23.5% stillbirth initially and subsequently 16.1%. Meanwhile, maternal Malaria was said to increase the likelihood of stillbirth by

Turnbull et al. (37). HIV infection was also insignificantly associated. Other factors including home deliveries and ingestion of traditional herbs to induce labor were also significantly associated (37). This study covered a rarely studied component of traditional herbs usage. Although modern medicine have constantly discouraged the use of traditional medicine due to their unstudied pharmacology, some African countries still feel strongly about their traditional medicine. A study done in Zimbabwe is one of the few documented studies on the use of herbal medicine (72). It however did not pay details to the use of herbs in pregnancy. On another note, Kasengele et al. (71) emphasized that health care in Zambia is sub-optimal and recommends introduction of strategies to confer change. This kind of study is recommended to measure the impact of new strategies, however, the sample size was particularly small especially for the subsequent auditing. Which may have reduced the power of the study.

Another recent study in Ghana in which risk factors for stillbirth were assessed, relate the same tale of devastating effect of stillbirth and how common it is (11). They too narrated how stillbirth is a fundamental indicator not only of services accessibility but also quality and utilization of service. Stillbirth remains higher in developing countries and even higher in sub-Saharan Africa. In Ghana, stillbirth rates are generally high but higher rates has been observed in Northern Ghana (11). According to Quandal (17), by 2009 Ghana experienced 22 stillbirths per 1000 deliveries. Badimsuguru et al. (11) articulates that in 2012 Tamale Metropolitan area in northern Ghana reported 35 stillbirths per 1000 deliveries, a huge margin from the country's estimated stillbirth rate. Amongst the socio-demographic factors, only maternal age had a significant association

whereby women younger and equal to 24 years were found have increased risk of stillbirth compared to those who are 25 to 34 years (aOR= 3.0, 95% CI 1.08 - 8.39). Maternal height, residence, education and occupation had no significant association. Amongst the obstetric factors, prolonged labor had a significant association. Labor longer than 12 hours was said to increase the risk of stillbirth. This significance existed both in bivariate and multivariate analysis. Birth weight also had a significant association with weight less than 2.5 kg being a protective factor whilst 2.5 kg to 3.9 kg increases the risk of stillbirth (cOR = 0.2, 95% CI 0.09 – 0.32). Another obstetric factor that had significant association was birth interval. Women who gave birth less than 24 months after their previous delivery had increased risk than those who had longer spacing. Despite the importance, this factor often goes undocumented during deliveries in Namibia. Parity, gestation and mode of delivery had no significance in this study. Low diastolic pressure of less than 80 mmhg was significant amongst maternal medical factors. Whereby it was found to increase the risk of stillbirth. Maternal anemia and malaria had no significant association.

A study done in a teaching hospital in Nigeria shared similar sediments to a lot others. It too echoes that stillbirth is defined differently in various countries (8). They agree with other researchers that stillbirth often go unreported and are hence underestimated. Stillbirths are also not seen as a major public health problem and are not included in the MDGs; neither the UN nor the Global burden of Diseases metrics tracks them. The study emphasized that stillbirth are higher in poor countries and that 67% of stillbirths occur in rural areas with 55% of these happening in sub Saharan Africa and south Asia, the same places where skilled deliveries and caesarian sections are much lower. The researchers

continued, stating that intrapartum stillbirths are associated with obstetric emergencies while antepartum with maternal infections, diseases and fetal growth restriction. This has been underscored by numerous other studies repeatedly. They also expressed those probable risk factors for stillbirth may be maternal, fetal or placental related. This study, which reviewed maternity records to pin point associated factors, was undertaken to measure the magnitude of the problem and serve as a basis for further studies. The findings revealed that there were 206 stillbirths during the study period, of which 84% were unbooked. Seventy five per cent stillbirths were macerated, which may be related to unbooked status. Other factors that led to stillbirths in this study were: prolonged labor, pre-eclampsia, ruptured uterus, preterm delivery, congenital anomalies, cord prolapse, placenta praevia and premature rupture of membranes. Prolonged labor featured the most (45.6%) and premature rupture of membranes the least (1.5%). The study suggested good ANC and obstetric care for prompt diagnosis of problems and response, to avert unnecessary stillbirths. Unlike many others, this study did not allocate statistical significance to all its variables which is a weakness in its own form, as readers are not able to estimate the significance of a certain factor by reading the article.

The researcher identified very few studies done on the risk factors for stillbirths in Namibia. One of those performed by Tshibumbu et al. (38) , in Omusati region, looking at the modifiable antenatal risk factors for stillbirth. This study emphasized the importance of stillbirth reduction both for social and economic purposes. They described stillbirth as a tragic event that affects the family, community and country negatively. Apart from grief stricken and mourning communities, frequent occurrence of stillbirth

adds to the country's perinatal death rate. In cohesion with studies done elsewhere, they state how stillbirth rates remain much higher in developing countries compared to developed ones. Further adding that, unlike in developing countries, the rates of stillbirth in developed countries have observed some decline in the past decades (38). Furthermore, they underscored the crucial role ANC plays in preventing some risk factors and subsequently reducing stillbirth. Stillbirth rates are a reflector of the quality of obstetric and perinatal care in different healthcare settings. This is a notion that is widely agreed upon amongst researchers. The quality of care in low resources countries is directly related to inadequate availability of machinery and diagnostic resources (38). Like most other developing countries, Namibia classifies stillbirths based on the fetal appearance. A stillbirth is regarded as fresh when the fetus skin is fresh with no visible signs of decay whereas it is regarded as macerated when visual changes can be observed on the skin (19,38).

Studies have previously assumed that risk factors for fresh stillbirth are similar to those of macerated stillbirth (19,28,40). This assumption was also adopted for this particular study. They investigated the risk factors that are potentially modifiable through enhanced ANC programs. These factors ranged from medical conditions including infections & ANC obstetric complications to maternal lifestyle and quality of ANC rendered. The study admitted that this topic is well studied but seldom in developing countries. This was a descriptive cross-sectional study that used collected records for data extraction. The descriptive design may not be suitable to study risk factors, as it does not allow for the determination of association between the exposure and stillbirth. Furthermore, the study found that 58.5% of the cases were macerated stillbirth, hinting

a loophole in the quality of ANC (38). Evidently, the average prevalence of risk factors related to the quality of ANC received were the highest (19.8%) (38). In addition, lack of folate supplementation (30.5%) was the most prevalent amongst individual risk factors followed by late commencement of ANC (16.7%) and then unbooked mothers (12.2%). All these factors are preventable with advanced quality of ANC rendered. Overall, the study propels for the betterment of ANC access and quality in Namibia. It also calls for boosted community awareness and health education on the importance and availability of ANC services (38).

Stillbirth surveillance system is in place but it is faced with challenges of under reporting and classification of the cause of death. Some other challenges the system face is poor data quality facilitated by shortage of staff, lack of resources and parallel reporting.

2.4 Conclusion

Stillbirth remains a big problem on the global scale and in Namibia. Although LMICs are more affected, cases are high in HICs too. There is less focus on stillbirth leading to it being left out of the MDGs. Less resources is mobilized to combat stillbirth despite it's detrimental effects towards maternal and perinatal health. Factors such as age, obesity, smoking, alcohol consumption, poverty, history of mental illness, parity, hypertension, Diabetes mellitus, APH and fetal growth restriction are but a few which

have been repetitively linked to stillbirth. Infections including malaria, syphilis, HIV, measles and rubella have also been associated with increased incidence of stillbirth. A functional stillbirth surveillance system is available in most countries at different settings. However, the system in low resources countries is faced with challenges of under reporting, unreliable data and classifying the causes of death. Lack of staff and resources makes it difficult for the system to perform.

Risk factors for stillbirth is well studied around the globe, though many were performed in developed countries. The researcher identified very few studies done in Namibia, hence more studies are deemed necessary.

CHAPTER 3: MATERIALS AND METHODS

3.1 Introduction

Risk factors for stillbirth are vaguely studied in Otjozondjupa region and Namibia. This chapter is aimed at describing the study design utilized for this study. It also outlines the research process implementation. The research population, sampling frame, sample size, research instruments, procedure and data analysis are also further explained. The main purpose of this study was to assess the risk factors for stillbirth in Otjozondjupa Region of Namibia.

3.2 Research Design

An unmatched case control study was carried out making use of quantitative approach to determine the risk factors for stillbirth. A quantitative approach enables the quantification of relationships between variables. It was an analytical study. Whilst descriptive studies seek to describe the problem by person, place, time and possibly develop hypothesis; analytical studies test these hypotheses (73). The case-control design was chosen due to its ability to determine the association between exposure and outcome. Case control study commences with identification of subjects with disease of interest (cases) and those without (controls) (73–75). To establish the disease attributes relationship, cases are compared against controls determining frequencies and levels of

the attribute in each group (74).

3.3 Research Methods

3.3.1 Research setting

This study was carried out in Otjozondjupa region, which is located centrally in Namibia. The region is 105 185 square kilometers and is one of the largest regions in Namibia. It borders Khomas region on the south, Omaheke region on the east, Kavango west & Oshikoto on the North and Erongo & Kunene on the West. The region is sparsely populated with a total population of 149 153 people, estimated at 0.6% annual population growth. It is estimated that 25% (37 288) of its people are WCBA, whilst 4.2% (6264) are pregnant women/ expected deliveries.

The region has 24 state healthcare facilities; 4 district hospitals, 2 health centers and 18 clinics. A total of 5 facilities has maternity wards and conduct deliveries on a daily basis, the 4 district hospitals plus one health center. The other 19 only conduct emergency deliveries. ANC services are also rendered at clinics and health centers. Medical doctors, registered and enrolled midwives/accoucheures offers health care to patients seeking services. The region is home to the Herero and San people although it has diversified as a result of urbanization. Figure 1 shows a map of Namibia with Otjozondjupa region highlighted in green.

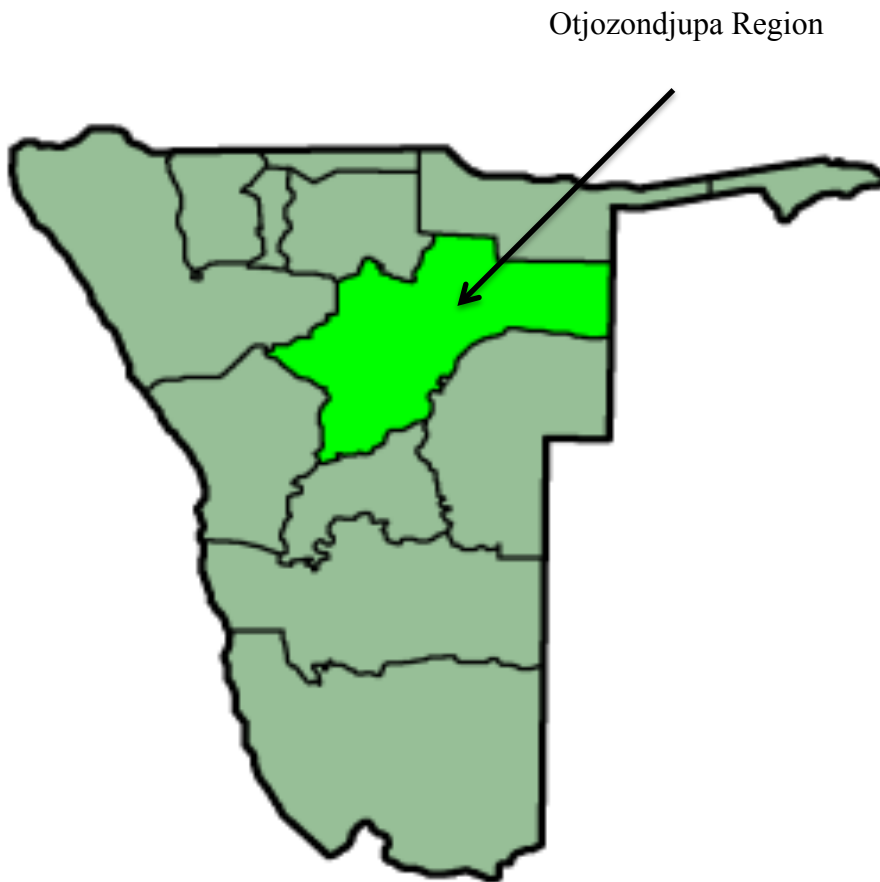


Figure 1: Map of the Republic of Namibia, *Source: Wikipedia*

3.3.2 Research population

A research population comprises of a group of individuals taken from the general population, who share common characteristics. These are people who meet the sample criteria (76). Generally, they are the focus of the research. From the 2011 census projection and regional population figures, the region has an estimated 6264 (4.2%) pregnant women/expected deliveries. Amongst the 6264 projected were those that delivered at state healthcare facilities in the region. They were the target population of

the study. Twenty-four state healthcare facilities that conduct deliveries were included in the study. They included 4 district hospitals, 2 health centers and 18 clinics.

3.4 Sample and Sampling frame

Case Definitions:

- **Cases** were defined as the women residing in Otjozondjupa, who delivered stillborn at state healthcare facilities in Otjozondjupa Region, between January and December 2016.
- **Controls** were defined as women residing in Otjozondjupa, who delivered live babies at state healthcare facilities in Otjozondjupa Region between January and December 2016.

Subjects were chosen using simple random sampling method. Files were assigned sequential numbers. Random numbers were then generated in Microsoft excel and files with corresponding random numbers chosen as part of the sample. This was done to ensure each woman have an equal probability of being chosen. Collected records were used for data extraction.

3.4.1 Sample Size

The sample size was calculated using stat cal in Epi Info 7.2. It was calculated at 95%

confidence level, 80% power, 11.1 % least prevalence exposure (unemployment), odds ratio of 2.5 and 1:2 case control ratio.

A total sample of 285 was required for this study, 95 cases and 190 controls (Kesley). They were chosen using simple random sampling method.

3.4.2 Inclusion criteria

There are certain characteristics a subject must possess in order to be part of the target population; these are referred to as inclusion sampling criteria. The inclusion criteria for this study are listed below.

- Delivery at any state healthcare facility in Otjozondjupa region, including BBAs.
- Equals to 28 weeks or greater gestational age at delivery to allow for international comparison, as recommended by the World Health Organization.

3.4.3 Exclusion criteria

Exclusion sampling criteria refers to the characteristics possessed by a subject that would result in him/her being excluded from the target population. Following are the exclusion criteria for this study.

- Twin pregnancy to avoid confounding considering its association with stillbirth.
- Extensively incomplete records.

3.5 Research data collection instruments

A pilot tested standardized data collection tool (questionnaire) was utilized for data extraction. The questionnaire that comprised of close-ended questions consisted of three sections. Section one was to determine the maternal socio-demographic information, section two on the maternal medical and obstetric information and section three on the fetal related information. Collected records such as patient maternity files were used to collect data instead of face-to-face interviews. Although face-to-face interviews have the ability to probe for more information, they were avoided to avoid stirring traumatic feelings of past events. Records were also considered to contain sufficient information. Due to the fact that records were utilized, the questionnaire was interviewer administered.

3.6 Procedure

Women of childbearing age (15 – 49 years) who delivered at any state healthcare facility January 2016 – December 2016 in Otjozondjupa region were included in this study. The study period was between August 2017 and September 2017.

The researcher obtained files of cases and controls from respective district hospitals (Otjiwarongo, Grootfontein, Okahandja and Okakarara). The files were assigned sequential numbers. A list of random numbers was then created using Microsoft excel.

Files with matching numbers were chosen to be part of the sample. Selected files that fell within the exclusion criteria were replaced with a file using separately run Microsoft excel random numbers. Using this simple random method, 285 files were selected for data extraction, 95 cases and 190 controls.

The researcher filled out the questionnaires together with a registered nurse/midwife who was trained as a data collector. A registered nurse/midwife was chosen as a suitable data collector given her expertise in the subject of concern. Administration of the questionnaires by the two professionals was believed to avoid incompleteness and assure validity of data. Questionnaires were filled in by extracting data from patient's maternity files.

3.7 Data analysis

Data was entered into EPI info and an excel line list created. Running frequencies of each variable checked for data completeness and consistency. Epi info 7 was used to analyze data. Bivariate analysis was run to find factors significant for stillbirth by generation Crude Odds Ratios (cOR) and 95% Confidence Intervals. The significant factors at P-value of < 0.05 and also other factors which are known risk factors by literature but were not significant at the bivariate level were then run in a multivariate logistic regression model to determine the true risk factors by generating Adjusted Odds Ratios (aOR) with 95% Confidence intervals. Multiple logistic regressions were used to control the confounding effect of different variables while assessing the effect of each

variable on the likelihood of stillbirth occurrence.

3.8 Research Ethics

3.8.1 Permission and informed consent

Permission was sought from the University of Namibia, School of Public Health, Research and Ethical Committee. Further permission was also sought from the National Health Research Unit of the Ministry of Health & Social Services. The study proposal was presented to the Otjozondjupa Regional Health Directorate and the permission letter from NHRU presented to them before the study commencement. Since no face-to-face interviews were conducted for this study, there was no need to obtain informed consents from the women whose files were selected.

3.8.2 Confidentiality, anonymity and privacy

Our research subjects' anonymity was maintained by replacing their identity with study codes. This was done during data collection stage. Furthermore, no names or physical addresses were collected or transferred from patient's files unto data collection tools. This was done to ensure that no subject could be linked to her information after data collection stage. Equally important, results are presented in frequencies and proportions rather than individuals. The recruited data collector signed a confidentiality clause, which compels her to keep all information related to the study private and only divulge it to other team members when need be.

3.8.3 Respect of persons

Stillbirth is a traumatic event. Parents who experienced stillbirth often have to undergo counseling to help them cope with their loss (1). Due to the sensitivity of the topic, face-to-face interviews were believed to have the capability of stirring preceding traumatic memories related to the event. To avoid this, records were preferred instead of face-to-face interviews. This was done in accordance to the principles of respect for persons, beneficence and non-maleficence.

CHAPTER 4: RESULTS OF THE STUDY

4.1 Introduction

This study was aimed at elucidating maternal and fetal risk factors for stillbirth in Otjozondjupa Region, Namibia with specific objectives aligned. Hence, this chapter will contemplate on data analysis and findings of the study. The socio-demographic variables were analyzed using descriptive statistical analysis, in the same vein; logistic regression was used to assess potential risk factors for stillbirth. The results are presented as descriptive tables, pie charts plus graphs in line with the aim and objectives of the study.

4.2 Socio-demographic characteristics of research participants

A total of 285 women who delivered in Otjozondjupa Region from January 2016 to December 2016 participated in this study; 95 stillborn mothers and 190 live born mothers. The mothers in the 20 – 29 years age group had the highest frequency of 50.53% (n=144) whilst teenage mothers accounted for the lowest frequency 10.53% (n=30). This trend continued unabated when cases were compared to controls with the 20 - 29 age group scooping 50.53% (n= 48) in cases and 50.53% (n= 96) in controls whereas the teenage group had a low 6.31% (n=6) for cases and 12.63% (n=30) for controls.

The overall mean age was 27 years (6.8 SD); this was similar to the mean age for controls 27 years (6.7 SD) whilst the mean for cases was 28 years (6.8 SD). The

youngest woman was 16 years old whereas the oldest 45 years old. Table 2 further presents the socio-demographic characteristics of the cases and controls.

Table 2: Socio-demographic characteristics of cases and controls

Characteristics	Cases (%) N = 95	Controls (%) N = 190	Total (%) N = 285
Age (Years)			
≤ 19	6 (6.31%)	24 (12.63%)	30 (10.53%)
20- 29	48 (50.53%)	96 (50.53%)	144 (50.53%)
30-45	41 (43.16%)	70 (36.84%)	111 (38.94%)
District of residence			
Grootfontein	23 (24.2%)	47 (24.7%)	70 (24.6%)
Okahandja	22 (23.2%)	40 (21.1%)	62 (21.8%)
Okakarara	14 (14.7%)	32 (16.8%)	46 (16.1%)
Otjiwarongo	36 (37.9%)	71 (37.4%)	107 (37.5%)
Employment status			
Employed	21 (22.1%)	38 (20.0%)	59 (20.7%)
Unemployed	74 (77.9%)	152 (80.0%)	226 (79.3%)
Marital Status			
Single	79 (83.2%)	163 (85.8%)	242 (84.9%)
Married	16 (16.84%)	27 (14.2%)	43 (15.1%)
Tribe/ Ethnicity			

Wambo	24 (25.3%)	49 (25.8%)	73 (25.6%)
Others	13 (13.7%)	21 (11.1%)	34 (11.9%)
Herero	22 (23.2%)	48 (25.3%)	70 (24.6%)
Damara>Nama	28 (29.5%)	63 (33.2%)	91 (31.9%)
San	8 (8.4%)	9 (4.74%)	17 (5.9%)

In table 2, we also discover that majority of these women reside in Otjiwarongo District and least from Okakarara District. A total 79.3% (n = 226) women were unemployed; meanwhile, 20.7% (n = 59) were employed. Table 2 further looks into the ethnicity of the participants. Most of the participants were Damara>Nama accounting for 31.9% (n= 91), followed by Wambos 25.6% (n= 73). The San were the smaller population of women, accounting for only 5.9% (n= 17) making them the least ethnicity amongst the sample. Only 15.1% (n= 43) of the participants were married. Meanwhile, more than three quarters of the participants were single 84.9% (n= 242).

About 1.8% (n= 5) of the participants only smoked cigarettes, 6.7% (n= 19) only drank alcohol whilst 4.6% (n= 13) drank alcohol and smoked cigarettes. The majority 84.9% (n= 242) were neither alcohol drinkers nor cigarette smokers. More information is illuminated in figure 2.

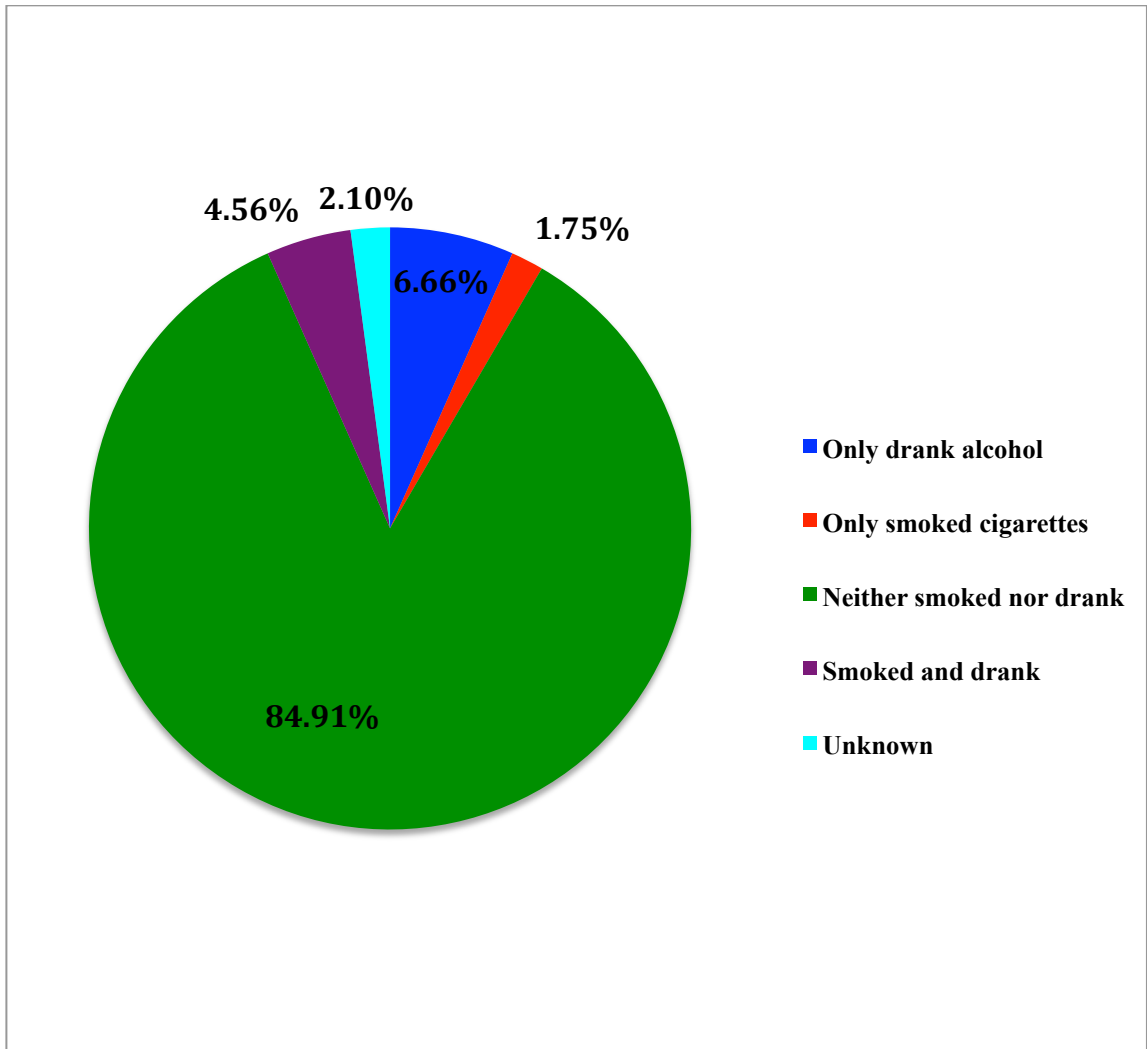


Figure 2: Smoking and drinking habits of research participants

4.3 Medical and delivery information of the research participants

Section 2 of the research questionnaire focused on the maternal medical and obstetric information. Medical history probed included weight against height (BMI), history of chronic illnesses and their HIV status.

Due to data incompleteness, the researcher was unable to assess BMI as none of the

participants had recorded height and only 2.1% (n= 6) had recorded weight. Amongst the 285 women whose records were included in this study, 93.7% (n=267) were tested for HIV. Amongst those tested, 84.6% (n= 241) tested HIV negative whereas 9.1% (n= 26) tested HIV positive. A total of 6.3% (n= 18) had unknown HIV status at delivery. Amongst them, merely 11.1% (n= 2) were BBAs. This information is further elucidated in Table 3.

Table 3: HIV status of the study cases and controls

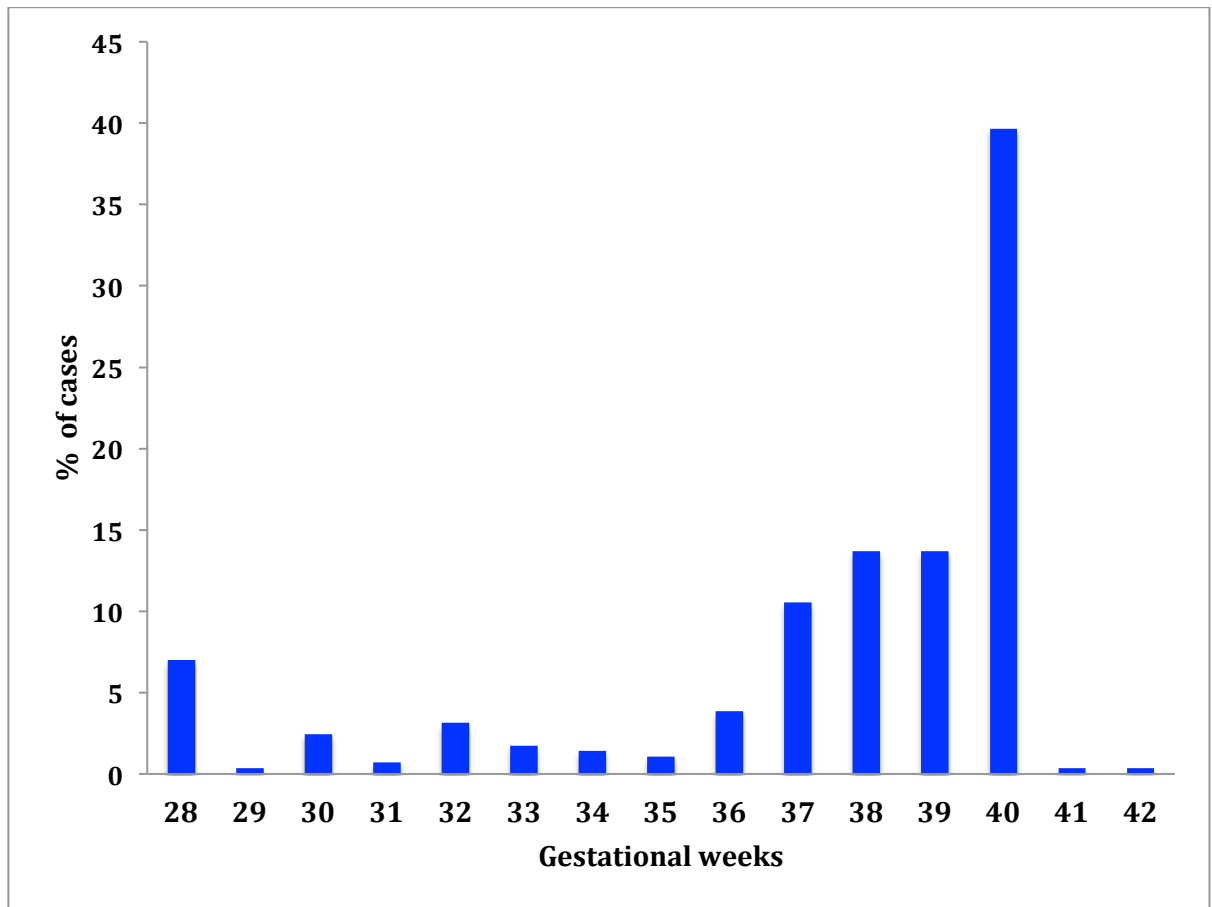
HIV status	Cases (%) N= 95	Controls (%) N=190	Total (%) N= 285
Negative	71 (74.7%)	170 (89.5)	241 (84.6%)
Positive	11 (11.6%)	15 (7.9%)	26 (9.1%)
Unknown	13 (13.7%)	5 (2.6%)	18 (6.3%)
Chi²= 14.8189	df= 2	P Value= 0.0006	

Table 4: Frequency of chronic conditions amongst research participants

Chronic condition	Cases (%)	Controls (%)	Total (%)
Cholesterol	0 (0%)	0 (0%)	0 (0%)
Diabetes Mellitus	1 (1.05%)	0 (0%)	1 (0.35%)
Hypertension	5 (5.26%)	3 (1.58%)	8 (2.81%)
Mental illness	1 (1.05%)	0 (0%)	1 (0.4%)

Only 3.50% (n= 10) of the participants suffered from chronic illness. Table 4 demarcated the conditions into frequency. Hypertension had the most frequency, 2.81% (n= 8). None of the participants suffered from cholesterol conditions. In addition none of the participants suffered from 2 or more chronic illnesses.

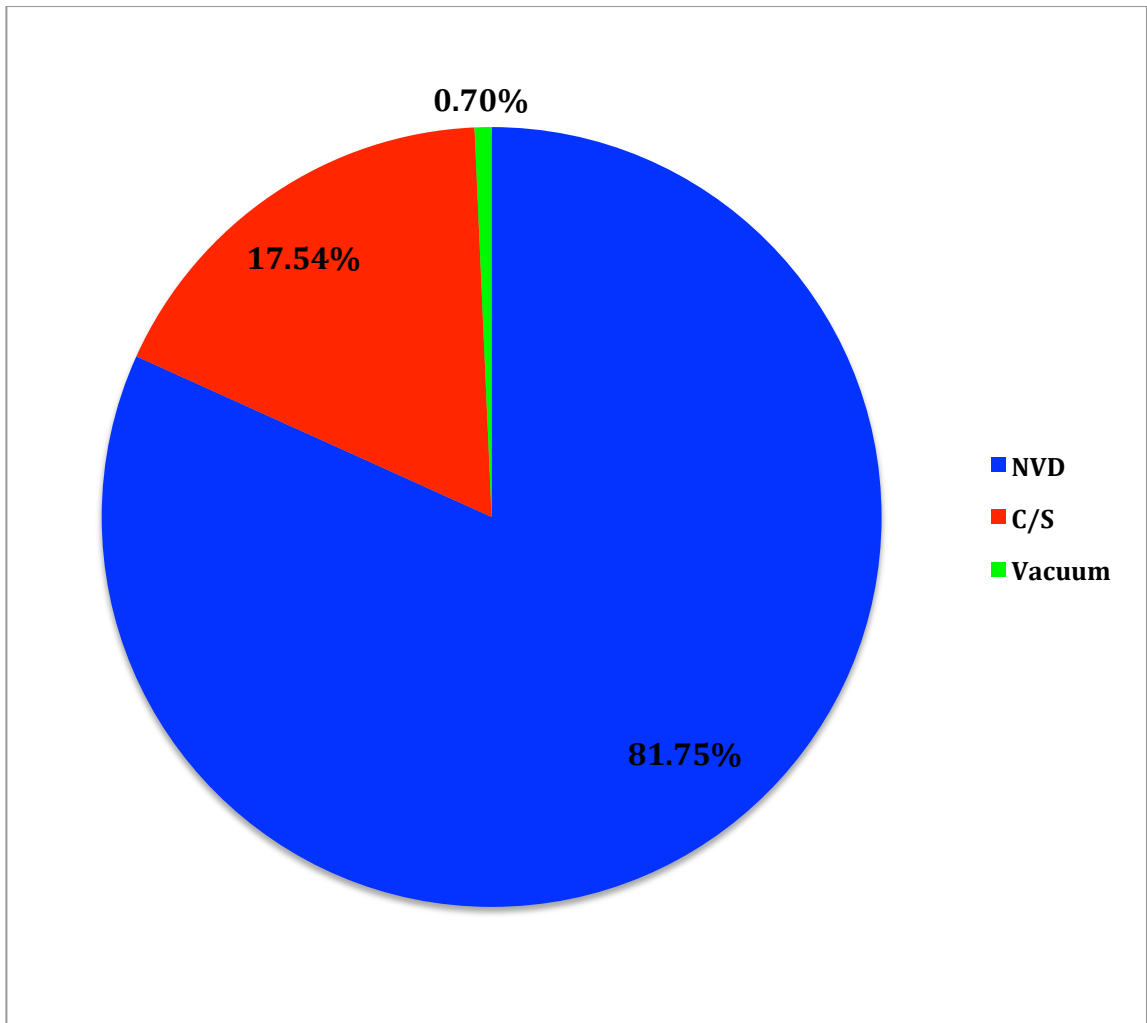
Gestational weeks ranging from 28 to 42 weeks were recorded. Majority of women delivered at 40 weeks (39.65%, n= 113), followed by 39 and 38 weeks with 13.68% (n= 39) each. Numerous women delivered prematurely at 28 weeks (7.02%, n= 20) whilst some delivered post term at 41 and 42 weeks (0.35%, n= 1) each. Further information on participants' gestational age is illustrated in figure 3.



Chi² = 118.9 df = 14 P value = 0.000

Figure 3: Gestational age of research participants

Majority, 81.75% (n= 233) of the women delivered through NVD, followed by 17.54% (n= 50) that delivered through Caesarian Section (C/S) and lastly 0.70% (n= 2) delivered via NVD assisted with vacuum. None of the women have had NVD forceps assisted delivery. Information on the types of deliveries conducted is further illustrated in figure 4.



$\text{Chi}^2 = 6.17$ df = 2 P value = 0.04

Figure 4: The types of deliveries of research participants

4.4 Potential risk factors of stillbirth amongst cases and controls

4.4.1 Socio-demographic risk factors of stillbirth

The researcher tested the association between maternal ages, district of residence, employment status, tribe/ ethnicity & marital status and stillbirth. None of these potential socio-demographic factors were statistically significant during bivariate analysis. Looking at the cOR, teenage mothers appeared to be at higher risk of delivering stillborn than other age groups, however the confidence intervals included one giving it null association (cOR 2.00, 95% CI 0.76 – 5.22, p value 0.15). District of residence was not a factor either. Employment status is another factor that yielded no significance (cOR 1.13, 95% CI 0.62 – 2.07, p value 0.67). We also found no association between stillbirth and alcohol consumption (cOR 0.59, 95% CI 0.28 – 1.25, p value 0.16) nor stillbirth and cigarette smoking (cOR 0.46, 95% CI 0.17 – 1.21, p value 0.11). As mentioned in chapter 3, factors that were not significant in bivariate analysis but by literature are known risk factors were run in the multivariate logistic regression model to determine the true risk factors. Tribe/ethnicity, employment status, marital status, alcohol consumption and cigarette smoking were some of those factors but none of them yielded significance in multivariate analysis model either. More on socio-demographic risk factors is further explained in table 5 below.

Table 5: Socio-demographic risk factors of stillbirth amongst cases and

controls

Risk Factor	Cases (%)	Controls (%)	cOR	P value	aOR	P value
Age (years)				0.87		
20-29	48 (50.53%)	96 (50.53%)	1			
≤19	6 (6.32%)	24 (12.63%)	2.00 (0.76 – 5.22)			
≥30	41 (43.16%)	70 (36.84%)	0.85 (0.50 – 1.43)			
Residence				0.98		
Okahandja	22 (23.16%)	40 (21.05%)	1			
Grootfontein	23 (24.21%)	47 (24.74%)	1.1 (0.54 – 2.31)			
Okakarara	14 (14.73%)	32 (16.84%)	1.25 (0.55 – 2.84)			
Otjiwarongo	36 (37.89%)	71 (37.37%)	1.08 (0.56 – 2.09)			
Employment status				0.67		0.83
Employed	21 (22.11%)	38 (20.00%)	1		1	
Unemployed	74	152 (80.00%)	1.13 (0.62 –		0.93 (0.50	

	(77,89%)		2.07)		- 1.74)	
Tribe/ Ethnicity				0.69		0.63
Wambo	24 (25.26%)	49 (25.79%)	1			
Damara>Nama	28 (29.47%)	63 (33.16%)	1.10 (0.56 – 2.13)			
Herero	22 (23.16%)	48 (25.26%)	1.06 (0.52 – 2.15)			
San	8 (8.42%)	9 (4.74%)	0.55 (0.18 – 1.60)			
Others	13 (13.68%)	21 (11.05%)	0.79 (0.33 – 1.84)			
Marital Status				0.55		0.95
Married	16 (16.84%)	27 (14.21%)	1		1.02 (0.48 – 2.14)	
Single	79 (83.16%)	163 (85.79%)	0.81 (0.41 – 1.60)		1	
Alcohol consumption				0.16		0.20
No	78 (84.78%)	169 (90.37%)	1		1	
Yes	14 (15.22%)	18 (9.63%)	0.59 (0.28 – 1.25)		0.83 (0.34 – 2.00)	

Cigarette Smoking				0.11		0.76
No	83 (90.22%)	178 (95.19%)	1		1	
Yes	9 (9.78%)	9 (4.81%)	0.46 (0.17 – 1.21)		0.84 (0.28 – 2.50)	

4.4.2 Maternal medical and obstetric related risk factors of stillbirth

Numerous risk factors were found to be significantly associated with stillbirth. A significant association was made between HIV status and stillbirth in bivariate analysis (p value 0.0001); this association however had no significance in multivariate analysis (p value 0.72). Joining it are, previous stillbirth and type of delivery whose significant association also changed to insignificant during multivariate analysis (p value 0.08 & 0.56). A total of 26.67% (n= 76) women had unknown duration of labor due to various reasons including BBA and elective C/S. However, when these 76 with unrecorded duration of labor were excluded, the association between stillbirth and duration of labor was significant in bivariate analysis (p value 0.002). Women who labored for more than 13 hours had lower risk of birthing stillborn compared to those who labored 13 hours or less. This association remained unchanged in multivariate analysis (aOR 4.04, 95% CI 1.56 – 10.43, p value 0.003). High-risk pregnancy was also found to have a statistical significant association to stillbirth (aOR 3.59 95% CI 1.35 – 9.55, p value 0.01). Gestational age and premature delivery too had significant associations with stillbirth.

Women who delivered at term had higher risks of delivering stillborn, however, this association changed during multivariate analysis becoming protective against stillbirth (aOR 0.13, 95% CI 0.05 – 0.33, p value 0.0001). Similarly, the association of gestational age changed from higher risk amongst women delivering after 36 weeks to lower risk (aOR 0.04, 95% CI 0.00 – 0.25, p value 0.0001). Women without history of previous stillbirth appeared to have high risks of stillbirth in bivariate analysis (cOR 7.33, 95% CI 1.96 – 27.32). Nevertheless, the association became insignificant in multivariate analysis (aOR 3.97, 95% CI 0.81 – 14.43, p value 0.08). Women with no history of ANC attendance had lower risk of stillbirth in both bivariate analysis and multivariate analysis (aOR 0.07, 95% CI 0.00 – 0.79, p value 0.03). No association was found between BBA, pre-eclampsia & parity and stillbirth (p value 0.10, 0.23 & 0.62). More information on the examined risk factors is detailed in the following table (6).

Table 6: Bivariate and Multivariate analysis of the maternal medical and obstetric related risk factors of stillbirth

Determinant	Cases (%)	Controls (%)	cOR	P value	aOR	P value
HIV Status				0.0001*		0.723
Positive	11 (11.58%)	15 (7.89%)				
Negative	71 (74.74%)	170 (89.47%)				
Unknown	13 (13.68%)	5 (2.63%)				
ANC attendance				0.001*		0.032*
Yes	85 (89.47%)	186 (97.89%)	1		1	
No	10 (10.52%)	4 (2.11%)	0.18		0.07 (0.00 – 0.79)	
Premature delivery				0.0001*		0.0001*
Yes	58 (61.05%)	13 (6.84%)	1		1	
No	35 (33.96%)	177 (93.16%)	16.38 (8.63 – 31.06)		0.13 (0.05 – 0.33)	
Previous Stillbirth				0.0001*		0.088
Yes	10 (10.53%)	3 (1.58%)	1		1	
No	85 (89.47%)	187 (89.47%)	7.33 (1.96 – 27.32)		3.97 (0.81 – 14.43)	
Type of delivery				0.045		0.569
NVD	81 (85.26%)	152 (80.00%)				
C/S	12 (12.63%)	38 (20.00%)				
Vacuum	2 (2.11%)	0 (0.00%)				

BBA				0.108		
Yes	7 (7.37%)	6 (3.16%)	1			
No	88 (92.63%)	184 (96.84%)	2.43 (0.79 – 7.47)			
Gestational age (weeks)				0.0001*		0.0001*
≤ 36	48 (50.53%)	3 (1.58%)	1		1	
>36	47 (49.47%)	187 (98.42%)	63.6 (18.99 – 213.37)		0.04 (0.00 – 0.25)	
High risk Pregnancy				0.038*		0.010*
Yes	38 (27.89%)	53 (40.00%)	1		1	
No	57 (60.00%)	137 (72.11%)	1.72 (1.02 – 2.89)		3.59 (1.35 – 9.55)	
Pre-eclampsia				0.234		
Yes	2 (2.11%)	1 (0.53%)	1			
No	93 (97.89%)	189 (99.47%)	3.89 (0.34 – 43.51)			
Parity				0.621		0.601
1	26 (27.37%)	61 (32.11%)	1.11 (0.55- 2.24)		0.34 (0.09 – 1.25)	
2-3	48 (50.53%)	85 (44.74%)	0.84 (0.45 – 1.58)		0.77 (0.28 – 2.05)	
≥ 4	21 (22.11%)	44 (23.16%)	1		1	
Duration of labor (hours)				0.002*		0.003*
≤ 13	36 (62.07%)	124 (82.12%)	2.80 (1.43 – 5.50)		4.04 (1.56 – 10.43)	
> 13	22 (37.93%)	27 (17.88%)	1		1	

*P value statistically significant at 0.05

4.4.3 Fetal related risk factors of stillbirth

Congenital malformations and birth weight were found to be significant factors for stillbirth (Table 7). Nonetheless, the association between congenital malformations and stillbirth disappeared during multivariate analysis (p value 0.96). On the other hand, the association between birth weight and stillbirth remained statistically significant. Weight lower than 2500 grams have been found to have a higher risk of stillbirth than weight higher than 2500 grams (aOR16.58, 95% CI 8.71 – 31.55, p value 0.00). No association was made between cord enlargement, cord prolapse & fetal distress and stillbirth. Table 7 digests the results further.

Table 7: Bivariate and Multivariate analysis of the fetal related risk factors of stillbirth

Determinant	Cases (%)	Controls (%)	cOR	P value	aOR	P value
Congenital Malformations				0.044*		0.964
Yes	2 (2.11%)	0 (0.00%)				
No	93 (97.89%)	190 (100.00%)				
Cord Enlargement				0.156		
Yes	1 (1.05%)	0 (0.00%)				
No	94 (98.95%)	190 (100.00%)				
Cord Prolapse				0.075		0.115
Yes	3 (3.16%)	1 (0.53%)	1		1	
No	92 (96.84%)	189 (99.47%)	6.16 (0.63 - 60.06)		6.23 (0.63 - 60.73)	
Fetal Distress				0.218		
Yes	2 (2.11%)	1 (0.53%)	1			
No	93 (97.89%)	189 (99.47%)	4.06 (0.36 - 45.40)			
Birth Weight (g)				0.0001*		0.0001*
≤ 2500	60 (63.16%)	18 (9.47%)	1		16.58 (8.71 - 31.55)	
> 2500	35 (36.84%)	172 (90.53%)	16.38 (8.63 - 31.06)		1	

*P value statistically significant at 0.05

4.5 Summary

Data collected for the study was analyzed; results and findings are presented above. The results were presented by means of tables, charts and graphs retorting to the set objectives. Two hundred and eighty five patient files were chosen for data extraction for this study, obtaining a 100% sample size. Data was analyzed using Epi info 7. Socio-demographic characteristics of participants were described as proportions and frequencies. Bivariate and multivariate analysis was performed on the potential risk factors for stillbirth. Odds ratio for the possible risk factors were tabulated at 95% confidence intervals and statistical significance set at p value 0.05. The following chapter (5) will look into the study findings, possible explanations and relate them to previously undertaken studies.

CHAPTER 5: DISCUSSION

5.1 Introduction

This chapter will focus on explaining the research results in details. It will attempt to put reasoning to findings and relate it to other studies done on stillbirths. The results will be examined in relation to the studies aim and objectives. Discussions will be presented in a similar sequence as that of results in the previous chapter.

5.2 Discussions of the findings

5.2.1 Socio-demographic risk factors of stillbirth

This unmatched case control study aimed at elucidating the risk factors associated with stillbirth. This study demonstrated that none of the examined socio-demographic factors had significant association. Maternal age has been associated to stillbirth by numerous studies (11,20,40,77–79). It is not new that a study found no significant association between maternal age and stillbirth. A study done in Victoria by Eng et al. (79) in Australia made no significant association between the two, similarly to our study. While this is the case, several studies done in Australia, Nepal and Tanzania have found that older women have a higher risk of delivering stillborn (20,40,77,78). A significant association to younger women was made in a study carried out in Ghana where higher risk of stillbirth was associated to women younger than 24 years old. Younger and older mothers are more likely to have stillbirth due to various reasons including developing

bodies, poor cooperation during delivery, reduced immunity respectively (11). Then again, the blame could be pinned to poor health care systems.

Whilst other factors such as residence, employment status, tribe/ethnicity and marital status also had no significant association, opposing and analogous results from other studies are ungrudgingly available. Chuwa et al. (77), in the study done in Tanzania found no significance between marital status and stillbirth. Opposing this is the study by Eng et al. (79), who found that married women had a lower risk of stillbirth than unmarried women. In support, the stillbirth collaborative group (80) also found a significant association whereby unmarried and not cohabitating women had a higher risk of stillbirth (aOR 1.62 95% CI 1.15 - 2.27, p value 0.02). Perhaps this association is related to the lifestyle of unmarried women and availability of a support system during pregnancy.

Alcohol consumption and cigarette smoking are amongst the well-researched risk factors for stillbirth. This study made no significant association to smoking and alcohol consumption. Meanwhile, studies from Omusati region, Namibia and Mozambique had similar results for smoking, and opposite for the alcohol consumption (28,38). In contrast to the former, various studies concur that smoking during pregnancy increases the risk of stillbirth; with some suggesting that this risk is proportional to the number of cigarettes smoked per day (18,49,81–83). A study done in India explored the association of stillbirth and the use of smokeless Tobacco products, it also established that the use of smokeless Tobacco products during pregnancy increases the risk of

stillbirth (14). The association of smoking to stillbirth may be justified given that smoking during pregnancy may lead to fetal growth restriction, which according to literature is a major risk factor to stillbirth (47,84). Alcohol consumption was also related to a higher risk of stillbirth by numerous studies (77,82).

This study was unable to determine the association between maternal BMI and stillbirth due to incomplete records. It is however worth noting that, increased BMI/ obesity has been linked to higher risk of stillbirth by various studies (28,41,78–80). In fact one study termed obesity as the highest-ranking modifiable risk factor for stillbirth in high- income countries (85). Equally important, some studies have suggested that pre-pregnancy obesity results in higher risk of stillbirth in relation to pregnancy-induced obesity (43,47).

5.2.2 Maternal medical and obstetric related risk factors of stillbirth

Several medical and obstetric factors had significant association. This study made no significant association between HIV status and stillbirth. This is consistent with studies undertaken in Omusati region and sub-Saharan Africa (38,86). On the contrary, assorted studies disputes these results (87–89). A study conducted in United Kingdom (UK) and Ireland concluded that stillbirth rates in HIV positive women in the UK is double that of the general population (87). Two African studies agree with the notion. Whilst a study in Tanzania agrees that HIV infection increases the risk of stillbirth, another done in Zambia went a step further, pointing out that advanced maternal HIV and high viral load

is associated with higher risk of stillbirth (88,89). The insignificant association in our results may be attributed to advanced PMTCT treatment in the region, which can be directly linked to suppressed viral load henceforward enhanced maternal immunity.

The importance of attending ANC services has continuously been emphasized. Despite the aforementioned, our results linked lack of ANC to lower risk of stillbirth. Countless studies are in agreement that lack of ANC increases the risk of stillbirth in opposition to our findings (18,21,22,69,90). A study by Korde-Nayak et al. (21), done in India pointed out that, no ANC means suboptimal care resulting in delayed diagnosis of problems subsequently late referral.

We found that premature labor increases the risk of stillbirth. Korde-Nayak et al. (21), found lower risk of stillbirth to women who delivered prematurely. The same results were observed in Ghana (11). Whilst this is so, a study in Bangladesh is in consensus with our findings (53). It found that premature labor increased the risk of stillbirth (53). Perhaps the low association made between premature labor and stillbirth is due to the aggressive emergency and obstetric care that the women receive upon presenting at health facilities. Equally important, premature delivery ought to be avoided at all cost as babies born before term often die within the first week of life due to preterm labor complications (5). Perhaps babies born at term have a better chance of being live born due to less complications in term labor compared to preterm labor plus that they are fully developed as opposed to premature babies. Longer duration of labor has frequently been associated with increased risk of stillbirth (53,69,91). Different studies have analyzed

the duration of labor range differently. Whilst a study by Omo-Aghoja et al. in Nigeria thought labor lasting more than 8 hours placed the baby at risk, one by Badimsuguru et al. in Ghana mentioned labor longer than 12 hours and another by Jammeh et al. in Burkina Faso labor longer than 1 day (12,62,85). We found that mothers who labored longer than 13 hours had lower risks of stillbirth.

Scrutinizing the results of this study, women with no history of previous stillbirth had significantly about three folds increased risks of stillbirth, although this association lost its significance in the multivariate analysis model. Numerous studies have shown that history of previous stillbirth does increase the risk of stillbirth (41,51,52,89). That aside, Millogo et al. (91), in their Burkina Faso study stated that the outcome of a current pregnancy is not affected by previous pregnancy's outcome. This was disputed by Mcpherson's (51), whose results pointed out that women who have had previous stillbirth are likely to miscarry during the second trimester. She also found that, most of those who deliver stillborn in this group are likely to be hypertensive and diabetic (51).

No association was made to the type of delivery conducted for this study. There have been conflicting results concerning the type of delivery and it's link to stillbirth. A study by Omo-Aghoja et al. (69) in Nigeria agreed that there isn't an association between the two. While this is the case, other studies by Jammeh et al. (90), Gambia and Kenny et al. (92), UK discovered that C/S increases the risk of stillbirth. A study by O'neill et al. (93) in Denmark made a link between C/S and stillbirth saying it leads to a small increase in stillbirth risk but only in subsequent pregnancies. Notwithstanding, a study by Feresu et

al. (22) from Zimbabwe dispute these findings as it found lower risk amongst women that delivered through C/S and higher risk amongst breech vaginal deliveries. Another study by Chuwa et al. (77) in Tanzania made a comparison between women who delivered vaginally and those who underwent other forms of delivery. The results showed that normal vaginal delivery had lower risks of stillbirth than other forms of deliveries (77).

Gestational age of the pregnancy at delivery does play a role in the outcome of the pregnancy. Our findings showed a significant association between gestational age and stillbirth. Whereby women who labored at 36 weeks or more seem to have elevated risk of stillbirth than those who labored before that in bivariate analysis, though this association appeared to be the opposite in multivariate analysis. Association between gestational age and stillbirth is not new. Several studies have found association over the years (94–97). A study by Rosenstein et al. (97) in California found that the risk of stillbirth increase with an increase in gestational age. It however found that the highest risk occur when the pregnancy is post dated, a finding that was supported by another study done by Shyam (95) in India. Additionally, a population-based study done in the United States emphasized that, as much as gestational age is linked to stillbirth, being (Small for Gestational Age) SGA or (Large for Gestational Age) LGA also adds to the risk of stillbirth (94).

Parity is also amongst those factors that had no significance in this study. Consistent with these are findings is a study by Millogo et al. (91) from Burkina Faso, which also made no significant association between the two. While this is so, several studies have

made a significant association between parity and stillbirth (15,18,20,96,98). Amongst them, most agreed that null parity increases the risk of stillbirth (18,20,96,98). Nevertheless, a study by Shyam (95) in India found increasing parity to increase the risk of stillbirth. Not only does a systematic literature review of factors associated with stillbirth in LMICs agreed that null parity raise the risk of stillbirth, it also made an association with parity of 5 and more (15).

This study did not explore into the association of STIs plus infectious infections and stillbirth due to poor quality of data. However, it is hard to ignore the overwhelming evidence that points to an increase risk when infection is present. Several studies including a systematic review of literature and a multinational ANC data analysis have made significant association between syphilis infection during pregnancy and stillbirth whereby they agreed that syphilis increases the risk of stillbirth (54,56,58–61). Malaria, Measles and Rubella are some of the infections that have been termed to upsurge the risk of stillbirth (38,56,65,66,99,100).

5.2.3 Fetal related risk factors of stillbirth

Congenital malformations, fetal distress, cord prolapse & enlargement plus low birth weight were the fetal factors, analyzed against stillbirth. Congenital malformations have been reported to cause about 2.1% - 33.3% stillbirth (15). According to Aminu et al. (15), some studies have categorized these malformations and analyzed them separately contrary to our study. The researcher did not classify congenital malformations but

analyzed them commonly. According to our findings, no significant association was made between stillbirth and congenital malformations. These results are comparable to a study by Flenady et al. (85). Given that, studies by Bapat et al. (101) and Lakshmi et al. (78) both done in India contradicted these findings, having found that babies with congenital malformations are at higher risk of being stillborn.

No link was made between cord prolapse and cord enlargement by our findings. Opposite association was made by a systematic review conducted by Liu et al. (47) who found the two to increase the risk of stillbirth. Gutierrez et al. (18) supported these findings as they too made an association between cord enlargement and stillbirth. Low birth weight of ≤ 2500 g was found to increase the risk of stillbirth by our study. Studies by Joseph et al. (102) and Lawn et al. (5) underlined that low birth weight babies are likely to die in their first week of life due to under-development, hypothermia and hypoglaecemia. Studies by Ashish et al. (40), Omo-Aghoja et al. (69) and Ngoc et al. (84) had similarly found low birth weight to increase the risk of stillbirth. This is in agreement to our findings.

5.3 Summary

Risk factors associated with stillbirth were discussed above. Whilst none of the socio-demographic risk factors had a significant association to stillbirth, various maternal risk factors such as premature delivery, ANC attendance, high-risk pregnancy, gestational age and duration of labor had a statistical significant relationship to stillbirth. Study

results were discussed in this chapter in accordance to the study objectives.

Conclusions will be presented in chapter 6, limitations stated and recommendations made from the conclusions.

CHAPTER 6: CONCLUSION, LIMITATIONS AND RECOMMENDATIONS

6.1 Conclusion

To round it off, stillbirth is a worrisome issue in Otjozondjupa Region. Stillbirth rates for the region are even high than those of Namibia. In this study, the researcher did not make a significant association between socio-demographic factors and stillbirth. On the other hand, maternal medical and obstetric factors were linked to stillbirth. Maternal medical and obstetric factors associated with stillbirth were: ANC attendance, premature delivery, gestational age, high-risk pregnancy and duration of labor. According to our study findings, ANC attendance was linked to elevated risk of stillbirth. This may mean ANC services in Otjozondjupa needs strengthening so risk factors are diagnosed early and handled appropriately. Premature delivery was found to be a risk factor for stillbirth. Continuous aggressive intrapartum care may be the answer to women in preterm labor to avert stillbirths amongst this sub group.

Whilst several factors were analyzed amongst the fetal related factors, low birth weight was the only factor that had a significant linkage to stillbirth. Low birth weight and premature delivery commonly go together. It is no wonder they both elevate the risk of stillbirth. The recommendations for premature labor may also prove effective for prematurity especially when implemented successfully.

6.2 Limitations

This study suffered the following limitations:

- The study only looked at women who delivered at state healthcare facilities. This means women who delivered at home and at private healthcare facilities were not included in the study.
- The study focused on Otjozondjupa Region only; therefore, the findings cannot be generalized to the whole country.
- Incomplete records made it impossible for some factors to be analyzed.

6.3 Recommendations

Given the results of the study, the following recommendations are presented:

- The researcher was unable to assess BMI as a risk factor due to incomplete records. There is also no provision for height and BMI in the ANC passports and maternity files. Therefore, it is recommended that the Ministry of Health & Social Services consider adding height and BMI to ANC passports and maternity files. In addition, it is urged that Otjozondjupa Family Health Division emphasize the importance of weighing during pregnancy and overall completeness of records. This can be achieved via continuous in-service staff training.

- ANC attendance has been universally recommended, however, this study finding showed an increased risk of stillbirth amongst women who attended ANC. This gives a picture of poor quality ANC in the region. We recommend that the Ojozondjupa Regional Directorate re-emphasize the importance of ANC examination, so that problems are identified promptly and the woman referred effectively.
- We recommend that the Ministry of Health and Social Services mandate every pregnant woman to undertake ultrasound scan in the first trimester and every trimester afterwards. This is important to detect defects early enough to effectively plan the way forward.
- High-risk pregnancy was found to have lower risk of stillbirth. Despite the findings that suggest poor ANC quality, this may mean exhaustive care is offered solely to high-risk pregnant women at ANC and or delivery. Due to this, it is recommended that midwives in the region pay as much attention to all pregnant and delivery cases to avert avoidable stillbirths. It is also recommended that Otjozondjupa Family Health Division, Primary Health Care Supervisors and Nurse Managers ensure that a high proportion (if not all) of midwives/accoucheures are trained in Emergency Obstetric and Newborn Care (EmONC) to equate them with better case management skills.

- BBAs accounted for 4.56% sample, amongst these 53.84% were stillbirths. Although no significant association was made between BBAs and stillbirth, it is recommended that the region's Primary Health Care Supervisors encourage regular health education sessions during ANC to discourage delivery outside healthcare facilities, as BBAs have been associated with stillbirth in other instances.
- Seeing that risk factors for stillbirth were vaguely studied in Otjozondjupa Region, and that some variables could not be assessed by this study due to incomplete data, it is recommended that more studies that are inclusive of more variables be undertaken for more conclusive and informative results.
- The researcher also recommends studies on the factors influencing poor records in LMICs. This will be crucial to the improvement of record keeping and proper storage.

6.4 Summary

Stillbirth is a problem in Otjozondjupa region. Numerous factors were associated with stillbirths by this study. The conclusions of this study were stated in this chapter, limitations outlined and recommendations made in accordance to study findings.

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ANNEXURE 1: RESEARCH PERMISSION LETTER

FROM UNAM

CENTRE FOR POSTGRADUATE STUDIES

University of Namibia, Private Bag 13301, Windhoek, Namibia
340 Mandume Ndemufayo Avenue, Pioneers Park
☎ +264 61 206 3275/4662; Fax +264 61 206 3290; URL: <http://www.unam.edu.na>



RESEARCH PERMISSION LETTER

Student Name: Rebekka Shikesho

Student number: 200520008

Programme: Masters of Science in Applied Field Epidemiology

Approved research title: Maternal and fetal risk factors for stillbirth in Otjozondjupa region, Namibia: a case control study.

TO WHOM IT MAY CONCERN

I hereby confirm that the above mentioned student is registered at the University of Namibia for the programme indicated. The proposed study met all the requirements as stipulated in the University guidelines and has been approved by the relevant committees.

The proposal adheres to ethical principles as per attached Ethical Clearance Certificate. Permission is hereby granted to carry out the research as described in the approved proposal.

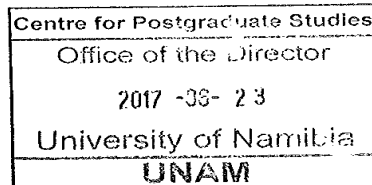
Best Regards

A handwritten signature in black ink, appearing to read 'Marius Hedimbi', is written over a horizontal dashed line.

Name: Dr Marius Hedimbi
Director: Centre for Postgraduate Studies
Tel: +264 61 2063275
E-mail: directorpgs@unam.na

23/06/17

Date



ANNEXURE 2: RESEARCH PERMISSION LETTER
FROM MoHSS



REPUBLIC OF NAMIBIA

Ministry of Health and Social Services

Private Bag 13198
Windhoek
Namibia

Ministerial Building
Harvey Street
Windhoek

Tel: 061 – 2032150
Fax: 061 – 222558
Email: shimenghipangelwa71@gmail.com

OFFICE OF THE PERMANENT SECRETARY

Ref: 17/3/3 ^{RS} JM RS
Enquiries: Mr. J. Nghipangelwa

Date: 03 August 2017

Ms. Rebekka N. Shikesho
P.O. Box 11412
Oshakati

Dear Ms. Shikesho

Re: Maternal and fetal risk factors for stillbirth in Otjozondjupa Region, Namibia: A case control study.

1. Reference is made to your application to conduct the above-mentioned study.
2. The proposal has been evaluated and found to have merit.
3. **Kindly be informed that permission to conduct the study has been granted under the following conditions:**
 - 3.1 The data to be collected must only be used for academic purposes;
 - 3.2 No other data should be collected other than the data stated in the proposal;
 - 3.3 Stipulated ethical considerations in the protocol related to the protection of Human Subjects' should be observed and adhered to, any violation thereof will lead to termination of the study at any stage;
 - 3.4 A quarterly report to be submitted to the Ministry's Research Unit;
 - 3.5 Preliminary findings to be submitted upon completion of the study;

BC

- 3.6 Final report to be submitted upon completion of the study;
- 3.7 Separate permission should be sought from the Ministry of Health and Social Services for the publication of the findings.

Yours sincerely,


Andreas Mwoombola (Dr)
Permanent Secretary



"Health for All"

ANNEXURE 3: RESEARCH DATA COLLECTION TOOL

Stillbirth study questionnaire Risk Factors for stillbirth in Otjozondjupa Region, Namibia, January – December 2016

Demographic Information

Study code _____

Tribe/ Ethnicity

1. Wambo

2. Herero

3. Damara>Nama

4. San

5. Others (specify)

District

1. Grootfontein

2. Otjiwarongo

3. Okakarara

4. Okahandja

Religion

1. Roman Catholic

2. ELCIN

3. AFM

4. Oruano

5. 7th Day Adventist

6. Anglican

7. Other (specify)

Marital Status

1. Single

2. Married

Employment status

1. Employed

2. Unemployed

Date of Birth

Age

Weight (kg)

Height (cm)

Alcohol Consumption

1. Yes

2. No

0. Unknown

Cigarette Smoking

1. Yes

2. No

0. Unknown

History of chronic illness

1. Hypertension

2. Diabetes Mellitus

3. Mental illness

4. Cholesterol

HIV status

1. Positive

2. Negative

3. Unknown

ANC History

Attended ANC

1. Yes

2. No

Gravidity

Parity

High Risk Pregnancy

1. Yes

2. No

Previous stillbirth

1. Yes

2. No

Delivery Information

Gestational age (weeks)

Delivery type

1. Normal Vaginal Delivery

2. Vacuum

3. Caesarean Section

4. Forceps

Born Before Arrival

1. Yes

2. No

Duration of labour (hours)

Delivery complications

1. Pre eclampsia

3. Placenta Abruptio

2. Ante Partum Hemorrhage

4. Cord Prolapse

5. Fetal Distress

6. Other delivery complications

Fetal Information

Type of birth

1. Live birth

2. Stillbirth

Type of stillbirth

1. Fresh stillbirth

2. Macerated stillbirth

Birth weight (grams)

Complications

1. Low birth Weight

2. Cord enlargement

3. Congenital Malformations

Cause of death

General comments
