AN AUDIT OF PREGNANCY OUTCOMES AT A PRIVATE FACILITY IN THE JOHANNESBURG HEALTH DISTRICT

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A research report submitted to the Faculty of Health Sciences, University of the Witwatersrand, in partial fulfilment of the requirements for the degree of Master of Science in the field of Maternal and Child Health.

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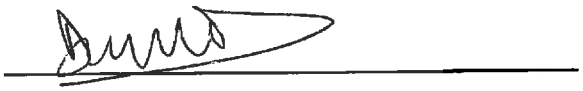
DECLARATION

I, Daina Siphelani Ruredzo, declare that this research report is my own unaided work. It is being submitted for the degree of Master of Science in the field of Maternal and Child Health at the University of the Witwatersrand, Johannesburg. It has not been submitted for any degree or examination at the aforementioned institution or any other university before.



Daina Siphelani Ruredzo

I dedicate this research report to my children Nhlanhla Mlalazi and Samukeliso Mlalazi.

ACKNOWLEDGEMENT

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ABSTRACT

Introduction

Neonatal health and morbidity are influenced by events prior to birth. Some of the events include antenatal care and the presence of co-morbid conditions in pregnant mothers. Mothers in South Africa have a choice from the two-tier health system to receive care during pregnancy either from the public health sector or from the private health sector. The choice is usually influenced by ability to pay for antenatal and perinatal services. High levels of antenatal care provision and positive outcomes are perceived in pregnant women who receive antenatal care in private healthcare facilities. However, there is no evidence of prior systematic testing of this perception.

The rationale for this research was conceptualised against this background, which explored both maternal and neonatal outcomes and the factors influencing these outcomes such as socio-demographic factors, and co-morbid conditions such as medical conditions. For example, hypertensive disorders and infections including the human immunodeficiency virus (HIV).

Objective

To describe the profiles and outcomes of pregnant women (who delivered or had termination of pregnancy at a private facility in the Johannesburg Health District) during a three-month study period.

Methodology

A retrospective record review was done. The sample for this study was drawn from pregnant women who delivered or suffered pregnancy loss at a private facility in Johannesburg Metro District. Ethics approval application was submitted to and approved by the Human Research Ethics Committee (Medical) of the University of Witwatersrand. A three-month period (quarter of a year) was chosen from the 16 quarters in the period 2008 to 2011. The quarters were numbered from 1 to 16, and one quarter was chosen using a random table of numbers, to exclude sampling bias.

The data collection tool used was specifically designed for this study, and was pre-piloted. Socio-demographic data and data on antenatal attendance, pregnancy co-morbidity and foetal outcomes were collected. The latter was measured as Apgar scores, birth weight and need for resuscitation including the need for neonatal intensive care unit (NICU) admission. Data was captured on an MS Excel spreadsheet and analysed using (NCSS) statistical software.

Results

The findings in this study included a low neonatal mortality rate (NMR), absence of maternal deaths and a high caesarean section rate. Moreover, women of high medical aid type suffered less complications of postpartum haemorrhage than the medium and low-level types.

Conclusion

This was probably the first study done in a private health facility in South Africa looking at maternal foetal and / or neonatal outcome and to stratify them according to medical aid type (high / medium / low). The demographic characteristics of the study population were representative of the South African population. The findings in this study showed better maternal and neonatal outcomes than public health facilities in South Africa. The study also reported a high caesarean section rate and relatively more frequent postpartum complications in low and medium medical aid holders.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

GLOSSARY OF TERMS

Audit of perinatal care: A process whereby careful review or evaluation of care given to pregnant women, their unborn babies and their neonates is undertaken. Therefore, evaluation is for outcomes or the processes associated with perinatal care. Outcomes are traditionally analysed through the maternal and perinatal mortality rates.

Health funders: Are medical schemes that fund private healthcare expenses of among others, pregnant women.

Midwife operated birth units: Birth centres run by a team of midwives who provide the majority of antenatal care and attend to deliveries. Birth centres operate with the backup of obstetric care, in case extra medical care is required before, during labour or after birth.

Medical aid plan: There are medical funds of different sizes. Each medical fund has a slightly different profile as defined by the medical scheme, which determines benefit options, as approved and registered by the Registrar of Medical Schemes.

Medical aid scheme: A medical scheme administers a medical fund whereby pooled funds from its members fund the benefits (or plans) it offers to its members.

Medical insurance: Is a form of private medical expenses funding.

Near-miss events: The sequence in a pregnant woman; from good health to organ dysfunction, and organ failure in women who survive. Clinically, this manifests as severe acute maternal morbidity.

Out-of-pocket costs: Healthcare expenses such as co-payments or co-insurance that a pregnant woman pays for. Health insurance companies and medical aid companies do not reimburse these costs.

Private healthcare facility: ‘For profit’ hospitals or clinics offering treatment or management of health conditions including maternity services.

Private funds: Pregnant women who use their personal finances to pay for private healthcare.

Public healthcare systems: Healthcare, including maternity service, which is provided by the government through national healthcare systems.

Private healthcare systems: Healthcare provided through ‘for profit’ hospitals and self-employed practitioners, and ‘not for profit’ non-government providers, including faith-based organisations.

Private sector: The part of the economy that is not state controlled, and is operated by individuals and companies for profit.

LIST OF ABBREVIATIONS

CPD	Cephalic pelvic disproportion
ENND	Early neonatal death
FAS	Foetal alcohol syndrome
FASD	Foetal alcohol spectrum disorders
HIV	Human immunodeficiency virus
IUD	Intrauterine death
IUGR	Intrauterine growth retardation
LGA	Large for gestational age
NICU	Neonatal intensive care unit
NVD	Normal vaginal delivery
PIH	Pregnancy induced hypertension
PMNCH	Perinatal maternal new-born and child health
PNMR	Perinatal mortality rates
PPIP	Perinatal Problem Identification programme
PTB	Pulmonary Tuberculosis
STI	Sexually transmitted infection
UTI	Urinary tract infection
VON	Vermont Oxford Network
MMR	Maternal mortality ratio
RDS	Respiratory distress syndrome
SES	Socio-economic status
NMR	Neonatal mortality rate

CHAPTER 1
INTRODUCTION

The purpose of this study is to describe the profiles and outcomes of pregnant women (who delivered or had termination of pregnancy at a private facility in the Johannesburg Health District) during a three-month study period. This introductory chapter will cover the background to the study, statement of the problem, its objectives as well as an outline of subsequent chapters.

1.1. Introduction

Maternal and child health is one of the main priorities for the South African government and as a result most women receive antenatal care. [1] However, South Africa has parallel private and public healthcare systems and the majority of pregnant women utilise the public service on a free basis while the wealthier minority use private health services on a 'fee-for-service' basis. [1, 2]

Perinatal mortality rates (PNMR) and avoidable causative factors associated with each maternal death in the public health sector, are determined by the Perinatal Problem Identification Programme (PPIP). This occurs in participating hospitals. Private sector hospitals cater for less than 10% of births in South Africa. [3] They submit perinatal deaths information to authorities not necessarily through PIPP. The Medical Research Council's Research Unit developed PPIP in the early 1990s for maternal and infant healthcare strategies. The department of health supported this with the aim of improving the quality of care.

In the private sector, paediatricians and neonatologists use the Vermont Oxford Network (VON) database to assist in assessing perinatal events in the management of neonates admitted to the NICU. The VON database collates maternal perinatal care details with neonatal patient outcome and care. On this database, some maternal details that are recorded, include the use of antenatal steroids in perinatal care, presence of chorioamnionitis and ethnicity, [4] co-morbid conditions such as HIV and tuberculosis infection are not included. [5] However, the VON database was never analysed at this individual hospital level. This study addresses that deficit and

explores other conditions not necessarily otherwise analysed with the VON databases.

This study was planned in the setting of a private facility (Castenhof Clinic, a private Life Healthcare health facility in the Johannesburg Health District), utilising the data from the patient clinical records. It explored prenatal service utilisation, maternal co-morbidity, birth and neonatal outcomes. An audit of the profile of maternal co-morbid conditions was performed. This included the profile of their new-borns or foetuses and assessed associations, including socio-demographic profiles, obstetric and perinatal profiles. The type and frequency of care in this case refers to antenatal care. The advantages of antenatal care on outcomes have been illustrated; for example in a large American study which showed reduction of spending on NICU admission and treatment of low birth weight sequlae. [6]

Neonatal outcomes inspired this research but the emphasis of this research was on upstream factors. These factors include events during pregnancy, during delivery and immediately after delivery. Additional upstream factors are socio-demographic factors, quality of antenatal care and presence of co-morbid conditions. Co-morbid conditions whether pregnancy related or non-pregnancy related, influence pregnancy outcomes. In light of this, maternal near-miss events were investigated. Medical insurance (since the study was in private sector) and maternal morbidity were correlated.

1.2. Statement of the Problem

Morbidity and Mortality meetings are common in public health facilities. These audits include the use of PIPP. In the private sector, selected health facilities keep and use the VON database. The VON records profiles of women who deliver in private facilities in South Africa. Data is captured on the VON at the clinic. VON does not analyse maternal medical conditions such as asthma or infections such as HIV further, VON does not relate medical insurance to pregnancy outcomes. This study is aimed at addressing that gap, raise awareness at local level and form a basis for future studies.

1.3. Research Question

a. What is the profile of pregnant women who delivered or had termination of pregnancy at a private facility in the Johannesburg Metro District?
b. What factors are associated with pregnancy outcomes in this setting?

1.4. Objectives

1.4.1 Broad objective

To describe the profiles and outcomes of pregnant women (who delivered or had termination of pregnancy at a private facility in the Johannesburg Health District).

1.4.2 Specific objectives

a. To describe maternal profiles, such as ownership of medical insurance, residence, booking status, mode of delivery obstetric history and demographic factors during a three-month study period in 2011.
b. To describe their pregnancy outcomes i.e. maternal, foetal and neonatal morbidity and mortality during a three-month study period in 2011.

CHAPTER 2
LITERATURE REVIEW

In this chapter, relevant literature of hospital maternity services, with particular reference to private healthcare is discussed. In addition to published literature on outcomes in the private health setting, information from various unpublished sources is reviewed.

2.1 Pregnancy Outcome

Worldwide, maternal mortality ratio (MMR) has declined. This is from 385 per 100 000 births to 216 per 100 000 in 2015. [7] Regional MMRs for 2015 ranged from 12 deaths per 100 000 live births (11-14) for high-income regions to 546 (511-652) per 100 000 for sub-Saharan Africa. [7]

In 1990, over 500 000 women and girls were reported to have died from complications related to pregnancy and childbirth each year. In 2014, this number had fallen to 289 000 deaths per year. More than half of these deaths occur in Sub-Saharan Africa [8] and there has been very little reduction in maternal mortality in countries in this region over the last decade.

While many countries are making progress, a number of countries such as Zambia, Mozambique, Angola, Zimbabwe, Malawi and Lesotho have a high MMR. In these countries, the MMR was found to be above 700 per 100 000 live births, which was higher than any other estimates for South Africa. [9]

The MMR in South Africa, although declining, still remains high with heterogeneity across institutions and geographic areas. [10] Poorer regions had higher mortality rates. For example, deaths per 100 000 births was 286 in the Free State and 186 in the Western Cape. Statistics South Africa, reported an increase in maternal mortality by 2010. [11] HIV and AIDS and Pulmonary Tuberculosis (PTB) were the main contributory factors. Furthermore, external causes (accident and violence) also

contributed about 14% of all maternal deaths.

2.2 Pregnancy Outcome in Private Sector

There is little published literature on the private sector in South African maternity services; therefore some unpublished data in this regard was used. Globally, studies have been published that compared clinical outcomes in private healthcare opposed to outcomes in public healthcare systems. [2] Although inconsistent, some have shown high incidence of negative clinical outcomes in privately insured mothers, dispelling the notion that private healthcare has better outcomes. This is controversial, because the better clinical outcomes in the public sector are also associated with delay in service. In addition, studies from the West have explored birth outcomes in publicly and privately insured mothers. Some conditions were more common in the publicly insured pregnant mothers, for example, intimate partner violence. [12] As mentioned earlier, even non-pregnancy related conditions can have an impact on the pregnancy outcome.

Globally, the provision of health services to pregnant women is generally regarded as government's responsibility especially for those mothers who cannot afford to pay for health services, [13] under the umbrella of the right to appropriate healthcare in sexual and reproductive health.

South Africa has a two-tier health system with public health service on one hand and private health sector on the other. [14] The latter provides healthcare to individuals and pregnant women who can pay for health services; either through medical insurance fund or through private funds. Within the South African context, a pregnant woman is expected to receive care mostly in the public sector, where maternity services are free. **[14]** On the other hand, the private sector caters for the minority who can afford to pay.

In the context of pregnancy outcomes, the cost in terms of life and / or treatment of loss of a mother and or her baby is catastrophic for the family concerned. [15] The cost is both psycho-social and economic. This is regardless of where in the health system the mother receives care.

The mode of delivery may also affect the overall cost of a pregnancy. The cost of a normal delivery is more affordable than that of a caesarean section. However, gestation at delivery has an impact on the cost of both the neonate and the maternal outcome. Cost impact studies on neonatal care in the West showed a difference in healthcare costs depending on gestation and condition of the neonate at birth. The healthcare cost of full term infants in prenatal care; delivery and postnatal care had lower average cost than other infants did particularly in comparison with those born prematurely. Premature neonates, are known to exhibit the highest cost of healthcare and this was also collaborated by this study. [15]

2.3 Factors Influencing Pregnancy Outcome

The socio-economic status (SES) of the women was explored using a medical aid plan type as a proxy. The presumption was that socio-economic status dictates the type and frequency of care, thereby having an impact on the outcome. The site of this study catered for only self-funded patients, which was either through medical insurance (medical aid) or private funds. The clinic caters for patients who have a wide variety of medical aid schemes and different medical aid plans even within a given scheme; varying from low to high end medical aid plans as defined by the schemes. [16] It was postulated that those who could afford the lower end medical aid plans might have a different risk profile compared to those who could afford medical aids at the higher end of the scale.

Clinical problems (such as hypertension, obstetric haemorrhage, early pregnancy losses and infections such as HIV), occurring during pregnancy affect the health of the new-born infant as well as perinatal care of the mother. [1] Therefore, the outcomes and required level of care of a new-born baby is influenced by events that occur before the infant is born, during pregnancy. [17]

This audit analysed all the births in the study period. It also explored the funding plan, maternal co-morbidity characteristics and birth outcomes. Neonatal outcomes such as prematurity, low birth weight and the need for NICU admission were also explored. This audit primarily focused on maternal morbidity and neonatal morbidity.

Medical care processes were excluded, as permission for the study did not cover this. However, it was anticipated that exploring morbidity outcomes and the level of funding might give some clues to relationships between outcomes and funding. In general, an audit of perinatal care is done for outcomes or the processes associated with perinatal care. Maternal outcomes are traditionally analysed through the maternal and perinatal mortality rates. [6]

The Saving Mothers programme by the Department of Health reports on confidential inquiries into maternal deaths in South Africa. This assesses processes in maternal care and the results are linked to policy making to improve maternal outcome. [18] In high income countries, maternal deaths are too rare to be used as a marker of the quality of care, instead maternal morbidity is analysed. [19] It has been suggested by Stones et al that useful information for assessing maternal care can be obtained from an analysis of near-miss events, cases resulting in maternal and neonatal morbidity. [20] These are events of maternal morbidity that threaten to cause maternal mortality but that the pregnant woman survives.

There were no cases of maternal mortality encountered, however, there were cases of pregnancy loss encountered and these were included in the analysis. Ideally, a perinatal audit should encompass all the medical personnel involved in perinatal care. [6] This was not the case due to fiscal commitments of the other members of the perinatal team and patient care commitments of medical and nursing staff in this private health facility.

Prematurity is one of the leading causes of neonatal deaths and accounts for 11% of deaths in children five years and younger in South Africa [21] through outcomes such as stillbirths, neonatal deaths, low birth weight and premature births. [22]

It has been suggested that maternal medical conditions, including infections affect neonatal outcomes, by causing asphyxia and low birth weight and thereby contribute to perinatal deaths. [23] In addition, as mentioned above regarding under five mortality, neonatal deaths contribute two thirds to infant mortality. Of these deaths, two thirds occur in the first week of life and of these deaths two thirds occur in the first 24 hours. [24] This suggests that antenatal, perinatal and early post-natal events

are all vital to maternal and neonatal survival morbidity and mortality. In addition, all this impacts on under five mortality.

Therefore, in developing countries, poor maternal health, new-born and child health problems occur because of diseases suffered and all are interconnected. Interventions for improving reproductive and maternal new-born care and child health are not only closely related, but should be done in a continuum of care. [25]

2.4 Private Health

Private healthcare's patient care, including maternity services is provided in hospitals that are neither owned nor controlled by government. [26] This is funded mostly through medical aid scheme membership. [16] A minority of patients pay for these services using private funds. As mentioned earlier, the ability to pay for services will influence whether and how pregnant women access these services. Affordability was not tested, but is suspected to have an impact on pregnancy outcomes via access to healthcare.

A complex web of interacting factors influences pregnancy outcomes. These factors are medical, related to quality of care, psycho-social and often socio-economic at population level. Some of these are discussed below.

Pregnancy outcomes are affected by smoking, [27] maternal alcohol intake during pregnancy [28] and maternal level of education. The latter is affected by social class and both influence behaviour for example risk of smoking [29] as well as pregnancy related and non-pregnancy related medical conditions.

Smoking during pregnancy is one of the most common preventable causes of pregnancy complications, illness and death among infants. [30] There are maternal effects and foetal complications. Complications suffered in pregnancy are premature rupture of membranes, placenta praevia and abruptio placenta. [30] All of these can then be upstream factors affecting foetal morbidity and mortality. Known foetal complications due to smoking on the unborn infant include prematurity, [27] low birth weight and small for gestational age birth weight. [30] Upstream factors as mentioned

above are complex and often socio-economic. Alcohol consumption during pregnancy can affect the foetus. This can cause foetal alcohol syndrome (FAS), which is the most clinically recognisable form of foetal alcohol spectrum disorder (FASD) and is characterised by a pattern of minor facial anomalies, prenatal and postnatal growth retardation and functional or structural central nervous system abnormalities. [28]

Studies from abroad comparing outcomes in pregnant women who delivered in public and those in private health sector showed differences, which may be attributable to psycho-social factors for example, in a group of pregnant women who were screened for being abused. [12] In this case, public sector attendees fared worse possibly because of psycho-social factors. This study did not explore partner abuse as it was a retrospective record review and this is not a routine question in the care of pregnant women in the facility.

The above study is cited to illustrate comparisons done between pregnant women delivering in the public compared to private sector. To the researcher's knowledge, there are no such published studies for South Africa. Such studies are necessary in South Africa for local data to be generated that compare outcomes in the public and private sector. This study, in this particular setting explored and analysed the pregnancy outcomes of women delivering at a private facility in the Johannesburg District. The methodology and the findings from the study are described in the subsequent chapters.

CHAPTER 3
METHODOLOLOGY

The aims and objectives for this study determined the methodology. In this chapter, setting, scope, study design and research tools are discussed.

3.1 Study Design

A cross sectional study design, based on retrospective record review.

3.2 Study Setting

The study site was Castenhof Clinic, which is a private hospital in the Johannesburg Health District. It is a private healthcare facility, under the Life Healthcare Group and is in Glen Austin, Midrand. Permission to conduct the study was obtained from the hospital management. The clinic, which caters for a wide range of patients is flanked by the affluent Waterfall Estates to the west, Glen Austin and the middle-to-low income township of Tembisa to the east. Whilst the clinic is in the Johannesburg District, it is also within close proximity of Ekurhuleni.

It caters for patients who pay for medical services using medical aid or out-of-pocket funds. It was anticipated that due to the costs involved in antenatal, perinatal and postnatal care most patients would use medical aid to access medical services at the clinic. Medical insurance level varies from most comprehensive to the bare minimum.

3.3 Study Population and Study Sample

The study population comprised of pregnant women who are members of medical aid schemes and delivered at Castenhof Clinic. The study sample was drawn from pregnant mothers who delivered and those who suffered pregnancy loss. The three-month period was chosen from one of the quarters from 2008 to 2011 using a table of random numbers. Pregnant mothers were recruited, even if the pregnancy ended in foetal loss.

Based on the number of deliveries (approximately 1 440 per annum), it was expected the study sample would be at least 300, as the facility has approximately 120 deliveries per month. The subjects on medical aid were stratified and analysed. The subjects who were not on medical aid were subsequently excluded from the rest of the study analyses.

The original study sample had 317 participants. The women who had inadequate identification data at enrolment were excluded from the study, thereby leaving only 311 participants.

The majority of the women 304 (98%) in the study had medical aid, accounting for 98% of the study population. Only 2% paid from out-of-pocket, for health services, (Figure 3.1). The subjects with no medical aid were insignificant in number compared to those on medical aid and as a result skewed the data and were therefore excluded in the data analysis.

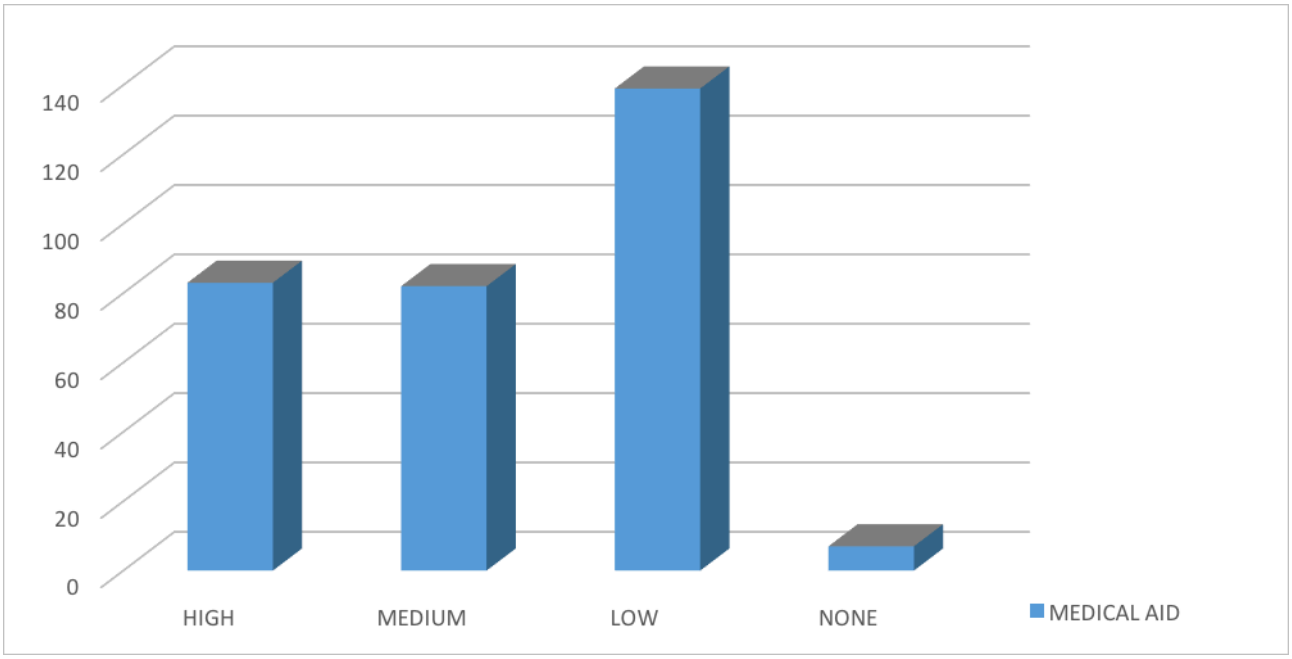

Figure 3.1 Medical aid membership (n= 311)

The classification of medical aid into high, medium and low used in this study is as per classification used by the medical aid industry.

3.4 Study Variables

The variables for this study are listed in Table 1.

Table 3.1 List of variables

Socio-demographic profile	Age, ethnicity, marital status, residential area, employment status, medical aid
Obstetric profile	Gestational age at delivery, booking status and gestational age at booking, gravidity, co-morbidity (anaemia, pregnancy induced hypertension, HIV, STI, other infections, UTI, chorioamnionitis and diabetes).
Pregnancy outcome	Miscarriage, induced abortion, ectopic, intrauterine death, fresh and macerated, stillbirth and normal birth.
	NVD, caesarean section, ventouse / forceps, breach

Mode of delivery	delivery.
Foetus and neonates	Apgar scores (at 1, 5 and 10 minutes), birth weight, head circumference and length.
Foetal and neonatal outcomes	Low birth weight, resuscitation, admission to NICU, fatal death and foetal infection.

3.5 Data Management

3.5.1 Data sources

Data was extracted from a number of sources, which are described below:

(a) Computerised Case Manager data: Every maternity patient in the Castenhof Clinic was recorded in the computerised Case Manager database and maternity register. The study sample was identified from the maternity register. Then the enrolled women's unique visit number was identified in the Case Manager database to be able to identify the file number for archive and file retrieval. Groups of patient samples identified were emailed or hand delivered to the Case Manager to get the unique visit number. Then the lists of the unique visit number were given to the Archives Supervisor who arranged for file retrieval. File control was exercised with signatures in a control book. Patient confidentiality and anonymity was maintained by use of study numbers for actual data extraction from patients' files and subsequent entry to the data collection tool.

(b) Clinical records: A number of other registers (such as the maternity register, the new-born register, maternal patient file, neonatal patient file, obstetrician's notes, paediatrician's notes, death book and hospital accounts) were used for cross checking and verification of data. All patient notes are written in duplicate and at discharge; doctors keep a copy while a copy is kept in the hospital archives. It is the duplicate notes that were retrieved from archives for record review. All these records were obtained from archives using the unique patient visit number, to identify the file in the hospital archive system.

3.5.2 Data collection

Data was collected using a pre-piloted data collection form (Appendix B). The data collection form did not have the patient's name nor the unique patient's identification number in order to maintain patient confidentiality as stipulated by the Ethics Committee. Data was obtained, through retrospective patient information review from the sources mentioned above. Patient files from archives were retrieved, using the unique visit number via the Case Manager and archive supervisors. Then the study variables were recorded in the data collection tool.

3.5.3 Data analysis

Data from the data collection tool was entered into MS Excel and was analysed using NCSS statistical software. The following statistics were used:

- *Descriptive statistics*: Mean and standard deviations (continuous variable, normally distributed) for numerical values such as maternal age and birth weight. Calculations of median and interquartile range (continuous variable, not normally distributed) were done for Apgar scores. Proportion and counts (ordinal and nominal data) were calculated for the number of women with co-morbid conditions and the number of neonates with negative outcomes.

- *Analytical statistics*: used to compare between groups (such as different maternal age groups or those who received to those who did not receive antenatal care): were the T-Test (continuous variable, normally distributed), Mann-Whitney's U-Test (continuous variable, not normally distributed), ANOVA and Chi-square test (ordinal and nominal data).

- The statistical significance was reported at 0.05 (based on α of 0.05).

3.6 Ethics

The University of the Witwatersrand Human Research Ethics Committee (Medical) approved the research (Clearance number M121043) (Annexure A) and subsequently the study commenced. In addition, the Clinic Manager of Castenhof Clinic gave permission for the study (Annexure A). Protection of study participants' data was by use of study number to identify them. The researcher kept a secure database linking the study number and patients' identity, such as hospital number and patient name as requested by the ethics committee. This information was stored securely.

CHAPTER 4
RESULTS OF THE STUDY

This chapter explains the analysis of the data collected for this study in relation to its aims and objectives. It further describes the results obtained from the analysis of data collected.

4.1 Number of Subjects

The number of subjects for this study was 304. The subjects with no medical aid were insignificant in number compared to those on medical aid and as a result skewed the data and were therefore excluded in the data analysis. Hence, data analysis was done for the 304 who had medical aid membership. They were stratified into three groups (high, medium and low) based on the level of the plan of their medical aid schemes:

Table 4.1 Medical aid type by count

Medical Level	Count	Percent
High	83	27.3
Medium	82	27.0
Low	139	45.7
Total	304	100%

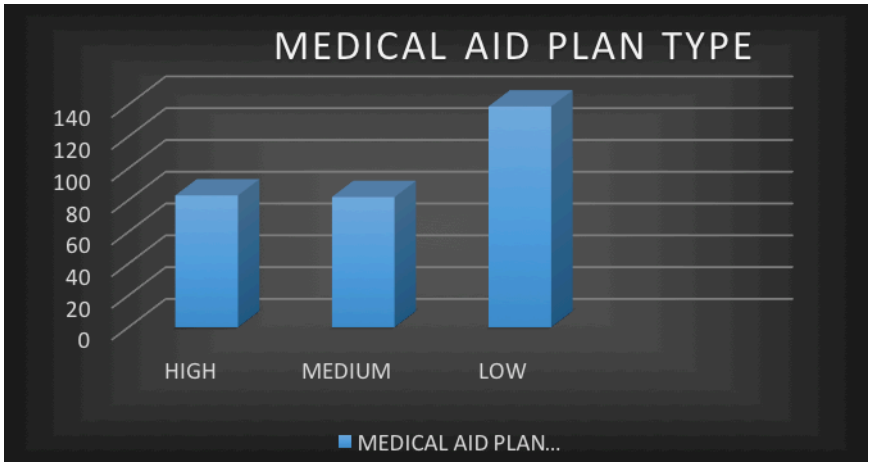

Figure 4.1 Medical aid plan (n=304)

The socio-demographic characteristics of the participants are described, followed by their obstetrics profiles and outcomes.

The majority of the women in the study had medical aid, 304 (98%). In addition, 139 (45.7%) of the study participants had low-level medical aid and this was the biggest single group as compared to middle and higher medical aid plans across the different medical aids. Eighty-three (27.3%) of participants had high-end plans while 82 (27%) had medium level of the medical insurance.

4.2 Socio-demographic Profile

4.2.1 Age

The ages of the women who delivered ranged from the youngest who was 16 years of age to the oldest who was 44 years of age and the standard deviation was five, (Table 4.2).

The profile of the age of study participants was normally distributed (Graph 4.3). In addition, the mean age of the women in the study sample was 29 years of age. The majority, 83% were between the ages of 20 and 35 years (Figure 4.2).

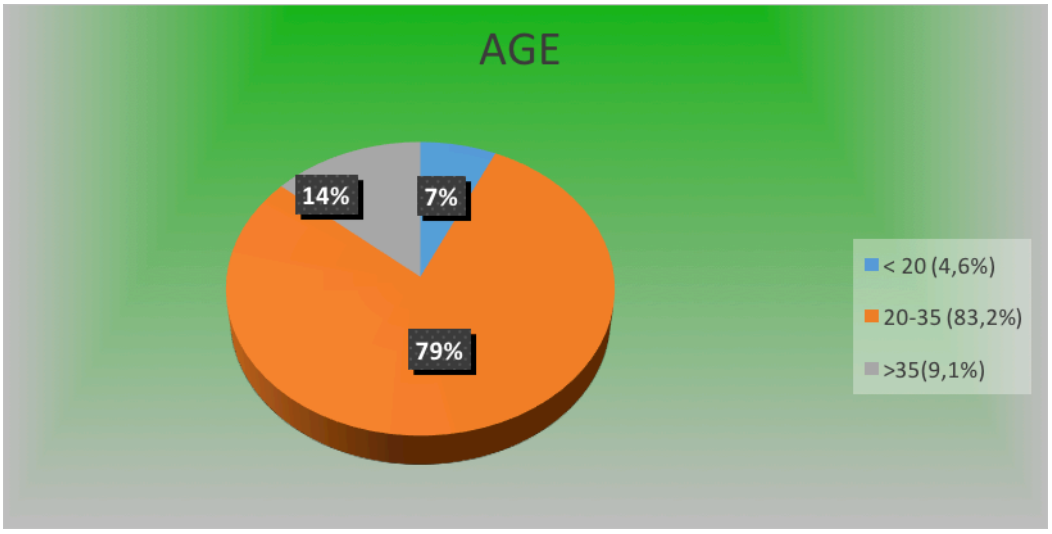

Figure 4.2 Age distribution (n= 304)

It is important to note the fact that the youngest participant was an adolescent who was 16 years old (Table 4.2).

Table 4.2 Age according to medical aid plan

	Total (n=304)	High (%)	Medium (%)	Low (%)
Count	304	83	82	139
Mean	29	29.3	28.9	29
Deviation	5	5.7	5.1	5.1
Minimum	16	16	16	16
Maximum	44	41	42	44

When the ages were stratified by medical aid there were no significant differences among the three groups (Analysis of Variance, p = 0.90). There was no statistical difference in the ages in the various categories of high, medium and low medical aid plan.

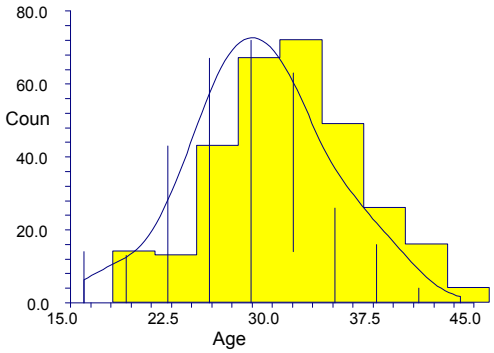

Figure 4.3 Age distribution of subjects (n=304)

Among the adolescents six (42%) were below 18 years of age, while the remaining eight (57%) were either 18 or 19 years old (Figure 4.4).

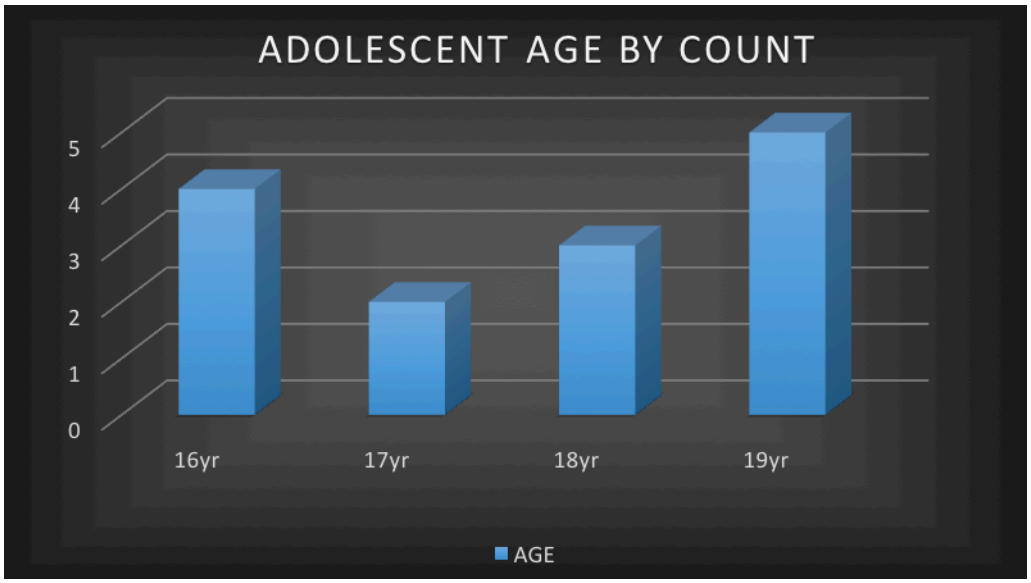

Figure 4.4 Age of adolescents (n= 14)

4.2.2 Residence

As to be expected, the majority of the pregnant women resided in Johannesburg accounting for 189 (63.2%) (Table 4.3) of the whole sample. Ekurhuleni District, which is in close proximity, was place of residence to 88 (29.4%) of the women. A few number of subjects came from Tshwane, West Rand and other districts accounting for 22 (7.4%) combined.

While the majority (63.2%) of the women in the study resided in the Johannesburg District, this was a heterogeneous group. It included those residing in suburbs such as Midrand, Rabie Ridge, Tembisa, Kempton Park and Kyalami.

Table 4.3 Residential area

District	Total (%)	High (%)	Medium (%)	Low (%)
Ekurhuleni	88 (29.4)	20 (24.4)	22 (27.5)	46 (33.6)
Johannesburg	189 (63.2)	59 (72)	49 (61.3)	81 (59.1)
Tshwane	19 (6.4)	2 (2.4)	8 (10.0)	9 (6.6)
West Rand	1 (0.3)	0 (0.0)	1 (1.3)	0 (0.0)
Other	2 (0.7)	1 (1.2)	0 (0.0)	1 (0.7)
Total	299 (100)	82 (100)	80 (100)	137 (100)

*Missing values

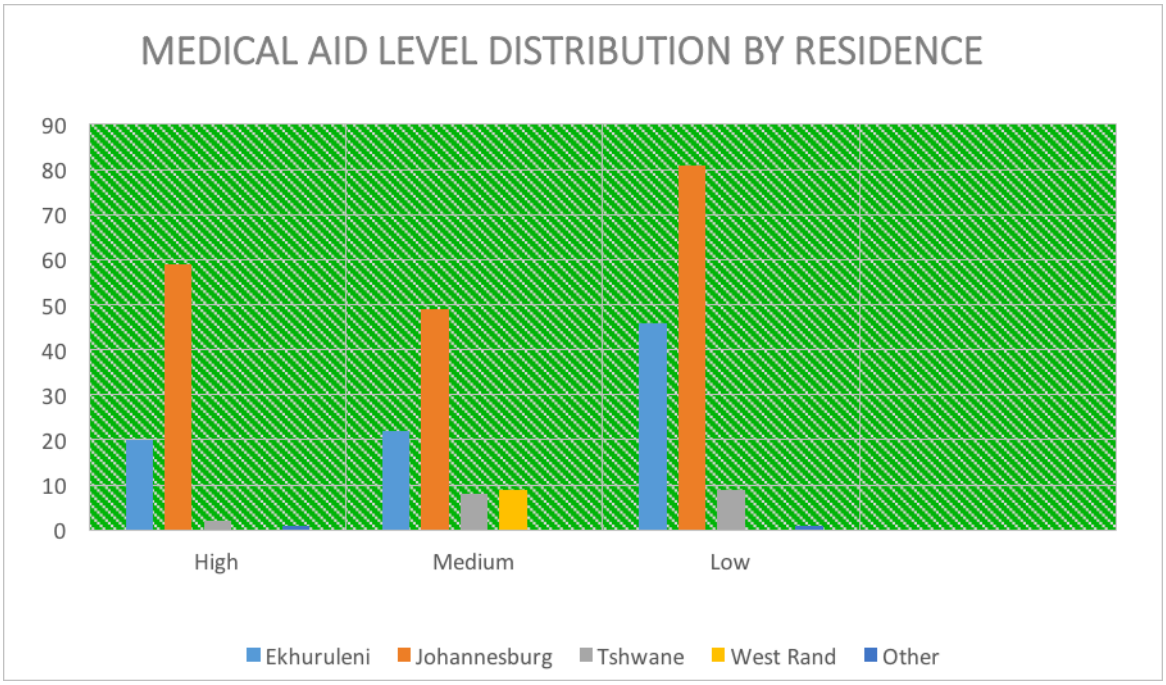

Figure 4.5 Place of residence (n= 299)

There are no significant differences among the three groups (Chi-square test, p = 0.24) of medical aids owned by participants by area of residence (Figure 4.5). This is important since socio-economic factors were of interest.

4.2.3 Ethnicity

The ethnic groups of the pregnant women were representative of the South African population. The majority of the women were black 255 (84.7%), while 18 (6%) were white, 16 (5.3%) were Asian and 12 (4%) were coloured (Table 4.4).

Table 4.4 Ethnicity

Ethnicity	Total (%)	High (%)	Medium (%)	Low (%)
Asian	16 (5.3)	3 (3.7)	5 (6.2)	8 (5.8)
Black	255 (84.7)	72 (87.8)	64 (79.0)	119 (86.2)
Coloured	12 (4.0)	4 (4.9)	3 (3.7)	5 (3.6)
White	18 (6.0)	3 (3.7)	9 (11.1)	6 (4.3)
Total	301 (100)	82 (100)	81 (100)	138 (100)

*Missing value 3

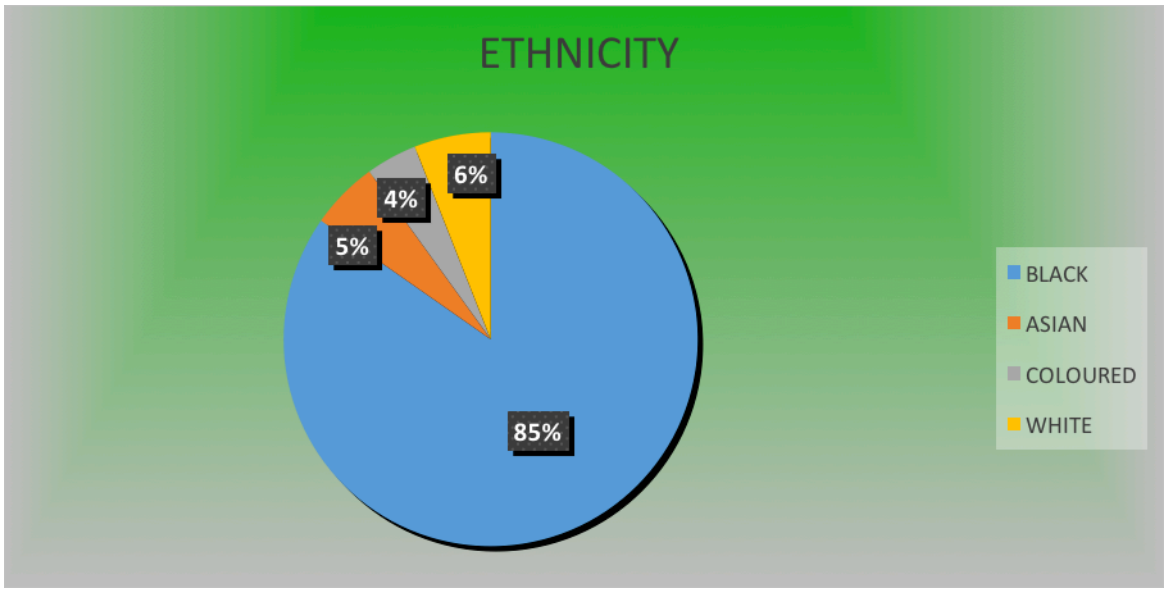

Figure 4.6 Ethnicity (n=301)

In terms of ownership of the various grades of medical aids there were no significant differences among the three groups (Chi-square test, p = 0.40). There was no racial difference of medical aid level detected among the different racial groups.

4.2.4 Marital status

The majority 180 (62.9%) of the study participants were married, while a quarter 72 (25.2%) were single women and 34 (11.9%) were in a cohabiting living arrangement with their partners at the time of the delivery. Unfortunately, some participants' marital statuses were not recorded in their files, so these were excluded.

Table 4.5: Marital status

Marital status	Total (%)	High (%)	Medium (%)	Low (%)
Cohabiting	34 (11.9)	12 (15.6)	6 (8.0)	16 (11.9)
Married	180 (62.9)	43 (55.8)	50 (66.7)	87 (64.9)
Single	72 (25.2)	22 (28.6)	19 (25.3)	31 (23.1)
Total	286 (100)	77 (100)	75 (100)	134 (100)

*Missing value 20

Analysis of medical aid type per marital status showed no significant differences among the three groups (Chi-square test, p = 0.51).

4.2.5 Employment status

The majority of the women in the study were employed 186 (97.4%), while a minority 4 (2.1%) were unemployed (Table 4.6). Unfortunately, information about employment status was unavailable for a third (38%) of the women, so these were excluded.

Table 4.6 Employment status

	Total (%)	High (%)	Medium (%)	Low (%)
No	4 (2.1)	2 (4.0)	2 (3.9)	0 (0.0)
Yes	186 (97.4)	47 (94.0)	49 (96.1)	90 (100.0)
Scholar	1 (0.5)	1 (2.0)	0 (0.0)	0 (0.0)
Total	191 (100)	50 (100)	51 (100)	90 (100)

*Missing values

There were no significant differences among the three groups of medical aid per employment status (Chi-square test, p = 0.16) even after excluding the scholar (n=1) from the analysis.

4.3 Obstetrics Profile

4.3.1 Booking status

There was a high antenatal attendance of the pregnant women having been booked and attending antenatal care. Of the patient files reviewed, 218 (69%) of the files revealed the booking status (Table 4.7 and Figure 4.7)

Among these, 212 (97.2%) confirmed the majority of the pregnant women had antenatal booking (Table 4.7), while a very small proportion had not booked (Figure 4.4). Six women (2.8%) had not attended antenatal care and presented as perinatal emergency cases.

On the other hand, 90 (28%) of all the files reviewed did not specify whether the patients had been booked or not, so these were excluded.

Table 4.7 Booking status (n= 218)

Booking status	Total (%)	High (%)	Medium (%)	Low (%)
No	6 (2.8)	3 (5.5)	1 (1.5)	2 (2.1)
Yes	212 (97.2)	52 (94.5)	66 (98.5)	94 (97.9)
Total	218 (100)	55 (100)	67 (100)	96 (100)

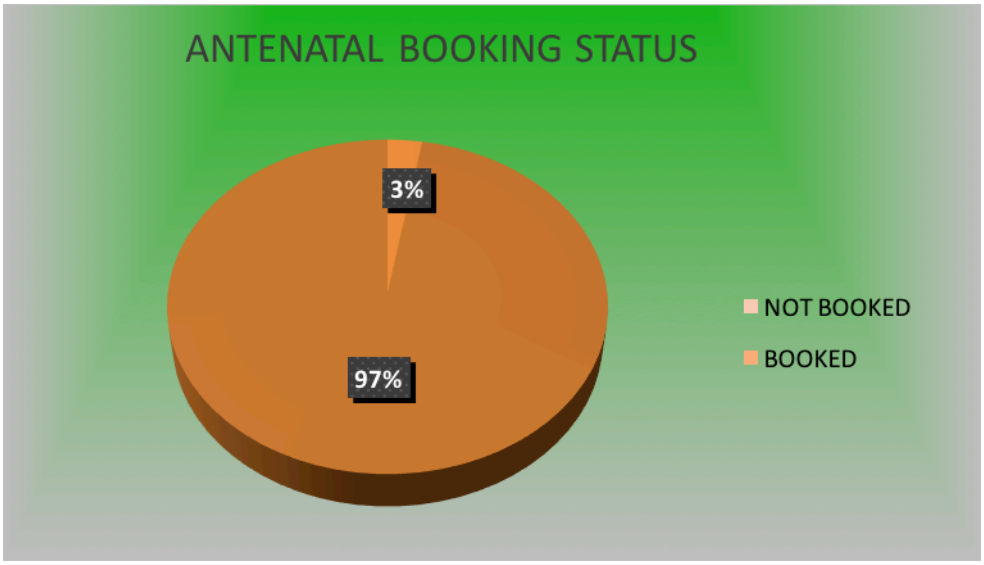

Figure 4.7 Booking status (n=218)

Comparison of the groups, for medical aid level and booking status using the Chi square test, showed no significant differences among the three groups (Chi-square test, p = 0.35).

4.3.2 Gestational age at delivery

Gestational age at delivery and / or miscarriage varied from a minimum of 22 weeks to a maximum of 41 weeks with an interquartile range of 38 -39. The most premature pregnancy was delivered at 22 weeks and maximum gestation at delivery was 41 weeks (Table 4.8). The interquartile range was 38.0 - 39.5.

Table 4.8 Gestational age at delivery

	Total	High	Medium	Low
Median	38	38.5	38	38
IQR	38-39.5	38-40	37-39	38-40
Minimum	22	22	28	24
Maximum	41	41	41	41

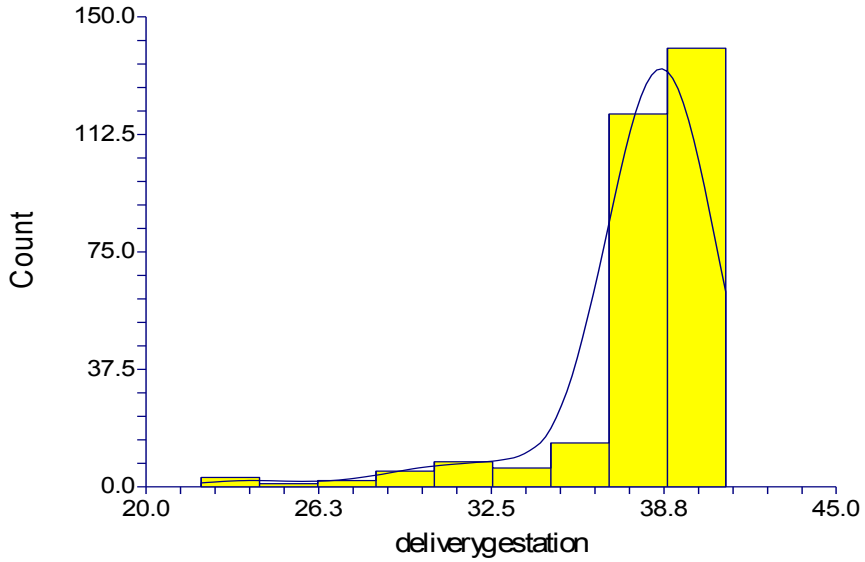

Figure 4.8 Gestational age distribution (n=304)

There are no significant differences among the three groups (Analysis of Variance, p = 0.49).

4.3.3 Parity

The maximum parity was four and the minimum number was zero, i.e. there were women who were in their first pregnancy. The maximum number of parity was four and the interquartile range was 0-1 (Table 4.9).

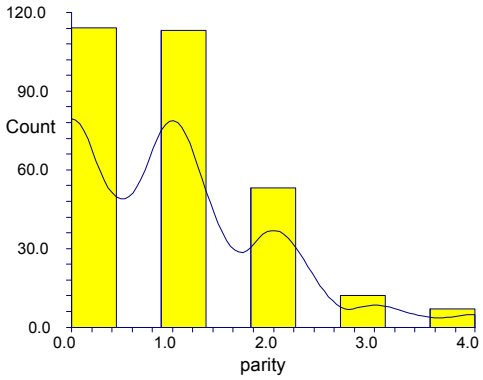

Figure 4.9 Parity (n=304)

Table 4.9 Parity

	Total	High	Medium	Low
Median	1	1	1	1
IQR	0-1	0-2	0-1	0-1
Minimum	0	0	0	0
Maximum	4	4	4	4

There are no significant differences among the three groups (Analysis of Variance, p = 0.12)

4.3.4 Previous pregnancies

4.3.4.1 Previous obstetrics history

Previous miscarriage was the most frequent condition, accounting for 43 subjects (14.1%), while the second most frequent was previous caesarean section at 23 (7.6%), followed by bad obstetric history at 7 (2.3%). The term bad obstetric history is used loosely here to refer to women who suffered pregnancy loss, preterm labour, foetal anomalies or delivered a stillbirth previously but this was not otherwise specified and only recorded as bad obstetric history in the patient's notes.

Table 4.10 Obstetrics complications in previous pregnancies (n=78)

	Total (%) (n= 304)	High (%) (n=83)	Medium (%) (n=82)	Low (%) (n=139)
Bad obstetric history	7 (2.3%)	5 (6%)	0 (0.0)	2 (1.4%)
Premature delivery	4 (1.3%)	1 (1.2%)	0 (0.0)	3 (2.2%)
Previous caesarean section	23 (7.6%)	6 (7.2%)	7 (8.5%)	10 (7.2%)
Previous C/S miscarriage	4 (1.3%)	1 (1.2%)	0 (0.0)	3 (2.2%)
Previous ectopic	1 (0.3%)	0 (0.0)	0 (0.0)	1 (0.7%)
Previous miscarriage	43 (14.1%)	10 (12%)	12 (14.6%)	21 (15.1%)
Total	78 (25.7%)	22 (26.5%)	19 (23.2%)	37 (26.6%)

*Some have more than one condition

There were no significant differences among these three groups (Chi-square test, p = 0.22).

4.3.4.2 Surgical history

A few of the women (n=5) had surgical procedures performed on them prior to current pregnancy. Procedures previously performed included mastectomy, nephrectomy adhesion lysis and colon surgery (Table 4.11 and Figure 4.1).

Table 4.11 Surgical history (n= 304)

Surgical History	Total (%) (n= 5)	High (%) (n=1)	Medium (%) (n=1)	Low (%) (n=3)
Adhesion lysis	1 (0.3%)	1 (1.2%)	0 (0.0)	0 (0.0)
Exploratory laparotomy	1 (0.3%)	0 (0.0)	0 (0.0)	1 (0.7%)
Mastectomy	1 (0.3%)	0 (0.0)	0 (0.0)	1 (0.7%)
Colon surgery	1 (0.3%)	0 (0.0)	1 (1.2%)	0 (0.0)
Nephrectomy	1 (0.3%)	0 (0.0)	0 (0.0)	1 (0.7%)
Total	5 (1.6%)	1 (1.2%)	1 (1.2%)	3 (2.2%)

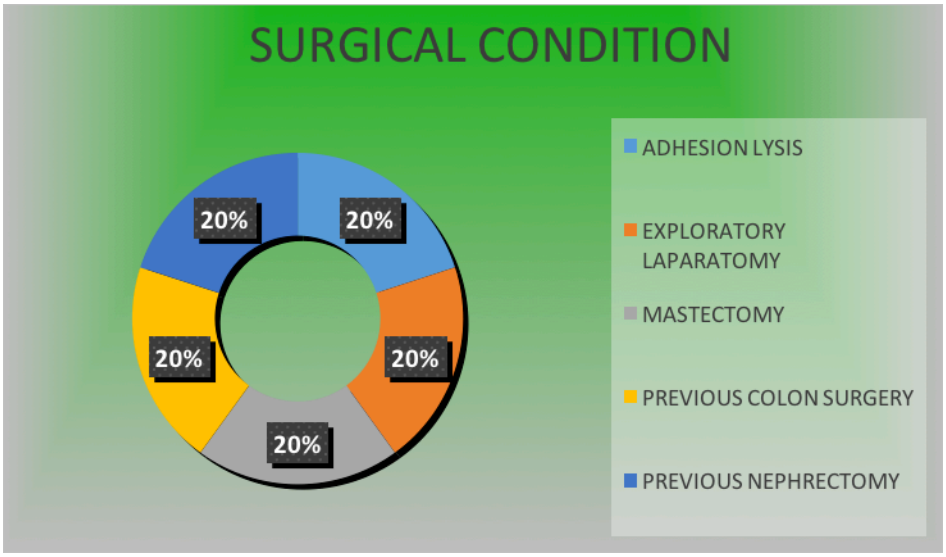

Figure 4.10 Previous surgical conditions (n=5)

4.3.5 Current pregnancy

4.3.5.1 Anaemia

Of the women who delivered, 133 (42%) of the whole sample had a Haemoglobin value recorded in their file and the the mean Haemoglobin level was 11.28g/dl with a standard deviation of 1.7 (Table 4.12). The majority of the pregnant women in this study had normal haemoglobin level while of the 41 (30%) women were anaemic.

Table 4.12 Haemoglobin

	Total	High	Medium	Low
Count	133	32	30	71
Mean	11.28	11.14	11.23	11.36
SD	1.67	1.49	1.55	1.80
Minimum	5.7	8.5	8.6	5.7
Maximum	15.8	14.1	15.8	15.7
Error	0.14	0.26	0.28	0.21

*Missing values

The test (Analysis of Variance) showed no significant differences among the three groups (Analysis of Variance, p = 0.80).

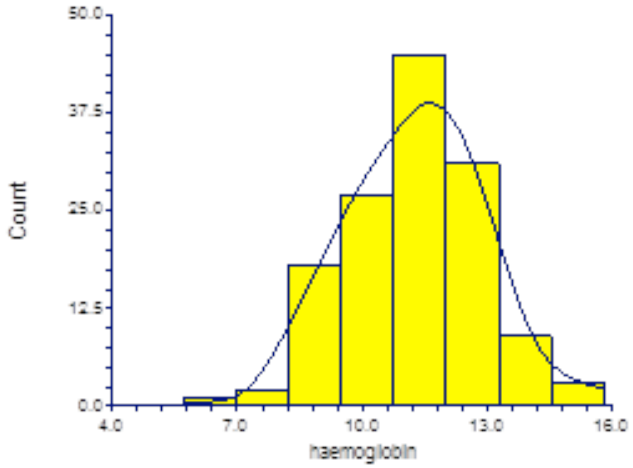

Figure 4.11 Haemoglobin (n=133)

4.3.5.2 Medical conditions in current pregnancy

HIV and pregnancy-induced hypertension (PIH) were the most common medical conditions encountered. HIV infection accounted for 39 (14%) while PIH accounted for 27 (8.5%) (Table 4.13). Other medical conditions included urinary tract infection, asthma, cardiac condition and patients with preeclampsia who had developed haemolysis, elevated liver enzymes and thrombocytopenia (HELLP syndrome).

Table 4.13 Medical conditions in current pregnancy (n=114)

Medical conditions	Total (%) (n= 114)	High (%) (n=30)	Medium (%) (n=28)	Low (%) (n=55)
Asthma	11 (3.6%)	5 (6%)	1(1.2%)	5 (3.6%)
Psoriasis	1 (0.3%)	0 (0.0)	1(1.2%)	0 (0.0)
Cardiac	1 (0.3%)	0 (0.0)	0 (0.0)	1(0.7%)
PIH	27 (8.9%)	6 (7.2%)	8 (9.8%)	13 (9.4%)
PIH mild to moderate	24 (7.9%)	5 (6%)	7(8.5%)	12 (8.6%)
PIH severe	3 (1%)	1(1.2%)	1(1.2%)	1(0.7%)
HELLP Syndrome	1 (0.3%)	0 (0.0)	0 (0.0)	1(0.7%)
Upper respiratory infection	1 (0.3%)	0 (0.0)	0 (0.0)	1(0.7%)
Urinary tract infection	4 (1.3%)	1(1.2%)	1(1.2%)	2 (1.4%)
Hepatitis B	1 (0.3%)	0 (0.0)	0 (0.0)	1(0.7%)
HIV	39 (14.0)	12 (14.5%)	9 (11%)	18(12.9%)

4.3.5.3 Surgical complications in current pregnancy

Six women had some surgical complications during current pregnancy (Table 4.14). The impact of these surgical procedures was not explored in this study and could be done in future studies.

Table 4.14 Surgical complications in current pregnancy (n=6)

	Total (%) (n= 6)	**High (%)** (n=1)	**Medium (%)** (n=0)	**Low (%)** (n=5)
Bladder injury	1(0.3%)	0(0.0)	0(0.0)	1(0.7%)
Exploratory laparotomy	1(0.3%)	0(0.0)	0(0.0)	1(0.7%)
Colon surgery	1(0.3%)	0(0.0)	0(0.0)	1(0.7%)
Nephrectomy	1(0.3%)	0(0.0)	0(0.0)	1(0.7%)
Septic wound	1(0.3%)	0(0.0)	0(0.0)	1(0.7%)
Adhesion lysis	1(0.3%)	1(1.2%)	0(0.0)	0(0.0)

4.3.5.4 Gynaecological complications in current pregnancy

Five women had some gynaecological complications during current pregnancy (Table 4.15). These included endometriosis, fibroids, mastectomy and cervical incompetence. None of them belonged to the high medical aid level group.

Table 4.15 Gynaecological complications in current pregnancy

	Total (%) (n= 4)	High (%) (n=0)	Medium (%) (n=2)	Low (%) (n=2)
Endometriosis	1(0.3%)	0(0.0)	0(0.0)	1(0.7%)
Fibroids	1(0.3%)	0(0.0)	1(1.2%)	0(0.0)
Mastectomy	1(0.3%)	0(0.0)	0(0.0)	1(0.7%)
Cervical incompetence	1(0.3%)	0(0.0)	1(1.2%)	0(0.0)

4.3.5.5 Antepartum haemorrhage in current pregnancy

Forty-five women (14.8%) had antepartum haemorrhage (Table 4.16). They had either abruptio placentae 2 (0.7%) or placenta praevia 43 (14.1%). The majority 25 (18%) were in the low medical aid group.

Table 4.16 Antepartum haemorrhage in current pregnancy

	Total (%) (n=45)	**High (%)** (n=10)	**Medium (%)** (n=10)	**Low (%)** (n=25)
Abruptio placentae	2 (0.7%)	0 (0)	1 (1.2%)	1 (0.7%)
Placenta praevia	43 (14.1%)	10 (12%)	9 (11%)	24 (17.3%)
Total	45 (14.8%)	10 (12%)	10 (12.2%)	25 (18%)

However, the test (Chi-square test) showed no significant differences among the three groups (Analysis of Variance, p = 0.57).

4.3.6 Intrapartum

4.3.6.1 Mode of delivery

The majority 187 (61.6%) of the women who delivered during this period delivered by Caesarean section, while 100 (32.9%) delivered by normal vertex delivery. On the other hand, a small proportion delivered by breach 1 (0.3%) and forceps delivery 1 (0.3%). One pregnant woman who had an intrauterine foetal death had a historotomy done after failing to deliver the foetus vaginally despite induction.

Table 4.17 Mode of delivery

Mode of delivery	**Total (%)**	**High (%)**	**Medium (%)**	**Low (%)**
C/S	187 (61.6)	49 (59)	51 (62.2)	87 (62.6)
NVD	100 (32.9)	30 (36.1)	23 (28)	47 (33.8)
Breach	1 (0.3)	0 (0.0)	0 (0.0)	1 (0.7)
Forceps	1 (0.3)	0 (0.0)	1 (1.2)	0 (0.0)
Assisted NVD unspecified	1 (0.3)	0 (0.0)	1 (1.2)	0 (0.0)
Ventouse	14 (4.6)	4 (4.8)	6 (7.3)	4 (2.9)
Total	304 (100.0)	83 (100.0)	82 (100.0)	139 (100.0)

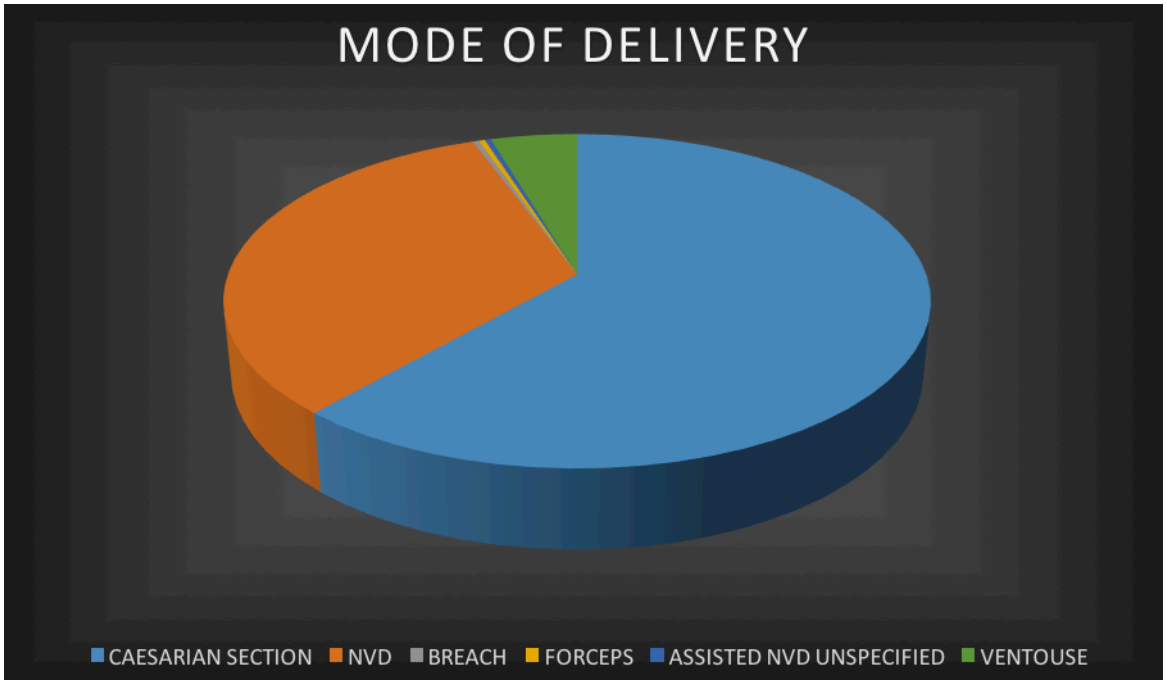

Figure 4.12 Mode of delivery

There are no significant differences among the three groups (Chi-square test, p = 0.46)

Maternal indication for caesarean sections

The most common indication of a caesarean section was having had a caesarean section before; accounting for 45 (28.1%). This was followed by the medical conditions such as HIV infection 29(18.1%), cephalopelvic disproportion (CPD) 21 (13.1%), poor progress 11 (6.8%), pregnancy induced hypertension (PIH) 15 (9.4%) and haemorrhage 7 (4.4%). The indications for caesarean section appear justified (Table 4.18). It is difficult to determine whether justified or not in those whose reason for having a caesarean section was having had a caesarean section before. This is because there were no reasons for previous caesarean sections given.

Table 4.18 Maternal indication for caesarean section

INDICATION FOR CS	Total	%	High	%	Medium	%	Low	%
Haemorrhage								
APH (Premature labour)	1	0,6	0	0	1	2,4	0	0
Abruptio	2	1,3	0	0	1	2,4	1	1,3
Placenta praevia	4	2,5	0	0	1	2,4	3	3,9
CPD								
CPD with poor progress	1	0,6	0	0	0	0	1	1,3
CPD	15	9,4	2	4,5	7	16,7	6	7,9
CPD and failed induction	1	0,6	0	0	1	2,4	1	1,3
CPD and previous c/s	1	0,6	0	0	0	0	1	1,3
CPD and failed induction	2	1,3	2	4,5	0	0	0	0
CPD and prolonged rupture of membranes	1	0,6	0	0	0	0	1	1,3
HIV								
HIV	26	16, 3	9	20,5	5	11,9	12	15,8
HIV and previous C/S	3	1,9	1	2,3	0	0	2	2,6
Failed induction								
Failed induction	7	4,4	3	6,8	0	0	4	5,3
Failed induction and poor progress	3	1,9	3	6,8	0	0	0	0
Failed induction and CPD	3	1,9	2	4,5	1	2,4	1	1,3
Failed induction and previous C/S	1	0,6	0	0	0	0	1	1,3
Medical condition								
Asthma HIV and previous C/S	1	0,6	0	0	0	0	1	1,3
PIH								
HELLP syndrome	1	0,6	0	0	0	0	1	1,3
PIH	10	6,3	3	6,8	3	7,1	4	5,3
PIH severe	3	1,9	1	2,3	1	2,4	1	1,3
Previous C/S & PIH	1	0,6	1	2,3	0	0	0	0
Preterm labour								
Preterm labour and APH	1	0,6	0	0	1	2,4	0	0
Preterm labour	2	1,3	0	0	0	0	2	2,6
Previous caesarean section								
Previous C/S asthma and HIV	1	0,6	0	0	0	0	1	1,3
Previous C/S and CPD	1	0,6	0	0	0	0	1	1,3
Previous C/S and placenta praevia	1	0,6	0	0	1	2,4	0	0
Previous C/S	38	23,	11	25	11	26,2	16	21,1

		8						
Previous C/S and PIH	1	0,6	1	2,3	0	0	0	0
Previous C/S failed induction	1	0,6	0	0	0	0	1	1,3
Previous C/S and HIV	1	0,6	0	0	0	0	1	1,3
Previous C/S x 2	1	0,6	0	0	0	0	1	1,3
Poor progress								
Poor progress and CPD	1	0,6	0	0	0	0	1	1,3
No progress	1	0,6	0	0	0	0	1	1,3
Poor progress	3	1,9	1	2,3	0	0	2	2,6
Poor progress and failed induction	3	1,9	3	6,8	0	0	0	0
Prolonged labour, foetal distress	1	0,6	0	0	1	2,4	0	0
Slow progress	2	1,3	0	0	0	0	2	2,6
Other								
Other/unspecified	7	4,4	0	0	3	7,1	4	5,3
Placenta insufficiency	1	0,6	0	0	1	2,4	0	0
Foetal distress and prolonged labour	1	0,6	0	0	1	2,4	0	0
Shrodika suture	1	0,6	0	0	1	2,4	0	0
Sterilisation	1	0,6	1	2,3	0	0	0	0
PROM and HIV	1	0,6	0	0	1	2,4	0	0
Chorioamnionitis	1	0,6	0	0	0	0	1	1,3
PROM and CPD	1	0,6	0	0	0	0	1	1,3
Total	160	100	44	100	42	100	76	100

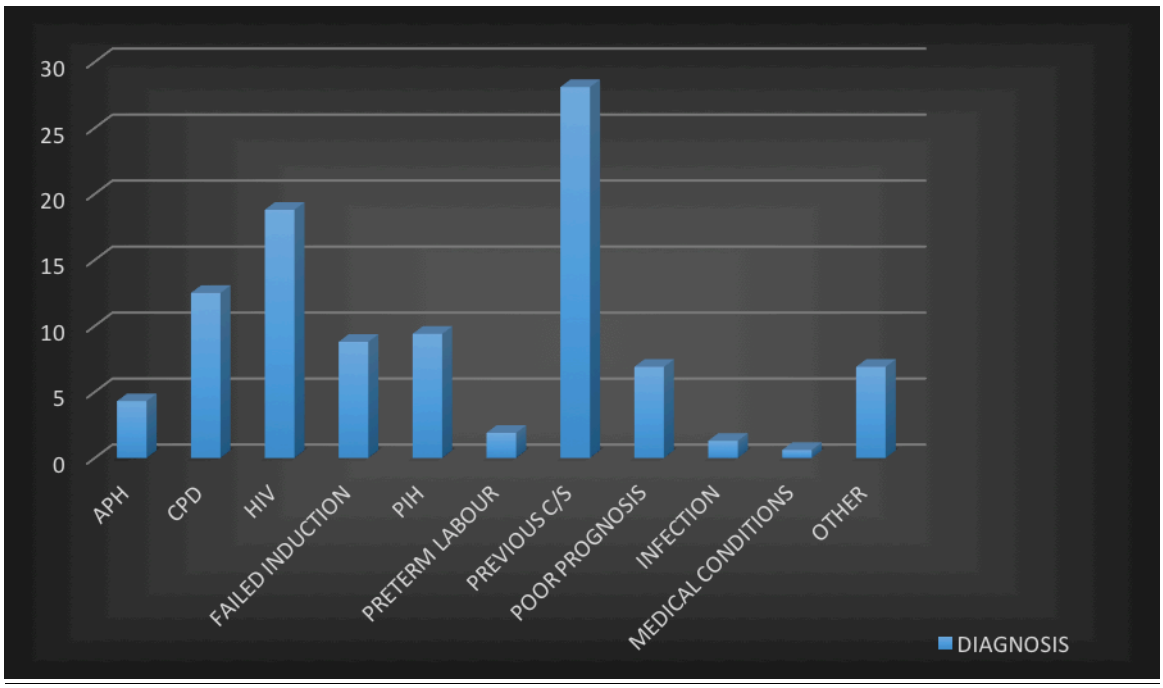

Figure 4.13 Maternal indications for caesarean section

Foetal indication for caesarean section

The most common indication for caesarean section was foetal distress, in 20 (41.7%) of the women who had a caesarean section due to a foetal indication. Breach presentation was the reason for just over a fifth 10 (20.8%) of the caesarean sections. Foetal distress was the most frequent foetal indication for caesarean section accounting for 20 (41.7%), twin pregnancy was a reason for caesarean section in 5 (12%) of the women who delivered by caesarean section (Table 4.19).

Table 4.19 Foetal indication for caesarean section

Foetal reason C/S	Total (%)	High (%)	Medium (%)	Low (%)
Breech	10 (20.8)	1 (8.3)	4 (30.8)	5 (21.7)
Cord round neck	1 (2.1)	1 (8.3)	0 (0.0)	0 (0.0)
Face	2 (4.2)	0 (0.0)	0 (0.0)	2 (0.0)
Foetal distress	20 (41.7)	4 (33.3)	4 (30.8)	12 (52.2)
IUD	1 (2.1)	1 (8.3)	0 (0.0)	0 (0.0)
Malpresentation	1 (2.1)	0 (0.0)	0 (0.0)	1 (4.3)
Meconium	2 (4.2)	1 (8.3)	1 (7.8)	0 (0.0)
Oblique lie	4 (8.3)	2 (16.7)	0 (0.0)	2 (8.7)
Twin	5 (10.4)	1 (8.3)	3 (23.1)	1 (4.3)
Ventouse	2 (4.2)	1 (8.3)	1 (7.8)	0 (0.0)
Total	48 (100.0)	12 (100.0)	13 (100.0)	23 (100.0)

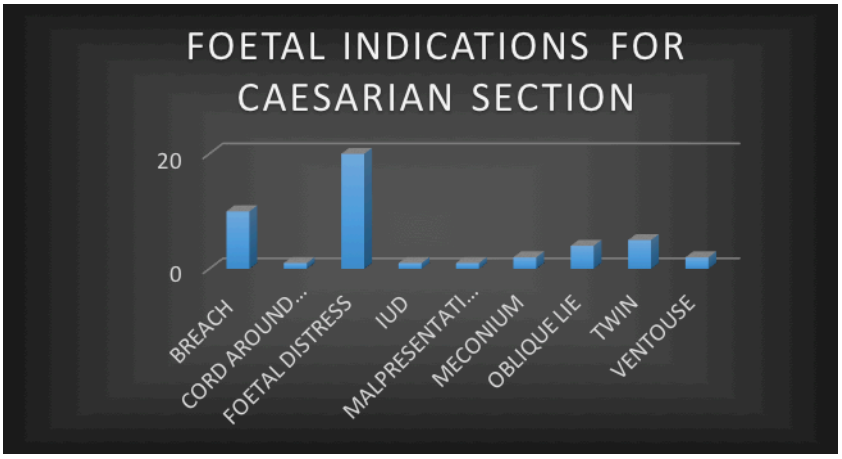

Figure 4.14 Foetal indications for caesarean section

Eighteen of the women had undergone sterilisation. Six of them were from high medical aid plans; four from medium medical aid plans and remaining eight were from low medical aid plans.

4.3.6.2 Intrapartum complications

Complications diagnosed during Intrapartum period were; chorioamnionitis, delayed second stage, hypotension in patients having caesarean section, Intrapartum haemorrhage and preterm labour (Figure 4.15). The conditions were stratified by medical aid level (Table 4.20). The most common intrapartum complications were preterm labour 9 (26.4%), prolonged rupture of membranes 9 (26.4%) and slow progress of labour 8 (23.5%).

Table 4.20 Intrapartum conditions

	Total (%)	High (%)	Medium (%)	Low (%)
Chorioamnionitis	1 (2.9)	0 (0.0)	0 (0.0)	1 (5.6)
Delayed second stage	1 (2.9)	0 (0.0)	0 (0.0)	1 (5.6)
Hypotension	4 (11.8)	1 (16.7)	1 (9.1)	2 (11.1)
Failed ventouse	1 (2.9)	0 (0.0)	1 (9.1)	0 (0.0)
Intrapartum haemorrhage	1 (2.9)	0 (0.0)	0 (0.0)	1 (5.6)
Postdates	1 (2.9)	0 (0.0)	0 (0.0)	1 (5.6)
Preterm labour	9 (26.4)	2 (33.3)	4 (36.4)	3 (16.7)
Prolonged rupture of membranes	9 (26.4)	2 (33.3)	4 (36.4)	3 (16.7)
Slow progress	8 (23.5)	1 (16.7)	1 (9.1)	6 (33.3)
Total	35 (100.0)	6 (100.0)	11 (100.0)	18 (100.0)

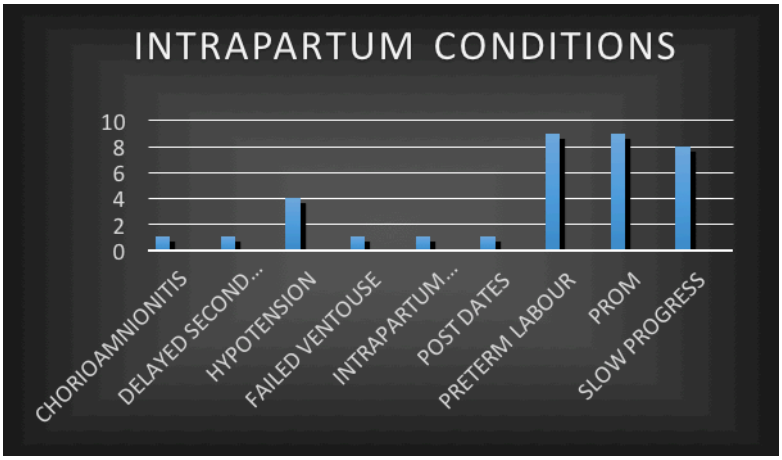

Figure 4.15 Intrapartum conditions

There are no significant differences among the three groups (Chi-square test, p = 0.76) for Intrapartum conditions per medical aid.

4.3.6.3 Foetal presentations

In the majority of the women, foetal presentation was vertex with just under 10% accounted for by abnormal presentation. Of all the births, two babies were born on the premises but before arrival into the ward.

Table 4.21 Presentations

Presentations	**Total (%)** (n= 304)	**High (%)** (n=83)	**Medium (%)** (n=82)	**Low (%)** (n=139)
Vertex	276 (90.8%)	79 (95.2%)	73 (89%)	124 (89.2%)
Other presentations	28 (9.2%)	4 (4.8%)	9 (11%)	15 (10.8%)
Breach	12 (42.9)	0 (0.0)	4 (44.4)	8 (6.7)
Face	2 (7.1)	0 (0.0)	0 (0.0)	2 (13.3)
Oblique	5 (17.9)	2 (50.0)	1 (11.1)	2 (13.1)
Twin	6 (21.4)	2 (50.0)	3 (33.3)	1 (6.7)
Malpresentation	1 (3.6)	0 (0.0)	0 (0.0)	1 (6.7)
BBA	2 (7.1)	0 (0.0)	1 (11.1)	1 (6.7)
TOTAL	304 (100%)	83 (100%)	82 (100%)	139 (100%)

There are no significant differences among the three groups in terms of foetal presentations (Chi-square test, p = 0.31).

4.3.6.4 Intrapartum foetal complications

Foetal distress is the most common foetal complication 12 (36.4 %) during the Intrapartum period. (Table 4.22). Cord around the neck was the next most common accounting for 11 (33.3%). Other foetal complications encountered were decreased foetal movements, intrauterine growth retardation (IUGR), large for gestational age (LGA) and prematurity (preterm).

Table 4.22 Intrapartum foetal complications

1.1.1.3 Intrapartum conditions	Total (%)	High (%)	Medium (%)	Low (%)
Blood stained liquor	1 (3.0)	0 (0)	0 (0.0)	1(8.3)
Cord around neck	11 (33.3)	5 (45.5)	3 (30.0)	3 (25.0)
Decreased foetal movements	1 (3.0)	0 (0.0)	0 (0.0)	1 (8.3)
Foetal distress	12 (36.4)	2 (18.2)	5(50.0)	5 (41.7)
IUGR	1 (3.0)	1 (9.1)	0 (0.0)	0 (0.0)
LGA	2 (6.1)	2 (18.2)	0 (0.0)	0(0.0)
MSL	1 (3.0)	0 (0.0)	0 (0.0)	1 (8.3)
Oligohydramnios	1 (3.0)	0 (0.0)	1 (10.0)	0 (0.0)
Placenta insufficiency	1 (3.0)	0 (0.0)	1(10.0)	0 (0.0)
Postdate	1 (3.0)	1 (9.1)	0 (0.0)	0 (0.0)
Preterm	1 (3.0)	0 (0.0)	0 (0.0)	1(8.3)
Total	33 (100.0)	11 (100.0)	10 (100.0)	12 (100.0)

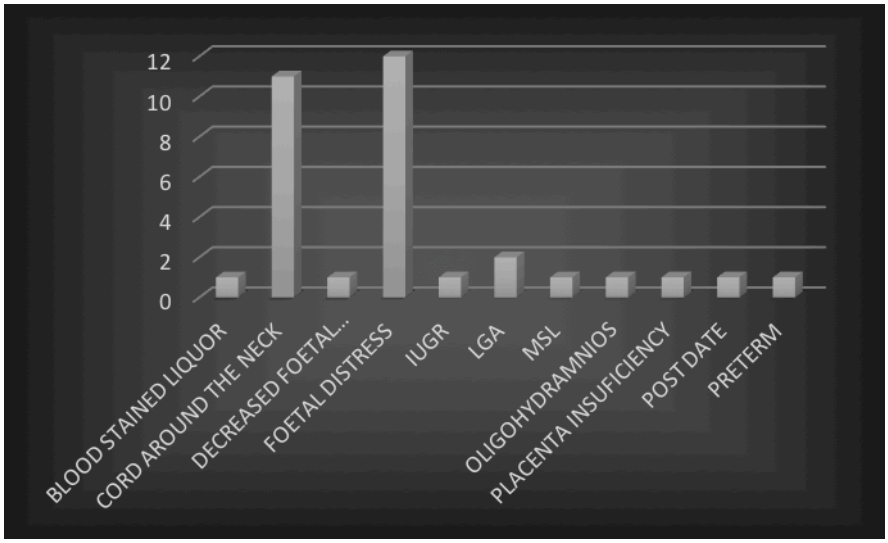

Figure 4.16 Foetal intrapartum conditions

4.3.7 Postpartum

4.3.7.1 Postpartum maternal conditions

Postpartum haemorrhage is the most common postpartum complication found in this study. Following delivery, postpartum haemorrhage 20 (95.2%) and retained placenta 1 (4.8%) were detected in 21 women. Wound sepsis occurred in 2 (0.7%) of the whole sample of pregnant women (Table 4.23).

Table 4.23 Postpartum maternal conditions

Postpartum maternal conditions	Total (%)	High (%)	Medium (%)	Low (%)
1.1.1.4 Postpartum Haemorrhage	20 (95.2)	1(50.0)	7 (100.0)	12 (100.0)
Retained placenta	1(4.80)	1(50.0)	0 (0.0)	0 (0.0)
Total	21(100.0)	2(100.0)	7(100.0)	12 (100.0)

The high medical aid group suffered much less haemorrhage compared to the middle - and low-income groups. There are significant differences among the three groups (Chi-square test, p <0.001); the patients in the high medical group had significantly less postpartum complications than the medium and low medical groups. It is postulated that this may be a spurious finding or more ominously could be due to those in the higher medical aid group having better access to care. This needs to be tested in a bigger study.

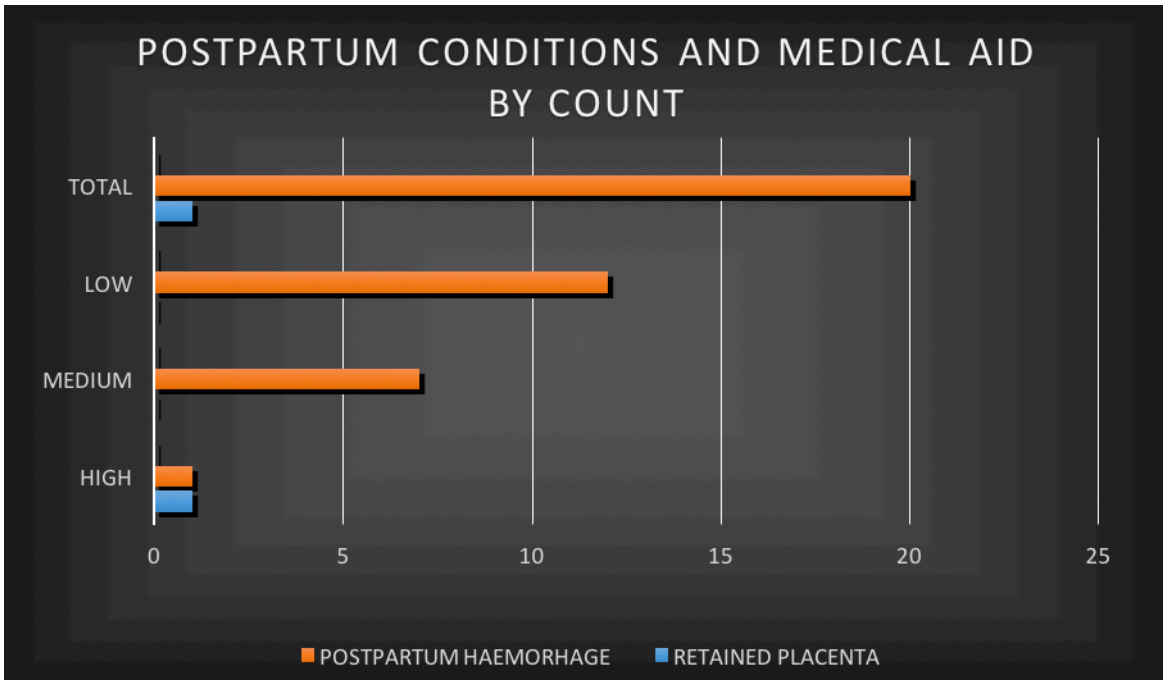

Figure 4.17 Postpartum conditions by medical aid count

4.4 New-born Profile

4.4.1 Birth weight

The minimum birth weight of babies born during the study period was a premature baby weighing 500g (0.5kg), while the biggest baby born was an infant of a diabetic mother who was large for gestational age and weighed 6 570g (6.57kg). There was a normal distribution to the weights (Table 4.24).

Table 4.24 Birth weight

Birth weight	Total	High	Medium	Low
Median	3020	2940	2960	3080
IQR	2 720-3 342	2 730-3 350	2 635-3 250	2 727-3 440
Minimum	500	500	1100	580
Maximum	6 570	4 400	4 410	6 570

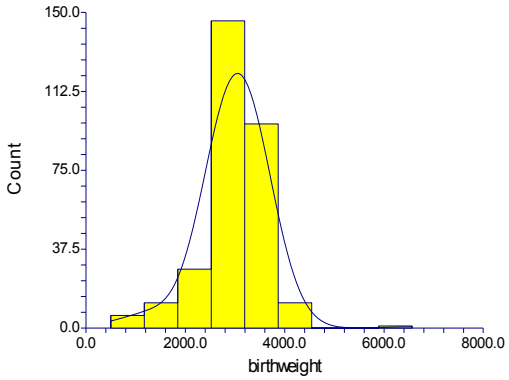

Figure 4.18 Birth weight (n=317)

There are no significant differences among the three groups (Analysis of Variance, p = 0.15) although the median range of the lower MA group is higher than both the other groups.

4.4.2 Birth length

Birth length had an interquartile range of 49 to 52cm. The shortest baby was 34cm while the tallest baby was 57cm. Median length was 50cm (Table 4.25).

Table 4.25 Birth length

Birth length	Total	High	Medium	Low
Median	50	50	49	50
IQR	49-52	49-52	48-51	49-52
Minimum	34	36	34	37
Maximum	57	56	55	57

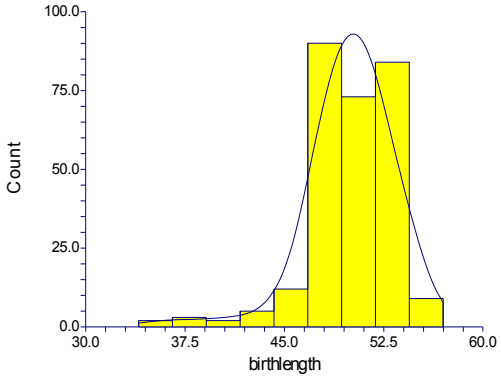

Figure 4.19 Birth length

There are no significant differences among the three groups (Analysis of Variance, p = 0.16)

4.4.3 Head circumference

Head circumference had an interquartile range of 34cm to 36cm. The minimum head circumference was on a premature baby. The baby with the smallest head measured 28cm while the baby with the largest head measured 38cm.

Table 4.26 Head circumference

Head circumference	Total	High	Medium	Low
Median	35	35	34	35
IQR	34-36	34-36	33-36	34-36
Minimum	28	30	28	28
Maximum	38	38	38	38

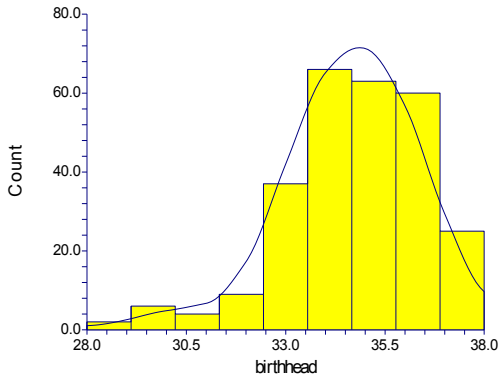

Figure 4.20 Birth head circumference

There are no significant differences among the three groups (Analysis of Variance, p = 0.23).

4.4.4 Apgar scores

Apgar score 1 min

The babies born to mothers during this period had good Apgar scores with a median value of nine and interquartile range of 8 - 9. Minimum Apgar score was 4 / 10 with skewing of the graph to the right in favour of high Apgar scores (Figure 4.21). The Apgar scores ranged between a minimum of four and a maximum of 10.

Table 4.27 Apgar score 1 min

Apgar score 1 min	Total	High	Medium	Low
Median	9	9	9	9
IQR	8-9	8-9	8-9	8-9
Minimum	0	0	4	0
Maximum	10	10	10	10

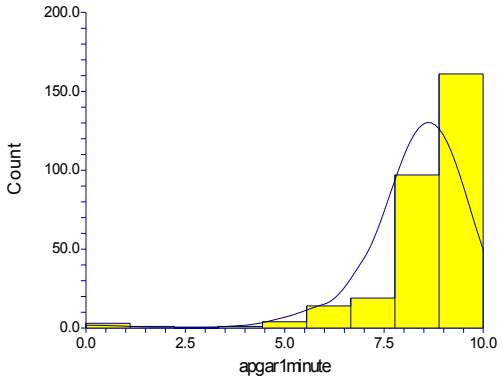

Figure 4.21 Apgar score at 1 min

There are no significant differences among the three groups (Analysis of Variance, p = 0.40).

Apgar score 5 min

The interquartile range for Apgar scores at 5 minutes was 9 - 10 (Table 4.28). Apgar score at 5 minutes was statistically and significantly higher than at 1 minute ($p < 0.0001$) using the Mann Whitney's U test. The data was skewed to the right indicating higher apgar score (Figure 4.22), but there are no differences among the groups high, medium and low medical aid levels.

Table 4.28 Apgar score 5 minutes

	Total	High	Medium	Low
Median	10	9	9	9
IQR	9-10	9-9	9-10	9-10
Minimum	0	0	5	0
Maximum	10	10	10	10

There are no significant differences among the three groups (Analysis of Variance, p = 0.21).

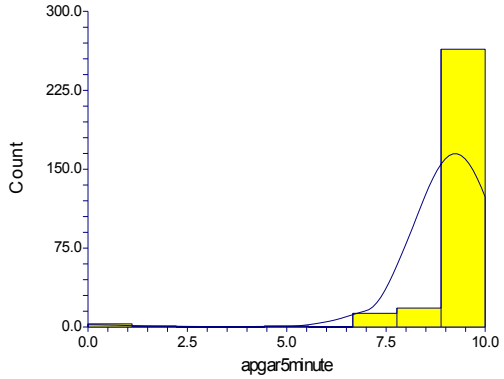

Figure 4.22 Apgar score at 5 min

Birth asphyxia

Birth asphyxia incidence was 16 (5.7%). The severity of asphyxia was sometimes classified as mild otherwise largely ungraded birth asphyxia. There are no significant differences among the three groups (Chi-square test, p = 0.46)

Table 4.29 Birth asphyxia

Diagnosis of birth asphyxia	Total (%)	High (%)	Medium (%)	Low (%)
No	271 (94.4)	71 (92.2)	74 (93.7)	126 (96.2)
Mild	1 (0.3)	0 (0.0)	0 (0.0)	1 (0.8)
Yes	15 (5.2)	6 (7.8)	5 (6.3)	4 (3.1)
Total	287 (100.0)	77(100.0)	79 (100.0)	131 (100.0)

4.4.5 Foetal outcome

The majority, 299 (98.1%) of the babies born to mothers who gave birth during the study period were born alive (figure 4.23). Neonatal mortality ratio was 10 per 1 000 live births. Other outcomes were intauterine death (IUD), early neonatal death (ENND) and stillbirth (Table 4.3).

Table 4.30 Foetal outcome

Foetal outcome	Total (%)	High (%)	Medium (%)	Low (%)
Alive	299 (97)	80 (96.4)	81 (98.8)	138 (99.3)
IUD	3 (1)	1 (1.2)	0 (0.0)	0 (0.0)
ENND	3 (1)	1 (1.2)	1 (1.2)	0 (0.0)
Stillbirth	3 (1)	1 (1.2)	0 (0.0)	1 (0.0)
Total	308 (100.0)	83	82 (100.0)	139 (100.0)

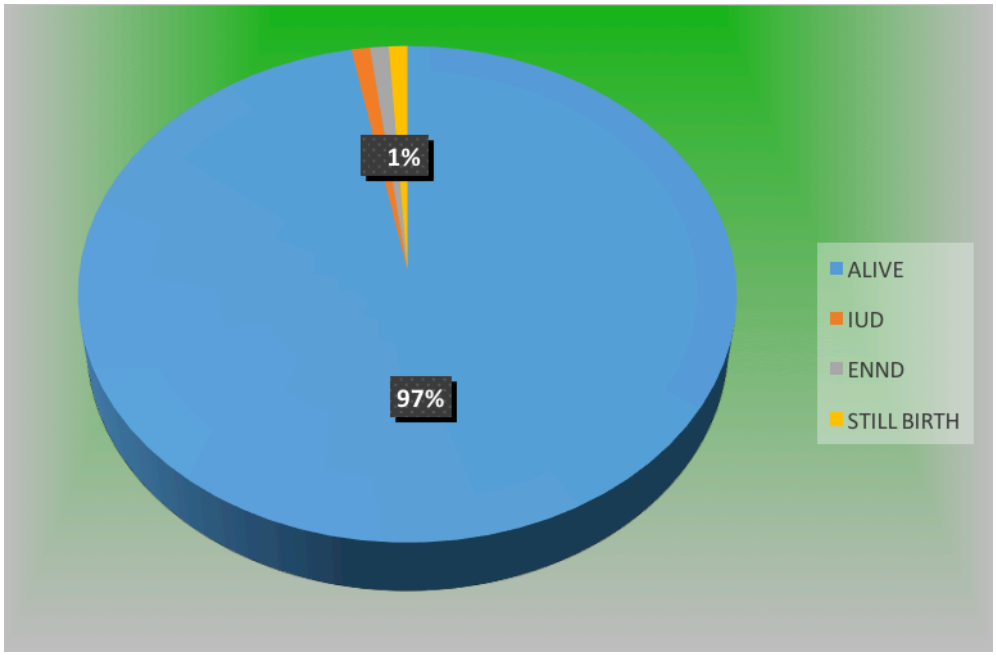

Figure 4.23 Foetal outcome

There are no significant differences among the three groups (Chi-square test, p = 0.50).

4.4.6 Foetal / neonatal complications

The most common diagnosis among neonates was prematurity, which accounted for 30.6% of neonatal conditions. This was followed by neonates who suffered from respiratory distress syndrome at 16% of the conditions. 4.4% of the neonates had suffered asphyxia while just under 3% had been exposed to HIV infection.

Table 4.31 Foetal and neonatal complications

	Total	(%)	High	(%)	Medium	(%)	Low	(%)
Asphyxia								
Asphyxia	7	4,1	3	5,9	4	9,1	0	0,0
Congenital anomaly								
Albinism	1	0,6	0	0,0	0	0,0	1	1,3
Contracture elbow	1	0,6	1	2,0	0	0,0	0	0,0
Disproportionate upper limbs	1	0,6	1	2,0	0	0,0	0	0,0
Extra digit left hand	1	0,6	0	0,0	0	0,0	1	1,3
Extra digits bilaterally	1	0,6	1	2,0	0	0,0	0	0,0
Left hand hyper contracture	1	0,6	1	2,0	0	0,0	0	0,0
Right knee genu recuvatum	1	0,6	0	0,0	0	0,0	1	1,3
Congenital cardiac anomaly								
Coarctation of the aorta	1	0,6	0	0,0	0	0,0	1	1,3
Murmur	2	1,2	1	2,0	0	0,0	1	1,3
Patent ductus arteriosus	1	0,6	0	0,0	0	0,0	1	1,3
Cord around the neck								
Cord around the neck	22	12,9	7	13,7	6	13,6	9	12,0
Intrauterine death								
Foetal death	1	0,6	0	0,0	0	0,0	1	1,3
Intrauterine death	2	1,2	2	3,9	0	0,0	0	0,0
Death								
Neonatal death	2	1,2	1	2,0	0	0,0	0	0,0
Early neonatal death	1	0,6	1	2,0	0	0,0	0	0,0
Stillbirth								
Stillbirth	2	1,2	1	2,0	0	0,0	1	1,3
Macerated stillbirth	1	0,6	1	2,0	0	0,0	0	0,0

Gastrointestinal disorders								
Feeding difficulty	1	0,6	0	0,0	0	0,0	1	1,3
Gastroesophageal reflux	1	0,6	1	2,0	0	0,0	0	0,0
Feed intolerance	4	2,3	2	3,9	0	0,0	2	2,7
HIV exposure								
HIV exposure	6	3,5	3	5,9	1	2,3	2	2,7
Hypoglycaemia								
Hypoglycaemia	7	4,1	0	0,0	2	4,5	5	6,7
MSL								
MSL	2	1,2	0	0,0	0	0,0	2	2,7
Neonatal jaundice								
Neonatal jaundice	3	1,8	2	3,9	0	0,0	1	1,3
Other								
Anaemia	1	0,6	0	0,0	0	0,0	1	1,3
BBA	2	1,2	0	0,0	1	2,3	1	1,3
Breach	1	0,6	1	2,0	0	0,0	0	0,0
Cephalic haematoma	1	0,6	1	2,0	0	0,0	0	0,0
Metabolic acidosis	1	0,6	0	0,0	0	0,0	1	1,3
Postdates	1	0,6	1	2,0	0	0,0	0	0,0
Rhesus incompatibility	1	0,6	1	2,0	0	0,0	0	0,0
Thrombocytopenia	1	0,6	0	0,0	0	0,0	1	1,3
Slow to suck	1	0,6	0	0,0	0	0,0	1	1,3
Tachycardia	1	0,6	0	0,0	0	0,0	1	1,3
Hyponatraemia	1	0,6	0	0,0	0	0,0	1	1,3
Nappy dermatitis	1	0,6	0	0,0	1	2,3	0	0,0
Renal failure	1	0,6	0	0,0	0	0,0	1	1,3
Premature twins	2	1,2	0	0,0	0	0,0	2	2,7
Twins	2	1,2	0	0,0	0	0,0	2	2,7
Prematurity								
Elbw	2	1,2	1	2,0	0	0,0	1	1,3
Vlbw	1	0,6	1	2,0	0	0,0	0	0,0
Lbw	3	1,8	0	0,0	3	6,8	0	0,0
Prematurity	5	2,9	1	2,0	0	0,0	4	5,3
Prematurity	38	22,2	10	19,6	14	31,8	14	18,7
Respiratory disorders								
Secondary apnoea	1	0,6	1	2,0	0	0,0	0	0,0
Congenital pneumonia	2	1,2	1	2,0	0	0,0	1	1,3
Hyaline membrane disease	3	1,8	0	0,0	1	2,3	2	2,7
Respiratory distress unspecified	7	4,1	1	2,0	4	9,1	2	2,7

Respiratory acidosis	1	0,6	0	0,0	1	2,3	0	0,0
Meconium aspiration	2	1,2	0	0,0	1	2,3	1	1,3
Sepsis/ Infections								
Conjunctivitis	7	4,1	0	0,0	3	6,8	4	5,3
Sepsis	2	1,2	0	0,0	0	0,0	2	2,7
Enterococcus faecalis sepsis	1	0,6	0	0,0	0	0,0	1	1,3
Thermoregulatory abnormality								
Hypothermia	4	2,3	2	3,9	1	2,3	1	1,3
Temperature instability	1	0,6	0	0,0	1	2,3	0	0,0
Total	171	100,0	51	100,0	44	100,0	75	100,0

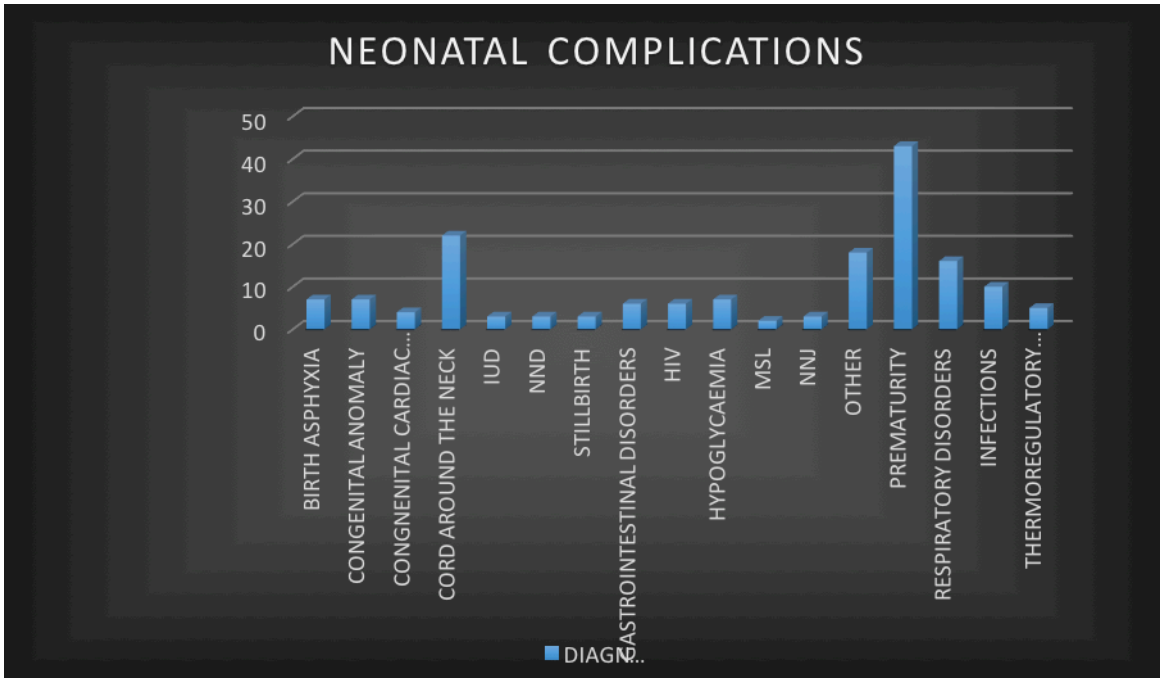

Figure 4.24 Neonatal complications

Respiratory distress syndrome

Respiratory distress was one of the main diagnoses in the neonates who were unwell at birth. The prevalence of RDS was 21 (7%). There are no significant differences among the three groups (Chi-square test, p = 0.3).

Table 4.32 Respiratory distress syndrome

RDS	Total	High	Medium	Low
Yes	21 (95.5)	0 (0.0)	7 (100.0)	8 (88.8)
No	1 (4.5)	6 (100.0)	0 (0.0)	1 (11.1)
Total	22 (100.0)	6 (100.0)	7 (100.0)	9 (100.0)

Premature birth

The proportion of premature births was 12.4%. The majority of the babies were born at term (Figure 4.25)

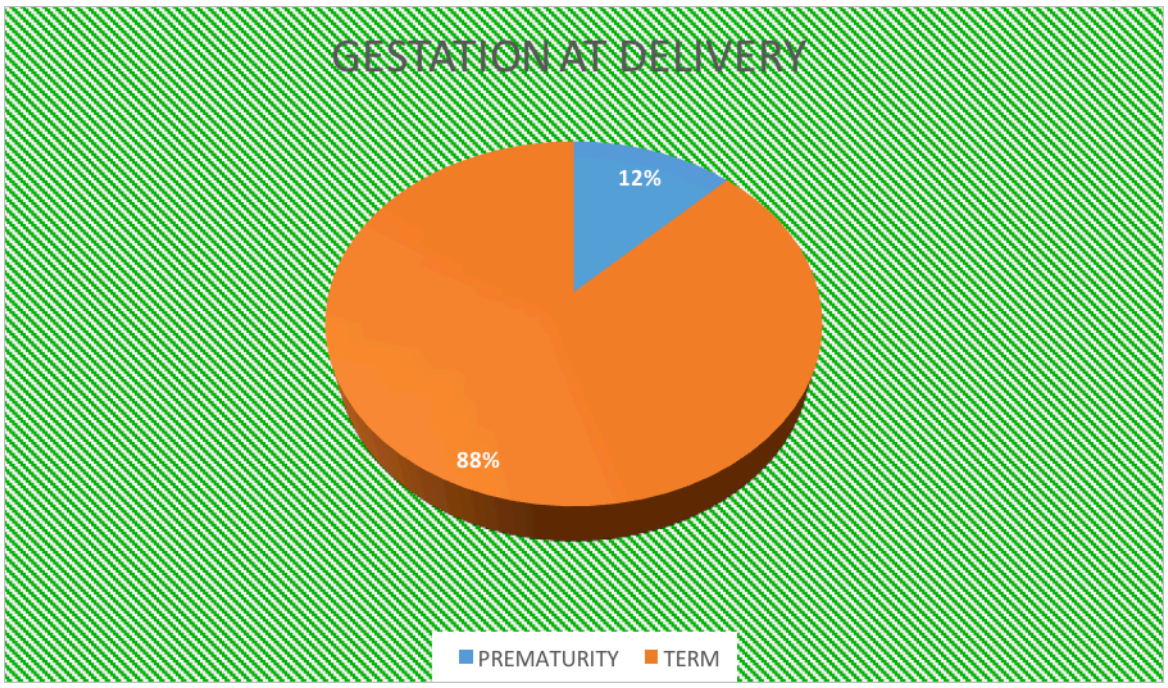

Figure 4.25 Gestational age at delivery

Hypothermia

Most babies had normal temperature but 19 (6.6%) were hypothermic (Table 4.33). There are no significant differences among the three groups (Chi-square test, p = 0.23).

Table 4.33 Temperature control

Temperature	Total	High	Medium	Low
Hypothermic	19 (6.6)	5 (6.5)	8 (10.5)	6 (4.5)
Norm thermic	268 (93.4)	72 (93.5)	68 (89.5)	128 (95.5)
Total	287 (100.0)	77 (100.0)	76 (100.0)	134 (100.0)

Hypoglycaemia

Hypoglycaemia and hyperglycaemia were encountered in neonates who were either admitted to NICU or who were being monitored in the maternity nursery unit. The majority 260 (90.6%) had normal glucose levels while 25 (8.7%) had hypoglycaemic episodes.

Table 4.34 Glucose

Glucose level	Total (%)	High (%)	Medium (%)	Low (%)
Normoglycaemia	260 (90.9)	73 (96.1)	67(87.0)	120 (90.2)
1.1.1.5 Hyperglycaemia	1 (0.3)	1 (1.3)	0 (0.0)	0 (0.0)
Hypoglycaemia	25 (8.7)	2 (2.6)	10 (13.0)	13 (9.8)
Total	286(100.0)	76 (100.0)	77 (100.0)	133 (100.0)

There are no significant differences among the three groups (Chi-square test, p = 0.08).

Sepsis

Neonatal sepsis was diagnosed in 3.4% of the neonates and the majority (96.6%) did not have sepsis.

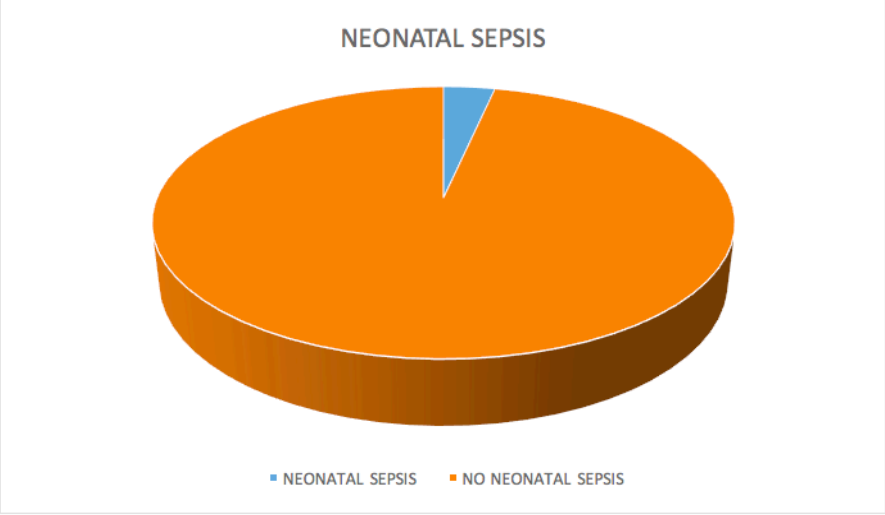

Figure 4.26 Presence of sepsis

There are no significant differences among the three groups (Chi-square test, p = 0.91).

4.4.7 Immunisation

The majority, 269 (93.1%), of the babies born during the study period were immunised before discharged home. There are no significant differences among the three groups (Chi-square test, p = 0.71)

Table 4.35 Immunisation

Immunisation	Total (%)	High (%)	Medium (%)	Low (%)
Yes	269 (93.1)	73 (93.6)	72 (94.7)	124 (91.9)
No	20 (6.9)	5 (6.4)	4 (5.3)	11 (8.1)
Total	289 (100.0)	78 (100.0)	76 (100.0)	135 (100.0)

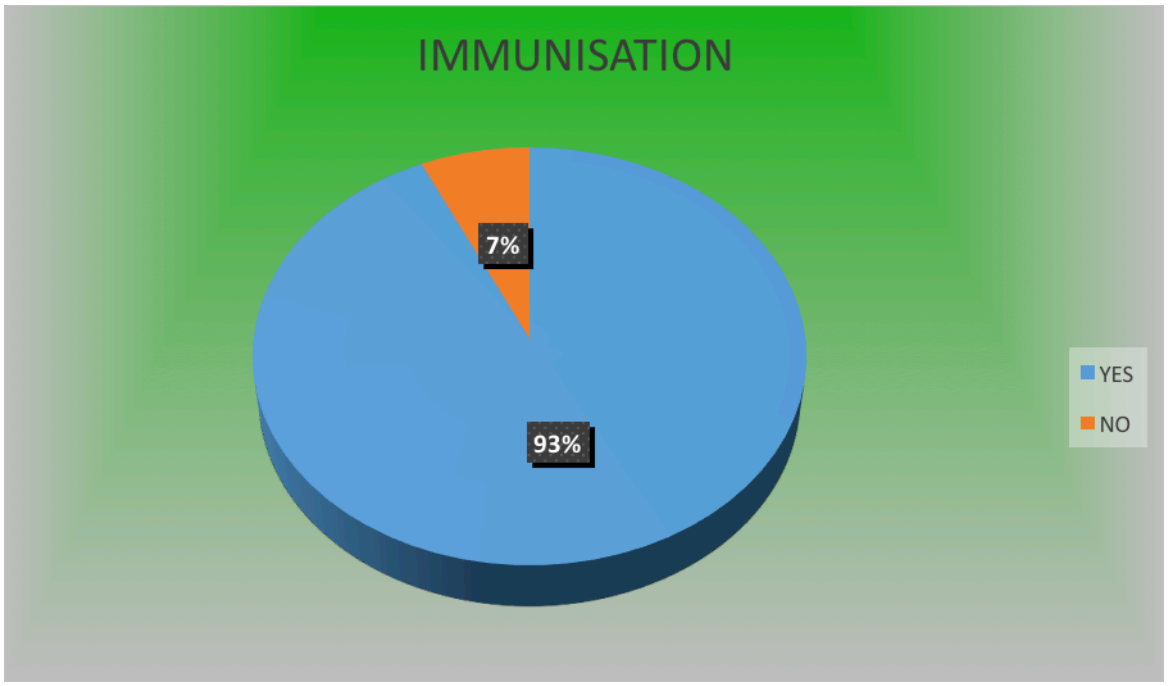

Figure 4.27 Immunisation

CHAPTER 5
DISCUSSION

In this chapter, the results obtained from the analysis of the data were discussed and compared with those from other published and unpublished studies.

5.1 Introduction

In this study, medical aid level was used as a proxy for socio-economic status. It is known that SES affects health through social determinants of health, but it is also known that there are confounding factors such as behaviour, for example smoking, which has deleterious effects on health of a pregnant woman and her unborn child.[27]

Maternal and foetal / neonatal health outcomes are impacted on by multi sectorial factors. These include government policies and actions, health system, other sectors, household and community factors. [31] Women in poor SES, possibly due to economic dependency, may make poor reproductive choices while cultural norms, beliefs about risks during pregnancy and birth also influence health-seeking behaviour. [31] The private sector in South Africa and women seeking care thereof are not exempt from these influences. In this study, the medical aid plan type (high, medium and low) was used as a proxy for SES and the above factors remain relevant to the results in this study.

The medical aid classification into high, medium and low was arbitrary and not determined during this study. The classification was recorded as supplied by medical schemes to their clients. The medical schemes have their own classifications of level of medical aid plan based on benefits and contributions. [16] In this facility, the majority of the study sample patients were on the low level medical aid plans regardless of medical aid scheme and this funded antenatal care, perinatal care and post-natal care. In the event of premature delivery, funded admission and treatment in NICU of the premature infant. It is known that NICU treatment costs can escalate the cost surrounding the birth of a sick infant. [15] Since they are in the majority, this

shows the sustainability of private healthcare, even in the face of low-level medical aid plan.

There are confounding factors in addition to the level of income that influence the outcome of a pregnancy and course of events after the baby is born. The place of residence was not found to be correlated with either outcome or funding plan level this is in contrast to literature, [32] which links pregnancy outcome to place of residence.

5.2 Maternal Outcome

Women of high medical aid type suffered less complications of postpartum haemorrhage than the medium and low-level types. There were no maternal deaths encountered in this study putting the maternal mortality rate for the institution for those three months at 0 per 100 000 live births. This is much lower than the maternal mortality rate for South Africa, which as of 2013 was 140 per 100 000. The general country MMR had been falling in the past decade but not by enough to reach the Millennium Development Goals 2015. [9]

The study also found a relatively high caesarean section rate (62%), which was higher than that reported in the public sector. [18] This may be due to various reasons including some suggested above. HIV, CPD, failed induction; poor progress and PIH were found to be the common maternal indications for caesarean section. HIV positive results were found in 14% of the subjects and this is much less than the reported country level of 30%. [18] On the other hand, the main foetal indications for caesarean section were foetal distress, breach and cord around the neck.

Maternal complications encountered in this study were pregnancy related; such as IUD, antenatal haemorrhage, postpartum haemorrhage, retained placenta and pregnancy-induced hypertension. Factors that can have an impact on pregnancy outcomes that were encountered included medical conditions such as asthma, gynaecological conditions such as endometriosis and past surgical conditions such as laparotomy for nephrectomy. Any of these conditions could result in the so called

near-miss events that informs us of maternal morbidity and can be used in situations such as this study where maternal mortality is low [33] or non-existent.

Postpartum haemorrhage and retained placenta were the main finding in postpartum complications in keeping with literature. In addition, in this study the frequency of postpartum complications was found to be different in the high, medium and low medical aid plan groups. There were significant differences among the three groups (Chi-square test, $p < 0.001$); the patients in the high medical group had significantly less postpartum complications than the medium and low medical groups. This is an important finding because postpartum haemorrhage contributed to 25% of South African maternal morbidity and mortality from data released in 2013. [9]

However, the reasons for the differences are not so clear-cut. In South Africa, the Saving Mothers programme, through confidential enquiries into maternal deaths have analysed patient, community and institution factors a process which over the times, has resulted in a reduction in the maternal mortality.[33] While institutions have mortality meetings, and these are varied as there are institutions. There are no such studies or all-encompassing enquiries in the private sector to enable pinpointing whether the findings in this study can be attributed to individual, community or facility (care). At this point, confounding factors such as socio-demographic characteristics have to be considered.

5.3 Neonatal Outcome

Globally, neonatal mortality rate (2012) was 41 per 1000 live births. [31] The NMR in South Africa (2014) was 20.4 per 1 000 live births. [9] In Africa, neonatal conditions are responsible for 30% of U5MR, with prematurity and birth asphyxia being in the top five. [34] Death due to prematurity in South Africa contributes up to 45% of cause specific early neonatal mortality in infants bigger than 500 grams. [21]

The findings in this study included a low NMR (10 per 1 000 live births). All three deaths were of premature infants at the extremes of viability, including the one who was 22 weeks gestation and two of them weighed less than 600 grams.

This is better than the Global figure of 41 per 1 000 births. Further, it's also less than the South African figure of 14 per 1 000 births. [34] The facility and the country's neonatal mortality rates are both worse than the developed countries neonatal mortality rate, which as of 2009 was 3.6 per 1 000. [21] However, they are better than most Southern African countries' rates. This shows that even though the majority was on low-level medical aids the majority still had good outcome in terms of neonatal survival. This is in contrast to literature, which suggests a link between poor socio-economic status and pregnancy outcomes including neonatal mortality. [35]

On the other hand, it might also suggest that the so-called low medical plans still afford patients quality care and good outcome is still possible as was seen in this study. Therefore, the low medical aid plan holders are not mirroring the public sector outcomes except with the haemorrhage postpartum as mentioned above and it is probably erroneous to group them with the poor socio-economic status group.

The NMR obtained in this case correlates with the Apgar scores that showed a statistically significant increase from one minute to five minutes. The Apgar score is a measure of how much or if a baby would require resuscitation at birth, including how well the baby is responding to neonatal resuscitation measures. [36] The majority of the babies in this study were delivered by caesarean section. Research has shown that availability of skilled health workers at the birth improves MNCH outcomes. [37] This might influence this neonatal outcome. In the facility, all caesarean sections whether emergency or elective are attended by a paediatrician and a midwife, both of whom are skilled in neonatal resuscitation.

Nevertheless, miscarriage rate was 1% (10 per 1 000 live births) at the institution. Of the three stillbirths encountered, one was macerated. In South Africa, the country stillbirth rate is 20 per 1 000, [9] the institution figure is half of the country figure. This may be due to the heightened state of responsiveness of the obstetricians and midwives. This is plausible when it is considered that private healthcare is operating at a certain level of competitiveness among practitioners and as well as facilities as proved by numerous maternity service advertisements online. See below further discussion on maternal outcomes.

Studies have shown that a patient's anxiety before seeing a doctor can influence their choice of practitioner. [38] Therefore, a poor outcome may influence the future choice of facility or indeed practitioner by the pregnant mother. Dutch policy makers as far back as 2008 were encouraging patients to choose a health facility based on quality assurance feedback data. [39] Locally, at the facility at discharge, maternity patients are offered an opportunity to give feedback including whether they would refer anyone to the facility, as part of quality assurance and monitoring. Incidentally, this might be contributing to the results obtained here but further studies would need to be done.

The rate for premature birth was 12.4%, which compares with countdown data quoting South Africa's rate as 12%. [9] Most probably related to this is the incidence of respiratory distress syndrome (7%), found in this study.

The rate of birth asphyxia was 5.7%, which was much lower than the countdown data for South Africa putting Birth Asphyxia at 8%. [9]

5.4 Factors Influencing Maternal and Foetal Outcomes

Age

The oldest woman to deliver at the facility was 44 years of age and the youngest was 16 years of age. The adolescents were 4.5% of the women who delivered, and only one was recorded as being a scholar. Teenage pregnancy is of interest globally and nationally in South Africa. It has been shown in studies that there are barriers that adolescents face to access contraception. [40] The fact that the pregnant adolescents who are still in school and /or otherwise unemployed can access private healthcare, suggests that their parents, guardians, caregivers or partners are funding the pregnancies. However, it also suggests that the system failed these teenagers in spite of their ability to access private healthcare. Higher socio-economic status has not protected these adolescents from teenage pregnancy. Even though there are new trends in delaying childbearing, urbanisation and challenges of accessing healthcare leaves adolescents at risk of pregnancy. [41]

Future studies can be done to assess and ensure subsequent access to contraception because finance is clearly not the barrier to these adolescents not having accessed contraception and thereby ending up pregnant. The average birthing age was 29 years, suggesting a general delay in having children. [41]

Ethnicity

The population structure was proportionally represented. Unlike what is suggested in the western literature, [32] there were no differences among the different races in this study. This encompasses financing and frequency of complications.

Marital status

This is one of the confounding factors, which may have influenced the low rate of complications. The majority of the pregnant women were married and in this study, no associations were found between outcomes and marital status. It is known that single status during pregnancy is associated with high levels of stress, which may result in poor pregnancy outcomes.

5.5 Limitations

The study occurred in a private hospital and its findings may not be extrapolated to other private hospitals nor to public hospitals. The other major limitation is the non-randomness of the sample given that it was a three-month study period. Also it was a small sample of 304. Therefore, it is a limitation of this study and the findings may not be the norm for all private facilities in South Africa. Moreover, confounding factors due to the differences in SES conditions of the women attending these facilities also limit the generalisability of findings.

However, it can be used as a case study for future reference to a bigger study. Notwithstanding this limitation, having this audit generated a database on pregnancy, risks and foetal outcomes. The database generated from this study may form the basis for future studies and improvement of service through better understanding of the subjects relating to this private health facility.

Even though the researcher works at the study site, there is no conflict of interests because she works as a paediatrician and there are three other paediatricians. While paediatricians are involved in neonatal care they are not directly involved in the management of patients in the Maternity Unit of the Hospital.

CHAPTER 6
CONCLUSION AND RECOMMENDATIONS

In this chapter, the results obtained from this study were assessed in relation to the aims and objectives of the study, so that appropriate conclusions can be drawn. The limitations of the study are listed. Based on the findings of the study, appropriate recommendations and suggestions for future research are included.

6.1 Conclusions Related to the Aims of the Study

This descriptive retrospective study looked at broad issues pertaining to the deliveries at the maternity unit of a private hospital in Johannesburg Health District during 2011. The results of this study are both in keeping and deviate from other studies. Certain aspects do not correlate with literature and this may suggest effects of other factors, not included in the study.

6.1.1 Description of maternal profiles (such as socio-economic status (proxy level of medical insurance), obstetric history and demographic factors) during a three-month study period

Only study participants who used medical aid cover to finance access to maternity services were included in this study. There were three levels of medical aid cover encountered. These were high, medium and low level cover, as classified by medical aid schemes and depending on the benefits conferred by the medical aid plan.

The ethnic distribution of the study population was representative of the South African population. In addition, there were incidences of adolescent pregnancy encountered.

6.1.2 Description of their pregnancy outcomes and processes (foetal and neonatal morbidity and mortality)

The findings in this study showed that there was no maternal mortality. Maternal morbidity was described. Caesarean section rate was high and postpartum complications were more frequent in low and medium medical aid holders. The neonatal mortality rate and incidence of asphyxia were lower than the country rates.

6.2 Recommendations

Further explorative study of maternal outcomes, especially postpartum haemorrhage, is recommended, using a larger sample size. In addition, a more random sample should be analysed.

This could help with the planning of clinical management with risk profiling on the basis of level of funding if it turns out that one group consistently suffers more complications than those in other levels of funding and to correlate the outcomes to social demographic factors.

The VON database is available at the hospital and it is recommended that it be analysed periodically by paediatricians to check reproducibility of this study and more importantly to monitor neonatal outcomes, and thereby improve neonatal care further (even though the NMR was lower that country average). In addition, neonatal outcome studies correlating level of funding need to be done in the future.

The profiles of women who delivered included some adolescents should be studied further because this is a vulnerable group. It is recommended that a programme of support for adolescents be explored comprising infant feeding support and contraception education to prevent further adolescent pregnancies, especially should they want to return to school.

Due to the absence of immunisations over the weekend, it is proposed that the immunisation clinic address this as some babies may be lost to follow up concerning returning for immunisation. A possible solution could be the availability of

immunisations in the ward over the weekend.

Future possible areas of study are:

a) Correlating maternal outcome with demographics and behaviour (for example smoking) stratified with different levels of medical insurance.
b) Periodic analysis of the VON database and correlating to different levels of medical insurance.
c) Adolescent pregnancy outcomes correlating to demographic factors, coupled with intervention of support group.
d) Plans include using the current database for further studies including publishing the data.

6.3 Conclusions of the Study

This was probably the first study done in a private health facility in South Africa that looked at the maternal and foetal / neonatal outcome, and to stratify them according to medical aid type (high / medium / low). The demographic characteristics of the study population were representative of the South African population. The findings in this study showed better maternal and neonatal outcomes than public health facilities in South Africa. The study also reported a high caesarean section rate and relatively more frequent postpartum complications in low and medium medical aid holders.

REFERENCES

1. Schneider, H., Gilson, L. The impact of free maternal healthcare in South Africa. 1999.

2. Basu, S., Andrews, J., Kishore, S., Panjabi, R. and Stuckler, D. comparative performance of private and public healthcare systems in low- and middle-income countries: A Systematic Review. PLoS Medicine. 2012;9(6):e1001244.

3. Belizan, M., Bergh, A.M., Cilliers, C., Pattinson, R.C., Voce, A. Stages of change: A qualitative study on the implementation of a perinatal audit programme in South Africa. BMC Health Services Research. 2011;11:243.

4. Horbar, J.D, Soll, R.F, Edwards, W.H. The Vermont Oxford Network: a community of practice. Clinics in perinatology. 2010;37(1):29-47.

5. Ballot, D.E., Chirwa, T., Ramdin, T., Chirwa, L., Mare, I., Davies, V.A., et al. Comparison of morbidity and mortality of very low birth weight infants in a central hospital in Johannesburg between 2006/2007 and 2013. BMC pediatrics. 2015;15:20.

6. Mancey-Jones, M. and Brugha, R.F. Using perinatal audit to promote change: a review. Health policy and planning. 1997;12(3):183-92.

7. Alkema, L., Chou, D., Hogan, D., Zhang, S., Moller, A.B., Gemmill, A., et al. Global, regional, and national levels and trends in maternal mortality between 1990 and 2015, with scenario-based projections to 2030: a systematic analysis by the UN Maternal Mortality Estimation Inter-Agency Group. Lancet (London, England). 2015.

8. USAID. Ending preventable maternal mortality. USAID maternal health vision for action http://www.usaid.gov/sites/default/files/documents/1864/MCHvision.pdf: USAID; 2014 [cited 2015 22/01/2015].

9. Requego, J.B.J., Fulfilling the health agenda for women and children www.who.int: UNICEF and WHO; 2014 [cited 2015 24102015].

10. Bomela, N.J., A cross-sectional analysis of the geographic distribution and causes of maternal mortality in South Africa: 2002–2006. BMC Public Health. 2015;15:273.

11. Africa, S.S., Millenium developmemt goals. Country report 2013 http://www.statssa.gov.za/MDG/MDGR_2013.pdf: Statistics South Africa; 2013 [cited 2015 24/01/2015].

12. Kearney, M.H., Haggerty, L.A., Munro, B.H., and Hawkins, J.W. Birth outcomes and maternal morbidity in abused pregnant women with public versus

private health insurance. Journal of nursing scholarship : an official publication of Sigma Theta Tau International Honor Society of Nursing / Sigma Theta Tau. 2003;35(4):345-9.

13. Kibel. M SH., Westwood, T. Children's rights and health. 5th ed. Southern Africa: Oxford University Press 2014.

14. D H. An Overview of Health and Healthcare in South Africa 1994 – 2010: Priorities, Progress and Prospects for New Gains http://ftp.bhfglobal.com/files/bhf/overview1994-2010.pdf2009 [cited 2016 25/01/2016].

15. Chollet, D.J, Newman, J.F, Jr., Sumner, A.T. The cost of poor birth outcomes in employer-sponsored health plans. Medical care. 1996;34(12):1219-34.
16. Scheme SM. Medical Funds - What funds a medical scheme? http:www.selfmed.co.za/ARTICLE/medicalfund: Selfmed Medical Scheme; 2015 [updated 2015; cited 2015 24/01/2015].

17. Kibel. M SH, Westwood. T. Child health promotion. 5th ed. Southern Africa: Oxford University Press; 2012.

18. Hussein, J. Improving the use of confidential enquiries into maternal deaths in developing countries. Bulletin of the World Health Organization. 2007;85(1):68-9.

19. Roberts, C.L, Cameron. C.A., Bell, J.C., Algert, C.S., Morris, J.M. Measuring maternal morbidity in routinely collected health data: development and validation of a maternal morbidity outcome indicator. Medical care. 2008;46(8):786-94.

20. Stones, W., Lim, W., Al-Azzawi, F., Kelly, M. An investigation of maternal morbidity with identification of life-threatening 'near miss' episodes. Health trends. 1991;23(1):13-5.

21. Saloojie, H. VS. Neonatal disorders. Kibel. M SH, Westwood. T, editor. Southern Africa: Oxford University Press; 2012. 12 p.

22. Orenstein, L.A.V., Orenstein, E.W., Teguete, I., Kodio, M., Tapia, M., Sow, S.O., et al. Background Rates of Adverse Pregnancy Outcomes for Assessing the Safety of Maternal Vaccine Trials in Sub-Saharan Africa. PloS one. 2012;7(10):e46638.

23. Kumbani, L.L SJ., Odland, J. O. Factors associated with perinatal deaths in women delivering in a health facility in Malawi. Journal of Research in nursing and midwifery 2012;1(5):69-79.

24. Beck, D. G.F., Goldman, S. Care of the new-born.Reference manual. resourcescentre.savethechildren.se/sites/default/files/documents/1952.pdf: Save the Children; 2004 [cited 2015 25/10/2015].

25. PMNCH. The partnership for maternal ,new-born and child health.A Global review of the key interventions related to reproductive,maternal,new-born and child health http://www.who.int/pmnch/topics/part_publications/essential_interventions_18_01_2012.pdf: PMNCH; 2011 [cited 2015 24102015].

26. Investopedia. Definition of private sector http://www.investopedia.com/terms/p/private-sector.asp#ixzz3xomgH8Gk Investopedia; 2016 [cited 2016 24/01/2015].

27. Sayres, W.G., Jr. Preterm labor. American family physician. 2010;81(4):477-84.

28. Wattendorf, D.J. and Muenke, M. Fetal alcohol spectrum disorders. American family physician. 2005;72(2):279-82, 85.

29. Cheng, H., and Furnham, A. The Big-Five Personality Traits, Maternal Smoking during Pregnancy, and Educational Qualifications as Predictors of Tobacco Use in a Nationally Representative Sample. PloS one. 2016;11(1):e0145552.

30. Control CfD. What are the health effects of tobacco use on pregnancy? http//www.cdc.gov/ tobacco/campaign/tips/: Centre for diseases control; 2015 [cited 2016 24/01/2016].

31. Bitran. Health, Nutrition and Population (HNP) http://siteresources.worldbank.org/HEALTHNUTRITIONANDPOPULATION/Resources/: World Bank; 2010 [cited 2016 24/01/2016].

32. Vinikoor, L.K.J., Richard, M Effects of racial density and income congruity on pregnancy outcomes in less segregated communities. Social Science and Medicine. 2008;66:255-9.

33. Pattinson, R.S., Souza. P, J. WHO maternal death and near-miss classifications http://www.who.int/bulletin/volumes/87/10/09-071001/en/: World Health Organisation; 2009 [cited 2016 25/01/2016].

34. S V. Reducing neonatal deaths in South Africa – are we there yet, and what can be done? South African Journal of Child Health 2012;6(3):67-71.

35. Zhang, S., Cardarelli, K., Shim, R. Ye J, Booker, K.L,, Rust, G. Racial disparities in economic and clinical outcomes of pregnancy among Medicaid recipients. Maternal and child health journal. 2013;17(8):1518-25.

36. Jenniskens, K., Janssen, P. A. New-born outcomes in british columbia after caesarean section for non-reassuring fetal status. Journal of obstetrics and gynaecology Canada : JOGC = Journal d'obstetrique et gynecologie du Canada : JOGC. 2015;37(3):207-13.

37. Gupta, N., Maliqi, B., França, A., Nyonator, F., Pate, M.A., Sanders, D., et al. Human resources for maternal, new-born and child health: from measurement

and planning to performance for improved health outcomes. Human Resources for Health. 2011;9:16.

38. Tang, L. The patient's anxiety before seeing a doctor and her/his hospital choice behavior in China. BMC Public Health. 2012;12:1121-.

39. Lako, Christiaan . J RP. Demand-Driven Care and Hospital Choice. Dutch Health Policy Toward Demand-Driven Care: Results from a Survey into Hospital Choice. Healthcare analysis. 2008:17-20.

40. Hagey, J.M., Akama, E., Ayieko, J., Bukusi, E.A., Cohen, C.R., Patel, R.C. Barriers and facilitators adolescent females living with HIV face in accessing contraceptive services: a qualitative assessment of providers' perceptions in western Kenya. Journal of the International AIDS Society. 2015;18(1):20123.

41. Bearinger, L.H., Sieving, R.E., Ferguson, J., Sharma, V. Global perspectives on the sexual and reproductive health of adolescents: patterns, prevention, and potential. Lancet (London, England). 2007;369(9568):1220-31.

ANNEXURES

ANNEXURE A

ETHICS CLEARENCE CERTIFICATES AND LETTER OF PERMISSION

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG
Division of the Deputy Registrar (Research)

HUMAN RESEARCH ETHICS COMMITTEE (MEDICAL)
R14/49 Dr Diana S Ruredzo

CLEARANCE CERTIFICATE	**M121043**
PROJECT	An Audit of Outcomes of all Pregnancies at a Private Facility in he Johannesburg Health District (revised title)
INVESTIGATORS	Dr Diana S Ruredzo.
DEPARTMENT	School of Public Health
DATE CONSIDERED	26/10/2012
DECISION OF THE COMMITTEE*	Approved unconditionally

Unless otherwise specified this ethical clearance is valid for 5 years and may be renewed upon application.

DATE 21/06/2013 **CHAIRPERSON** .....
(Professor PE Cleaton-Jones)

*Guidelines for written 'informed consent' attached where applicable

To:	**Dr D Ruredzo**
	Paediatrician
	Life Carstenhof Clinic
From:	**Dr Morgan Mkhatshwa**
	Hospital Manager
	Life Carstenhof Clinic
Subject:	**Permission to conduct research**
Date:	**01 August 2012**

This is to certify that you have been granted permission to utilize the hospital data (Year 2008-2011) to do your research studies for Masters in Science in Child Health with the University of Witwatersrand.

You will be requested to present your findings & recommendations to the hospital's management team and put up a poster on the notice board of your research work.

The hospital management team wishes you the best of luck with your studies.

Kind Regards,

Life Carstenhof Clinic
Private Bag X54 Halfway House
Midrand 1685 South Africa
Tel: 011 655 5500 Fax: 011 310 2318

Dr Morgan Mkhatshwa

ANNEXURE B
DATA COLLECTION TOOLS

AN AUDIT OF PREGNANCIES OUTCOMES AT A PRIVATE FACILITY
IN THE JOHANNESBURG HEALTH DISTRICT

DATA COLLECTION FORM: (Appendix B)

Maternal Data

Study Number: **Age:**

Residential area_____Ethnicity **B**- black, **W**-white **C**- colored, **I**- Indian,

MARITAL STATUS Married- **M**; Divorced- **D**; co-habiting - **CH**; Single-**S**

Education level: _____Primary, Secondary, Tertiary OCCUPATION_____

MEDICAL AID **Y** **N**

If Yes, Relationship to main member [**O**-own, **S** spouse, **P**-parent/other relative]

If No, relationship person responsible for account_____

1(b) DETAILS OF THE PREGNANCY

Gestation at delivery (weeks) _____ Booked Yes No

If Yes: Weeks at booking:_____ Hemoglobin Proteinuria

GRAVIDITY PARITY

Comorbidity:

1

AN AUDIT OF PREGNANCIES OUTCOMES AT A PRIVATE FACILITY
IN THE JOHANNESBURG HEALTH DISTRICT

Anemia Pregnancy induced hypertension HIV STI

Other Infections (uti, chorioamnitis) Diabetes Syphilis Rubella

Haemoglobin level: _____

Pregnancy Outcome:

Live birth : Miscarriage: Ectopic: Induced abortion: Still birth:

Mode of delivery:

NVD : Ventouse /forceps : Breach : Caesarian section:

Reason C/S_____

2. FOETUS/NEW BORN BABY:

APGARS at 1 minute:_____ 5 minutes:_____

RECUSCITATED Y N ADMITTED NICU: Y N

If yes, DA_____DOD_____ RDS Hypothermia Hypo/Hyper Glycaemia

BIRTH WEIGHT:_____ LENGTH:_____ HC :_____ SGA : LBW :

Premature birth: Y N Still birth: Y N: Healthy Y N

Fetal death Y N Neonatal sepsis Y N HIE Y N

Immunization at discharge: Y : N: