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An overview of substance and alcohol use in pregnant women attending antenatal care

Sebothoma, Rebone Immaculate

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An overview of substance and alcohol use in pregnant women attending antenatal care

Dr Rebone Immaculate Sebothoma

Student Number 684730

A research report submitted to the Faculty of Health Science, University of the Witwatersrand, in partial fulfilment of the requirements for the degree of Master of Medicine in the branch of Psychiatry

Johannesburg, February 2021

Declaration

I, Dr Sebothoma declare that this Research Report is my own, unaided work. It is being submitted for the Degree of Master of Medicine, in the branch of Psychiatry, at the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination at any other University.

Signature of Student……..... Date…….....…

24/02/2021

Dedication

For my parents, partner, siblings, my late aunt Minah. Thank you for your ongoing prayers, love and support. My precious daughters Khanya and Zinathi, you inspired this project in so many ways.

Presentations / publications arising from this research

The results of this research were presented at:

- The Wits University Department of Psychiatry Research Day held at the Sunnyside Park Hotel in Johannesburg on 8 June 2016

- A Sedibeng District Health Services workshop on maternal mental health held at Kopanong Hospital Department of Family Medicine on 3 December 2020

Abstract

Background: Substance and alcohol use during the antenatal period increases the risk of poor maternal and fetal outcomes of pregnancy. Although substance use is common in South Africa, there is a paucity of research among pregnant women.

Aim: To determine the prevalence of substance use among pregnant women who delivered at Rahima Moosa Mother and Child Hospital during January 2013. A secondary objective was to explore associations between substance use and the socio-demographic and clinical profiles of the study sample.

Methods: A quantitative, retrospective record review was conducted of women who delivered at Rahima Moosa hospital in Gauteng, South Africa the 1st and 21st of January 2013.

Results: 399 records were retrieved; 84% of women were aged between 20 and 40 years, 8% were 19 years or less and 8% over 40 years. Any substance use was recorded in 45% (n=178) of clinical files. Of these, concurrent use of alcohol and tobacco was recorded in 63% (n=113), tobacco in 20% (n=36), alcohol in 14% (n=25), cannabis in 2% (n=4). Chi-square testing showed significant associations between substance use and premature delivery ($p<0.0001$), positive HIV status ($p=0.04$) and low birth weight ($p=0.001$). Multivariate logistic regression found women using substances were more likely to have a low-birth weight baby than non-users (aOR = 2.5, 95%CI: 1.23 -5.16, p= 0.01).

Conclusion: Alcohol and tobacco were commonly used during pregnancy among women who delivered at Rahima Moosa hospital, Gauteng province. Substance use was associated with positive HIV status, preterm labour and low birth weight.

Key words: Substance use; pregnancy; South Africa

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List of Abbreviations

DSM	Diagnostic and statistical manual of mental disorders
FAS	Fetal alcohol syndrome
FASD	Fetal alcohol syndrome disorders
HIV	Human immuno-deficiency virus
SACENDU	South African Community Epidemiology Network on Drug Use
SASH	South African Stress and Health study
NSDUH	National Survey on Drug Use and Health
USA	United States of America
WHO	World Health Organization

Chapter 1 – Introduction

1.1 Background

The World Health Organization (WHO) includes the harmful use of psychoactive substances such as alcohol, cannabis, amphetamine-type stimulants, cocaine, opioids, and benzodiazepines, as well as substance dependence, under "substance use disorders" (World Health Organization, 2014). The 5th edition of the Diagnostic and Statistical Manual of Psychiatric Disorders (DSM 5) divides substance related disorders into two categories: substance use disorders, and substance induced disorders (American Psychiatric Association, 2013). The DSM 5 incorporates ten separate classes of substances, specifically alcohol; caffeine; cannabis; hallucinogens (and other hallucinogens); inhalants; opioids; sedatives, hypnotics, and anxiolytics; stimulants (amphetamine-type substances, cocaine, and other stimulants); tobacco; and other (or unknown) substances. The DSM 5 further includes both substance abuse and dependence into one category, with a continuum of severity. The presence of physical, social, and psychological symptoms must be met for a substance use disorder to be diagnosed, and its severity is classified according to the number of criteria met.

Both the DSM 5 and the WHO describe three patterns of substance use: hazardous, harmful, and dependent use (American Psychiatric Association, 2013; World Health Organization, 2014). Hazardous use is defined as a pattern of substance use that increases the risk of harmful consequences for the user, including, in pregnancy, for the fetus and infant. Harmful use is a pattern of psychoactive substance use that causes damage to the individual's physical, mental, and/or social wellbeing. Substance dependence is conceptualized as a cluster of physiological, behavioural, and cognitive phenomena during which an individual prioritizes the use of a substance over other behaviours that once had greater value. The term "addiction" has often been used interchangeably with substance use and/or dependence. The American Society of Addiction Medicine describes addiction as a primary, chronic disease, which includes dysfunctional pathways affecting the brain reward system, motivation, and memory. (Cook *et al*., 2017).

Alcohol and other substance use while pregnant can have a negative impact on both the mother and the fetus (Lester & Twomey 2008; World Health Organization 2014; Forray & Foster 2015). Substance and alcohol use may also severely compromise an individual's functioning as a parent and/or spouse and may exacerbate domestic violence. Therefore, substance use among parents may significantly affect the physical, mental, and emotional development of children (World Health Organization, 2014). An increased risk of HIV transmission is conveyed by injecting substances, which is also associated with an increased risk of hepatitis C. According to the WHO, alcohol consumption increases the risk of unprotected sex, unintended pregnancy, delayed recognition of pregnancy, and continued alcohol and substance use during pregnancy, with consequent increased risk of fetal exposure to alcohol and negative consequences for new-borns (World Health Organization, 2018).

Antenatal use of alcohol can lead to fetal alcohol syndrome and other harms such as spontaneous abortion, intrauterine growth restriction, stillbirth, low birthweight, prematurity, and birth defects (Forray & Foster 2015; World Health Organization, 2018). Alcohol and substance use in pregnancy has also been correlated with a shortened duration of breastfeeding, leading many women to abstain from breastfeeding entirely (Wilson & Thorp, 2008). Illicit substance use in pregnancy has been related to preterm labour, low birth weight of new-born babies, placental insufficiency, neonatal abstinence syndrome, and admissions to the neonatal intensive care unit (Lester & Twomey 2008; Harrison & Sidebottom 2009).

1.2 Literature Review

1.2.1 Global prevalence of substance use, focussing on women and during pregnancy

During 2016, alcohol accounted for approximately 3.5% of the 11 million deaths which occurred worldwide from communicable, maternal, perinatal, and nutritional conditions (World Health Organization, 2018). According to the WHO "Global status report on alcohol and health, 2018," 47% of the global population used alcohol in 2016, described by the WHO as "current drinkers". Globally, the per capita consumption of alcohol in litres among people aged 15 years and older, increased from 5.5 litres in 2005 to approximately 6.4 litres in 2010. However, it remained stable at 6.4 litres between 2010 and 2016. Heavy episodic drinking, defined as 60 or more grams of pure alcohol on at least one occasion at least once per month, decreased in prevalence globally from 22.6% in 2000 to 18.2% in 2016. However, heavy

episodic drinking remained high, at approximately 60% of those using alcohol in some sub-Saharan African countries.

The 2018 WHO report (World Health Organization, 2018) reports that fewer women used alcohol during 2016 than men. It found that, globally, 32.3% of women compared to 53.6% of men were current drinkers, and, in Sub-Saharan Africa, that 21% of women and 43.6% of men were current drinkers. The WHO also notes that when women used alcohol, they drank less than men in all WHO regions. However, alcohol and other substance use in women is still too frequent and has serious consequences (World Health Organization, 2014; Forray & Foster 2015; Cook *et al*. 2017). A systematic review cited by the WHO 2018 report found the global prevalence of alcohol use during pregnancy to be 9.8% (World Health Organization *et al*., 2018). In addition, the WHO, states that, at the country level, binge drinking during pregnancy ranged from 0.2% to 13.8%.

There is a paucity of data from low- and middle-income countries on substance use in pregnancy (May *et a*l. 2005; Harrison & Sidebottom 2009; World Health Organization, 2014). A recent cross-sectional study among 718 women attending an antenatal clinic in Ethiopia (Mekuriaw *et al*. 2019) found a prevalence rate of 8.1% for alcohol use. Alcohol use was associated with an increased risk of pre-pregnancy alcohol use and unplanned pregnancy. Using data from a national household survey conducted in 2006 in India, Mistry and Dasika (2018) found that 9% of pregnant women used tobacco. This was slightly less than the 11% of non-pregnant women between 15 and 49 years. Another, smaller study using structured interviews among 100 antenatal women in India found that 16% used tobacco (Mistry *et al*. 2018)

Importantly, the highest risk period for developing a substance use disorder is during the reproductive years (15–44 years). Although substance use among pregnant women may be higher than among non-pregnant women, a high prevalence has still been noted. The USA National Survey on Drug Use and Health for 2012 and 2013 (SAMHSA, 2013) found 9.4% of pregnant women used alcohol and 15.4% used tobacco. Illicit substances were used by 11.4% of non-pregnant women and 5.4% of pregnant women aged between 15 and 44 years, with the highest prevalence during adolescence, at 14.6% of those aged 15 to 17 years, and lowest among those over 26 years, at 3.2%.

The 2018 WHO report comments that cannabis may often be substituted for alcohol of concurrently with alcohol. An observational study conducted among 422 pregnant women in five urban antenatal clinics in Pittsburgh, Pennsylvania (Chang *et al*. 2017) found that 34% of the sample tested positive for one or more substances. Cannabis was most commonly detected, at 27% of the sample. Of patients who tested positive for any substance, 46% did not disclose any use and only 36% of patients who tested positive for cannabis disclosed current use.

1.2.2 Prevalence of substance use in South Africa, focussing on women and during pregnancy

There is a paucity of literature regarding the prevalence of substance use in South Africa as a whole, however, data derived from different regions has been documented. According to Forray *et al*. (2016), the South African Department of Social Development's Central Drug Authority has reported that substance use in South Africa exceeds that of the world norm (Forray 2016). The only national survey, the South African Stress and Health (SASH) study, found women were less likely to use alcohol and other substances than men (Van Heerden e*t al*. 2009). Surveying a representative sample of 4351 adults aged 18 years and over, the SASH study found 38.7% used alcohol. 30% used tobacco, 8.4% used cannabis, and 2% used other substances. Women were 70% less likely to use alcohol and 80% less likely to use other substances.

The South African Community Epidemiology Network on Drug Use (SACENDU) collates data from substance use rehabilitation centres across the country's nine provinces. The 2019 report found women were far less likely to have attended a rehabilitation centre than men (Dada *et al*., 2019). Between 2014 and 2018, women accounted for 25-29% of substance use admissions in the Western Cape, 12-15% in Gauteng, and 9-12% in the Northern region (Limpopo and Mpumalanga). In the Western Cape, women accounted for approximately a third of admissions for alcohol use and 20% for cannabis use. However, in Gauteng and the Northern region, women accounted for 20% and 10% of alcohol use admissions, respectively. The SACENDU data only reflects who receives treatment at specific substance rehabilitation centres, some of which require payment by the user. Therefore, population level rates of substance use cannot be deduced from the data, it is also not known if all women who need rehabilitation actually receive it.

In a report on the South African National Health and Nutrition Examination Survey (SANHANES-1) of 14764 participants by Wendell *et al*. (2012) stated that 9.6% of South Africans were involved in concurrent tobacco and risky alcohol use (16.8% among men and 3.5% among women). Tobacco use only was found among 18.2% and risky alcohol use without tobacco use among 20.3%. A study conducted by Pasche and Myers (2012) found that levels of methamphetamine use among men and women were similar. Female substance users reported 28% daily use of methamphetamine compared to 22% of their male counterparts (Pasche & Myers 2012).

Despite the high rates of alcohol and substance use in the general population of South Africa, there is a paucity of data on substance use during pregnancy in South Africa, and specifically in Gauteng Province. It appears that most studies conducted in South Africa regarding the effects of alcohol use in pregnancy have been carried out in the Western Cape (Choi *et al*. 2014; May *et al*. 2000; May *et al*. 2005; Onah *et al*. 2016; Petersen Williams *et al*. 2014; Raggio *et al*. 2019). Considerable research has been conducted on Fetal Alcohol Spectrum Disorders (FASD), and it has been shown that the Western Cape specifically has one of the highest recognised prevalence rates in the world. Several studies (May *et al*. 2005; Bhuvaneswar *et al*. 2007; Odendaal, Kruger & Botha 2020) suggest that tobacco is the most commonly used substance in pregnancy, followed by alcohol, cannabis, and illicit substances.

Petersen Williams *et al*. (2014) conducted a study in Cape Town, looking at alcohol and drug use in pregnancy, among women attending midwife obstetric units in the Cape Metropole. Urine testing among 684 pregnant women revealed that 8.8% tested positive for at least one illicit substance, while 19.6% tested positive for alcohol consumption. It was concluded from these findings that there were high rates of alcohol and substance use during pregnancy among women appearing at public sector antenatal clinics. The authors recommend routine screening for alcohol and substance use in pregnancy with relevant interventions put in place according to the women's level of risk (Petersen Williams *et al*. 2014).

Another study conducted in Cape Town by Choi *et al*. (2014), examined the relationship between South African women's alcohol use before and after realising they were pregnant

and traumatic experiences such as childhood abuse and intimate partner violence. The authors found that maternal childhood trauma or intimate partner violence increased alcohol consumption among women upon being aware of their pregnancy (Choi *et al*. 2014).

1.2.3 Risk factors and consequences associated with substance use in pregnancy

The harm associated with intrauterine exposure to alcohol, tobacco, and illicit substance abuse is well known, extensive, and intergenerational (Viteri *et al*. 2014). According to the 2018 WHO report, FASD are the leading cause of non-inherited intellectual disability in the world, despite being 100% preventable through maternal abstinence from alcohol. FASD is the umbrella term used to collectively refer to fetal alcohol syndrome (FAS), which is considered the severe end of the spectrum, as well as fetal alcohol effects, which consists of a less severe phenotype compared to FAS. Effects of alcohol on the fetus include partial FAS, alcohol-related birth defects and alcohol-related neurodevelopment disorder.

Drinking during pregnancy resulted in an estimated prevalence of FAS among the general population of 14.6 per 10 000 people, and a prevalence of FASD of 77.3 per 10 000 people (Popova *et al*. 2017 as cited in the 2018 WHO report). Common conditions occurring with FASD include congenital malformations, intrauterine growth restrictions, intellectual disability, behavioural disorders, speech and language difficulties, visual and audiological impairments, cardiac deformities, and urogenital problems. Congenital anomalies affecting the central nervous system have lifelong consequences (Hoyme *et al*. 2005; Cook *et al*. 2017). Even mild alcohol consumption during pregnancy may result in a miscarriage or spontaneous abortion as well as a significant decrease in birth weight of the new-born (Odendaal *et al*. 2020; Forray 2016; Harrison & Sidebottom 2009).

South Africa has been reported to have the highest rates of FASD in the world, with rates of over 70/1000 live births in the Western Cape (May *et al*. 2000). In 1996, in the Western Cape, incidence of FAS alone has been estimated at 40.5 to 46.4 per 1000 first grader school children (Institute of Medicine, 1996). May *et al.* (2000) subsequently reported rates of 65.2 to 74.2 per 1000 first graders two years later, and 68.0 to 89.2 per 1000 first graders two years following that. Thus, prevalence of FAS is high and appears to be increasing.

In a case control study by May *et al*. (2005) that aimed to identify risk factors for FAS compared mothers of 53 first-grade learners with FAS with 116 randomly selected mothers of first-grade learners without FAS (May *et al*., 2005). Findings revealed poorer socioeconomic status, lower religiosity, lower education, and more being unmarried among those who had children with FAS. Mothers of children with FAS generally came from alcohol-abusing families in which heavy drinking was almost universal, while control mothers drank little to no alcohol. Among the mothers of children with FAS, 87% did not reduce their alcohol intake after having children and were heavy binge drinkers on weekends. They were also more likely to use tobacco, with a rate of 75.5% compared to 30.3% among mothers whose children did not have FAS.

Despite knowledge on its harms, substance use in pregnancy continues. Literature suggests that clinical characteristics and patient profiles or circumstances may be important in understanding the use of substances in pregnancy (Onah *et al*. 2016; Cook *et al*. 2017). Increased and persistent substance use during pregnancy is associated with prenatal depression, and persistent tobacco smoking during pregnancy has been linked to a history of problematic relationships, risky health behaviours, maladaptive functioning, low educational levels, single parenthood, and low-income levels (Onah *et al*. 2016; Cook *et al*. 2017).

Onah *et al*. (2016), aimed to identify predictors of alcohol and other substance use among pregnant women in a peri-urban setting in Cape Town. Demographic, socioeconomic, and life events data were collected. Of their total sample of pregnant women, 18% reported current alcohol and other substance use. Of these, 18% were currently experiencing a major depressive episode, 19% had a current anxiety disorder, and 22% expressed suicidal ideation. Factors associated with alcohol and other substance use included younger age, poverty, unemployment, and interpersonal conflict. (Onah *et al*. 2016). Likewise, in the USA, Chang *et al*.'s observational study on perinatal illicit substance and cannabis use among pregnant women in antenatal clinics in Pennsylvania revealed that 68.5% of these women were aged between 20–29, 43.4% were single, and 40.0% had a low level of education (Chang *et al*. 2017).

It appears that younger, single women, with low level of education, are prone to developing a perinatal substance use. Demographic information, particularly low socio-economic status,

which includes rural residence and lower education levels, have been identified as significant maternal risk factors for substance use in pregnancy (May *et al*. 2005; Cook *et al*. 2017).

A study by Harrison and Sidebottom (2009) examined alcohol and other substance use before and during pregnancy and identified the predictors of use cessation before the first prenatal visit (Harrison & Sidebottom 2009). They found 87% of women stopped using alcohol and 55.6% stopped other substances after realising they were pregnant. Continuation of alcohol and substance use was predicted by being older and being a current smoker. Alcohol use continuation was also predicted by increased frequency of alcohol use prior to pregnancy, depression, and physical or sexual abuse. This is consistent with other findings which have suggested that women who use alcohol and other drugs are more vulnerable to intimate partner violence and exposure to other forms of violence than the general population (World Health Organisation, 2014). Harrison and Sidebottom also found continuation of substance in pregnancy was also predicted by race, being more common among American Indians and African Americans compared to Americans of European descent. This study also indicated that these women may be at greater risk for acquiring HIV and other sexually transmitted infections.

As with alcohol use, tobacco and cannabis use may be continued during pregnancy, despite widespread public awareness of their deleterious health effects. Up to a quarter of women in developed countries smoke during their pregnancies. Murray, Small and Burrage (2014) reports smoking in pregnancy to be associated with adverse pregnancy outcomes, such as low birth weight, preterm birth, and perinatal death. Similarly, in-utero exposure to cannabis is linked to complications in the developing fetus, including anencephaly (a condition in which the forebrain fails to form), and later development of attention deficit hyperactivity disorder, learning disabilities, memory impairment, depression, and aggression (Cook *et al*. 2017).

Murray *et al.*'s study on the lived experience of smoking during pregnancy explored the meanings of smoking in pregnancy (Murray, Small & Burrage 2014). Data was collected through interviews with eight pregnant women from Newfoundland and Labrador. In the participants' stories, four main themes were identified: "living in a smoking world; finding oneself on a moral low road; navigating one's own way to a high road; and not preparing for

postpartum smoking pitfalls." Of note, smoking was perceived by participants to be beneficial, natural, and difficult to stop. Participants believed that smoking in smaller amounts was as good as or even better than quitting for the baby's well-being. This study suggests that greater education is needed and not just public awareness.

1.2.4 Methods to screen for substance use in pregnancy

The WHO has published an evidence-based guideline regarding the identification and management of substance use in pregnancy (World Health Organisation, 2014). Screening and brief interventions are necessary. With regards to screening for substance use in pregnancy, Wilson and Thorp (2008) reported on various methods, including urinalysis, self-report questionnaires, hair analysis, meconium tests, and nail analysis (Wilson and Thorp, 2008). They indicated that self-report questionnaires are the most affordable method. However, limitations such as under-reporting, misleading information, fear of stigma associated with substance use, perceived negative reactions from health care workers, rejection, and even fear of losing child custody, may be encountered when a physician collects history from these women.

In a cross-sectional survey of 87 psychiatric inpatients at a regional hospital in Kwa-Zulu Natal, Davis *et al*. (2016) used the ASSIST (Alcohol, Smoking and Substance Involvement Screening Test) questionnaire to report that 54% had used alcohol in the preceding three months, and 43% had used cannabis. A study conducted in South Africa, by Morojele *et al*. (2010), reported that various pregnant women were likely to decline their utilization of alcohol or substance use for fear of being criticized. Other research studies have echoed this sentiment (Milligan *et al*., 2010; Reitan 2018).

1.3 Motivation for the study

Substance use during pregnancy has been associated with poor maternal and fetal outcomes. Despite the high rates of alcohol and substance use globally, there is a paucity of research regarding substance use in pregnancy in Gauteng Province, South Africa. Thus, there is a need to understand the prevalence and sociodemographic profile of pregnant women in this population.

It was hypothesized that there would be a high prevalence of substance use among pregnant women who delivered at Rahima Moosa Mother and Child Hospital, and that the prevalence would be associated with worse clinical outcomes as compared with those women without substance use.

1.4 Aim and objectives

The aim of this study is to understand the prevalence of substance use in pregnant women who delivered at Rahima Moosa Mother and Child Hospital. The study will also describe possible socio-demographic factors and clinical profiles associated with substance use in pregnancy.

As there has not yet been a study such as this one conducted in Gauteng, South Africa, the objectives were:

- To describe the socio-demographic and clinical characteristics of pregnant women who delivered at Rahima Moosa Mother and Child Hospital in Gauteng, South Africa.
- To assess the prevalence of substance use among these pregnant women.
- To explore the associations between substance use and the clinical and socio-demographic profiles of these pregnant women.

Chapter 2 – Methods

2.1 Study design

This was a quantitative study in which a retrospective record review of pregnant women who delivered at Rahima Moosa Mother and Child Hospital during the first three weeks of January 2013 was conducted. This study design was selected for pragmatic reasons as it may be conducted by a single investigator and is inexpensive. It was anticipated that sufficient socio-demographic and clinical data would be available in the records as maternal and child health is a priority health program in South Africa. In addition, as a specialist mother and child hospital, the primary care maternal health record is accompanied by additional hospital records with greater detail. A quantitative analysis is appropriate for assessment of prevalence and exploring associations (Bacon-Shone 2015).

2.1.1 Study setting

Rahima Moosa Mother and Child Hospital is situated in Coronationville which is in the City of Johannesburg, Gauteng, South Africa. Rahima Moosa is attached to University of the Witwatersrand and provides inpatient and outpatient tertiary level obstetric and paediatric services. Prior to 2008, it was known as Coronation hospital. It was previously established during the Apartheid era for people classified as Coloured and Indian (Coronation Action 1986). The hospital served local communities of Newclare, Noordgesig and Coronationville. Until 1955, it also served Black African people living in Pimville, Orlando and Sophiatown. Those living in Sophiatown were forcibly moved to Meadowlands in Soweto. However, many continued using the services of Coronation hospital after it was zoned only for Coloured and Indian people.

2.1.2 Study population

The study population comprised the clinical records of pregnant women who delivered at Rahima Moosa hospital between 1st and the 21st of January 2013.

Inclusion/ exclusion criteria

All records of pregnant women who delivered at Rahima Moosa between, and including, the 1st and 21st of January 2013 were to be included. No records were to be excluded.

Sampling strategy

Purposive sampling was used. The names and hospital numbers of all women who delivered at Rahima Moosa Mother and Child hospital during the study period were obtained from the maternity admissions book. These were then taken to the hospital records office and the clinical files retrieved.

Minimization of bias

Selection bias was minimized by considering all the records for women who delivered at the hospital during the study period. Information bias was minimized by using the same pre-defined data collection sheet for all records and capturing only what was in the clinical files with no supplementary information sources. The researcher bias was minimized by having the same investigator collect all the data.

2.1.3 Data collection

Socio-demographic, clinical, and substance use data were collected. All data were collected by one investigator (Dr Rebone Sebothoma). Data was collected manually onto a paper data collection sheet. The data was then captured onto an Excel® spread sheet where a study number was assigned to each record. The data were cleaned, and duplicates removed.

Socio-demographic data

The following socio-demographic data were collected using a data collection sheet (Appendix 1):

- Age according to groups: 12–19 years; 20–30 years; 31–40 years; 41 years and over.
- Population group according to the categories used by Statistics South Africa in the National Census (Statistics South Africa 2011): Black African; Coloured; Indian/Asian; and White.
- Relationship status: Single; Married; Widowed; Separated; Unknown.
- Employment history: Unemployed; Employed; Unknown.
- Highest level of education: None; Primary; <Grade 7 (Grade 6 or less); Grade 7-12; Tertiary; Unknown

Clinical data

The same data collection sheet was used to collect the following clinical variables:

- Gestational age at delivery: Preterm; Term; Unknown
- HIV statusy: Positive; Negative; Unknown
- Parity (excluding current delivery): 0–2; 3–5; >5 (Para 6 or more)
- Method of delivery: Normal vaginal delivery; Caesarean section
- Booking status: Booked; Unbooked.
- Substance use: Alcohol; Tobacco; Cannabis; Other; Unknown.
- Contact with psychological or psychiatric services: Yes; No
- Birth weight: Normal; Low birth weight

2.2 Data analysis

Data were imported from Excel® into STATA® version 13 for statistical analysis. Descriptive statistics on the sociodemographic variables and clinical information and the proportions (i.e., percentages) of substance use were computed. Inferential statistics to determine the associations were also computed. Further analyses using chi-square test/Fisher's exact test, bivariate and multivariate regression analysis were used to investigate the association between substance use and the socio-demographic and obstetric factors. Results are presented as number of participants (percentages) and odds ratio (confidence interval). Probability level was set at a p-value less than 0.05.

2.3 Ethical considerations

Ethical approval was obtained from Wits University Human Research Ethics Committee (Ethics number: M131188) to conduct the study. Permission was also obtained from the Chief Executive Officer of Rahima Moosa hospital. All identifying data were removed and confidentiality was maintained through assigning a study number for each record reviewed.

Chapter 3 - Results

A total of 970 deliveries were documented in the maternity admissions book. However, clinical records of only 399 women could be retrieved from the records office. These were all included in the study.

3.2 Socio-demographic characteristics of the sample

Most women were aged between 20 and 40 years (Figure 3.1). 43.9% (n=175) were aged between 20–30 years, with a median age of 25, followed by 40.6% (n=162) aged between 31– 40 years, with a median age of 36. Adolescents, with a median age of 16, accounted for 7.5% (n=30) of the sample, and women aged 41 and older accounted for 8% (n=32).

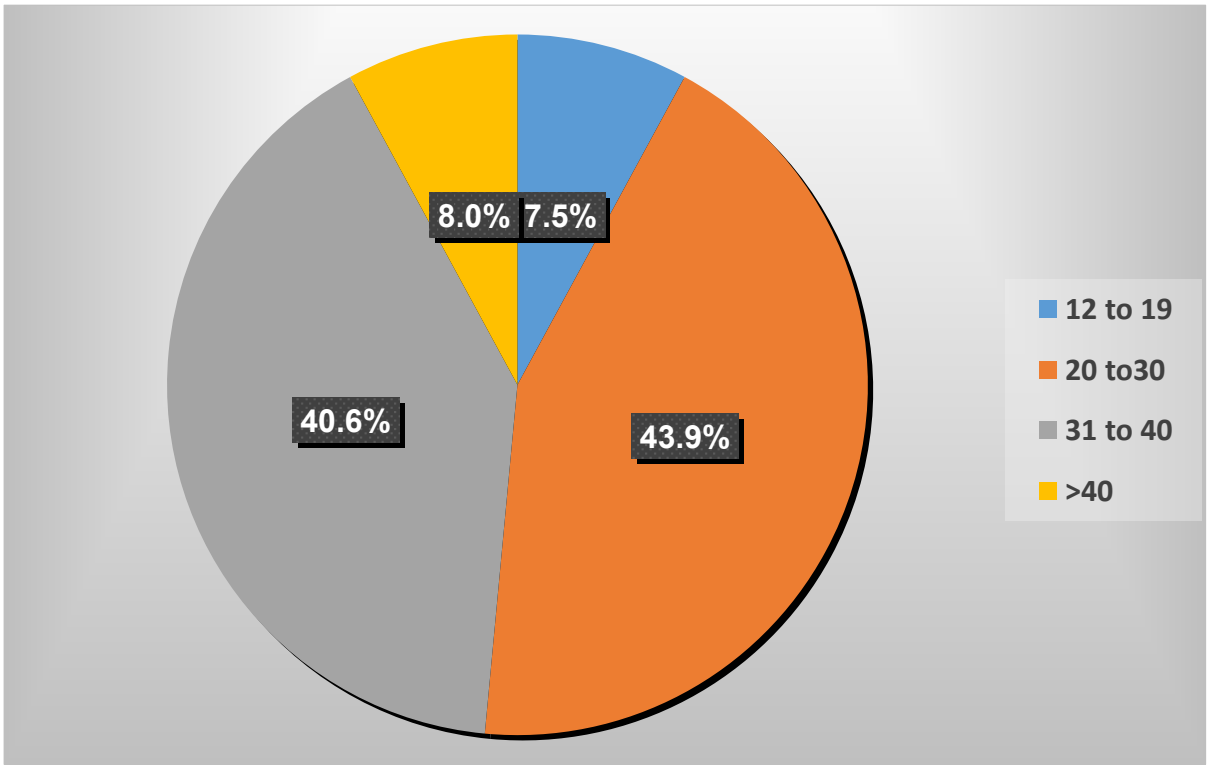


Figure 3.1 Distribution of sample by age group

In terms of population group, most of the women (79%, n=316), were Black African, 16% (n=64) were Coloured, 3.8% (n=15) were Indian or Asian and 1% (n=4) were White (Table 3.1). Almost two thirds (61%, n=243) were single, 33% (n=131) were married, and 6% (n=25) were either separated, divorced, or had no information on marital status. 52% (n=207)

were unemployed, while 33% (n=131) were employed, and 15% (n=61) had missing information. The majority of women in this study were single 61% (n=243) and just over half (52%, n=207) were unemployed. The level of education is unknown as it was recorded in only one clinical file.

Table 3.1 Socio-demographic characteristics of the sample

Variables	Categories	Frequency (N=399)	Percentage (%)
Population group*	Black African	316	79
	Coloured	64	16
	Indian/Asian	15	4
	Whites	4	1
Marital status	Single	243	61
	Married	131	33
	Separated/widow/ other	25	6
Employment status	Unemployed	207	52
	Employed	131	33
	Unknown	61	15
Highest Level of education	Completed grade 12	1	1
	Unknown	398	99

*Nomenclature according to population groups used by Statistics South Africa (Statistics South Africa, 2011)

3.2 Clinical characteristics of the sample

The clinical profile of the sample is presented in Table 3.2. Most women (88%, n=351) had a full term delivery, and 21% (n=82) were HIV positive. Almost three-quarters of the sample (71.7%, n=286), had 1-2 children, and only 0.3% (n=1) had more than five children. Caesarean was the most common method of delivery at 64% (n=25). Only 10% (n=40) of women gave birth to children with low birth weight. Approximately, all women booked for antenatal care and none of were recorded as having had contact with a psychological or psychiatric service.

Table 3.2 Clinical characteristics of the sample

Variables	Categories	Frequency	Percentage
Gestation at delivery	Full term	351	88
	Premature	47	11.8
	Unknown	1	0.2
HIV status	Negative	312	78
	Positive	82	21
	Unknown	5	1
Parity	1-2	286	71.7
	3 to 5	112	28
	>5	1	0.3
Method of delivery	Vaginal	143	36
	Caesarean	256	64
Birth weight	Normal	359	90
	Low	40	10
Antenatal care booking	Booked	398	99.7
	Not booked	1	0.3
Mental health services	No	399	100
	Yes	0	0

3.3 Prevalence and types of substance use

Of the 399 women, 45% (n=178) were recorded as using substances. In the 55% (n=221) of the records, no substance use was noted. Tobacco use was recorded in 37% (n=149) of records, alcohol use in 35% (n=138), and cannabis in 1% (n=4). Use of illicit substances was not recorded in any patient files.

Of the 178 records in which substance use was noted, 63% (n=113) of women used both alcohol and tobacco (Figure 3.2), 20% (n=36) used tobacco only, 14% (n=25) alcohol only, and 2% (n=4) cannabis only.

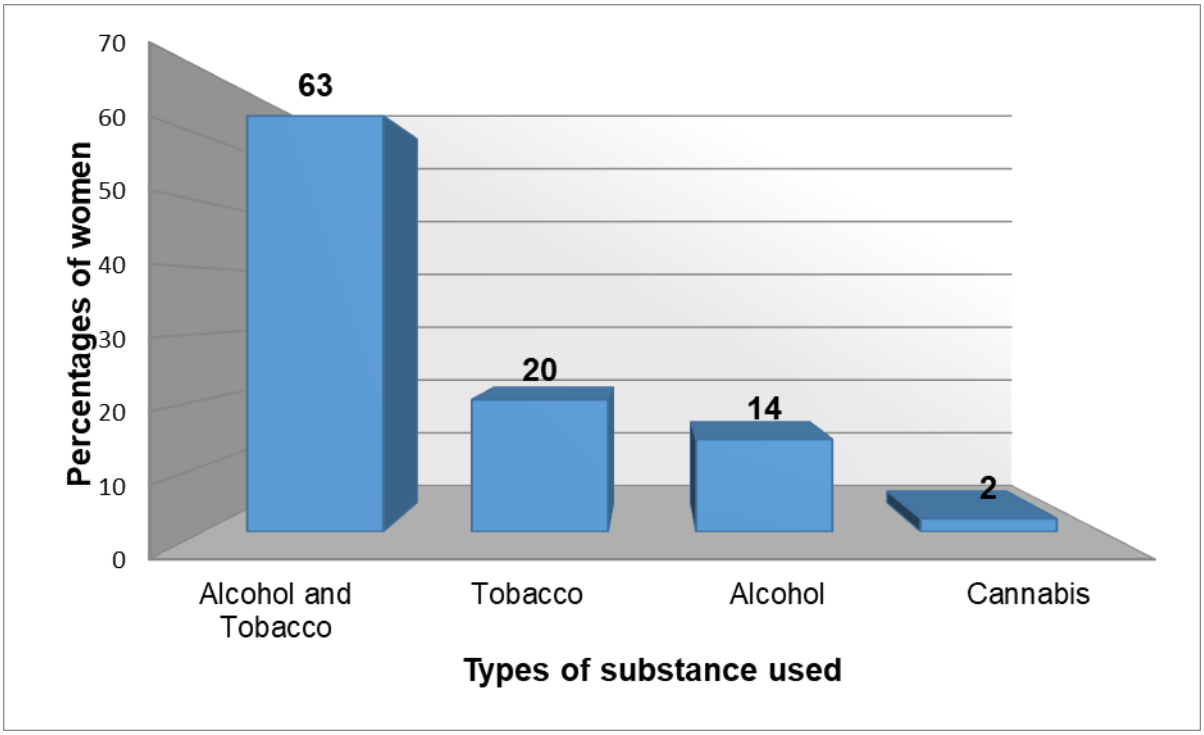


Figure 3.2 Frequency of substances used in those documented as users (n=178)

3.4 Associations between substance use and socio-demographic and clinical variables

Associations of substance use and socio-demographic variables are presented in Table 3.3. The age group of 12–19 years (n=30) was merged with age range of 20–30 years (n=175) to make one group of ≤30 years and equalled 51% of the sample (n=205). Age group 31–40 years (n=162) was merged with those 41 years and older (n=32) to make one group of ≥31 years, which was 49% of the sample (n=194). For population group, only Black African 83% (n=316) and Coloured 17% (n=64) were considered; Indian or Asian and White were excluded from this analysis due to their small numbers. For marital status, the categories of single 71% (n=243) and married 29% (n=131) were analysed. The category of separated/widow/other was excluded due to its ambiguity. For employment status, we used unemployed 38% (n=131) and employed 62% (n=207) women, and excluded unknown (n=61), due to it indicating missing data. On chi-square testing, and none of the sociodemographic variables were significantly associated with substance use.

Table 3.3 Association between substance use and socio-demographic variables

Variable	None n (%)	Yes n (%)	p-value
Age range (n=399)			
≤30	111 (54)	94 (46)	0.35
≥31	114 (59)	80 (41)	
Population group (n=380)			
Black African	175 (55)	141 (45)	0.72
Coloured	37 (58)	27 (42)	
Relationship status (n=342)			
Single	137 (56)	106 (45)	0.49
Married	69 (53)	62 (47)	
Employment status (n=338)			
Employed	113 (55)	94 (45)	0.53
Unemployed	67 (51)	64 (49)	

Table 3.4 shows the associations of substance use and clinical variables using a chi-square test. Significant associations between substance use and gestational age at delivery ($p<0.0001$), HIV status ($p=0.04$) and birth weight ($p=0.001$) were found.

The multivariate logistic regression analysis to determine the association of substance use with socio-demographic factors is presented in Table 3.5. Bivariate analyses (p-value at 0.1) showed associations of substance use with population group, gestational age at delivery, HIV status, parity, and birth weight. These variables were used to build a multivariate logistic regression model. Results showed significant associations of substance use with HIV status and birth weight. Women who were HIV negative were less likely to use substances [adjusted odds ratio (aOR) = 0.6, 95% Confidence Interval (CI) 0.35–0.96, p=0.04] than women who were HIV positive. Additionally, women using substances were 2.5 times more likely to have a child with low birth weight than non-users [aOR = 2.5, 95%CI: 1.23 -5.16, p= 0.01].

Table 3.4 Association between substance use and clinical variables

Variables	**No substance use n (%)**	**Substance use n (%)**	**p-value**
Delivery gestation Full term Premature	 212 (60) 13 (28)	 139 (40) 34 (72)	 <0.0001*
HIV status Negative Positive	 185 (59) 38 (46)	 127 (41) 44 (54)	 0.04*
Parity 1-2 ≥3	 155 (54) 70 (62)	 131 (46) 43 (38)	 0.16
Method of delivery Vaginal Caesarean	 84 (59) 141 (55)	 59 (41) 115 (45)	 0.48
Birth weight Normal Low	 212 (59) 13 (32)	 147 (41) 27 (68)	 0.001*

Table 3.5 Multivariate analysis of substance use correlates

Substance use correlate	**aOR (95%CI)**	**P-value**
Population group		
Coloured	1[Reference]	
Black	1.1 (0.65-2.00)	0.64
HIV status		
Positive	1[Reference]	
Negative	0.6 (0.35 – 0.96)	0.04*
Parity		
1-2	1[Reference]	
≥3	0.7 (0.45 – 1.16)	0.18
Birth weight		
Normal	1[Reference]	
Low	2.5 (1.23 – 5.16)	0.01*

Chapter 4 - Discussion

In this sample of 399 clinical files of women who delivered at Rahima Moosa hospital in Gauteng province, 45% were documented as substance users. Substance use was significantly associated with being HIV positive, preterm labour, and low birthweight.

4.2 Sample characteristics

At 79%, the majority of women in this study sample were Black African. This is similar to the 2011 National Census of the City of Johannesburg, which found 77.1% of the general population (men and women) were Black African (Statistics South Africa 2011). The proportion recorded as Coloured (16% of the sample) is considerably higher than the proportion of the general population found in the National Census (5.6%). This may be related to historical racial divides in the catchment area and hospital services during the apartheid era (Coronation Action 1986). However, the Indian or Asian population group, which accounted for 4% of the sample is similar to the proportion of the general population (4.9%), although they were also a race group for which Coronation hospital was established to serve. Notably, Whites only formed 1% of the study population, whereas they form 12.4% of the City of Johannesburg population.

It may be that employment plays a role with regards to the different population groups served by the hospital, as it is a public sector hospital and would therefore serve those who cannot afford private health care. The 2011 National Census found unemployment to be lowest among Indian or Asian and White women in the City of Johannesburg, at 16% and 10% respectively. At 52%, the unemployment rate in this sample of women from Rahima Moosa hospital was even higher than the National Census unemployment rates for Black African women (36%) and Coloured women (34%). This suggests a high level of poverty among the whole study sample.

As substance use in pregnancy is associated with poorer socio-economic conditions (May *et al*. 2005; World Health Organisation, 2018; World Health Organisation, 2014), this may explain the high level of substance use found in this study sample. However, there was no significant association with unemployment or population group.

4.1 Prevalence and type of substance use

Tobacco and alcohol were the most commonly used substances, being recorded in 37% and 35% of the total sample, respectively. Of those recorded as using a substance, 63% used tobacco and alcohol concurrently, 20% used tobacco only, followed by 14% using alcohol, and 2% used cannabis. No record of substance use may be related to missing information or the persons who did not use substances. The profile of substance use noted in this study may reflect the trends in the catchment area or the nature of the questioning – that enquiry after specific substances was not complete and patients may have not volunteered information on illicit substances because of stigma and fear of discrimination. Maybe it is related to the small sample, or coincidence given that the sample was drawn from only three weeks of deliveries.

The findings of this study are fairly similar to those of Petersen-Williams *et al*. (2014), using a structured questionnaire (the Alcohol, Smoking, and Substance Involvement Screening Test (ASSIST)) in the Western Cape. Among 684 pregnant women, 28.3% screened positive for tobacco use, 36.8% for alcohol use, 2.9% for cannabis use, and 2.4% for methamphetamine use. However, a higher prevalence of alcohol use was found at Rahima Moosa hospital than another questionnaire-based study in the Western Cape, which found 18% of 376 pregnant women used substances (Onah *et al*. 2016). Of those who screened positive for substance use, 76% used alcohol (13.7% of the total sample).

The prevalence of substance use in this sample at Rahima Moosa were higher than international surveys. A 2013 national survey in the United States of America reported the rate of tobacco use in pregnancy was 15.4% and alcohol use 9.4%, with 5.4% for other illicit substances (SAMHSA, 2013). Results from a population-based cohort study by Muggli, O'leary, Donath *et al*. (2016) documented that 27% of Australian pregnant women drank in the first trimester, and 27% continued to drink alcohol at some level during pregnancy. In other studies, 13.8% of Australian women reported cigarette smoking in the first 20 weeks of pregnancy, and 5% of women screened were using cannabis and 2% other illicit drugs in pregnancy.

The high rates recorded in the files of pregnant women at Rahima Moosa are concerning, especially as these may be an under-estimate. A study in South Africa and Uganda by Raggio *et al*. (2019) found that 16% of 163 HIV positive pregnant women under-reported their

alcohol when comparing patient report to biomarkers for alcohol use (Raggio *et al*., 2019). It is possible that substance use was not fully explored by antenatal staff in this study.

4.2 Association between substance use and HIV status

Using biomarkers, Raggio *et al*. (2019) found 43% of their sample of HIV positive women tested positive for alcohol use. In Kwa-Zulu Natal, Desmond K *et al*. (2012) explored alcohol consumption among HIV–positive pregnant women who enrolled in Prevention of Mother-To-Child Transmission programmes at 8 clinics. They found that 18% reported drinking during pregnancy, of whom 67% were binge drinkers (Desmond *et al*. 2012). This study further indicated that women living in urban and peri-urban locations were more likely to drink. Contrary to studies suggesting greater alcohol use among people with poorer socio-economic conditions (May *et al*. 2005; World Health Organisation, 2018), they found alcohol use to be associated with higher economic status and greater social engagement. However, married women were less likely to drink, while women who had poorer mental health used tobacco or had a greater history of sexual risk-taking were more likely to drink.

4.3 Association between substance use and low birth weight

In these findings, substance use in pregnancy was associated with a low birth weight of infants. Low birth weight could be related to premature delivery, which was significantly associated with substance use, or related to small for gestational age babies. According to the WHO report (2018) and Cook *et al*. (2017), chronic alcohol use during pregnancy, defined as the ingestion of two or more drinks per day, has been associated with increased rates of spontaneous abortion, higher rates of low-birth-weight infants, placental abruption, increased perinatal mortality, amnionitis, and a threefold increase in preterm deliveries. Some evidence suggests that alcohol impairs the placental transfer of essential amino acids and zinc, thus increasing the risk for intrauterine growth retardation by inhibiting protein synthesis.

Also, according to the WHO (2018), risks of tobacco abuse during pregnancy exist for both mother and fetus. Odendaal *et al.* (2019) reported that pregnant women who smoke have an increased risk for ectopic pregnancy, premature rupture of membranes, placental abruption, placenta previa, and stillbirth. Tobacco smoking during pregnancy is also linked to

neurodevelopmental abnormalities that are caused by changes in cognition in fetal brain development. Risks to the fetus include preterm birth, low birth weight, intrauterine growth restriction, birth defects such as cleft lip or palate, and sudden infant death syndrome. In addition, prematurity is a risk factor for developmental disorders such as cerebral palsy, learning disabilities, and even death. Smoking during pregnancy is further associated increased risk for mental disorders such as attention deficit hyperactivity disorder, bipolar disorder, conduct disorders and schizophrenia.

Cannabis use was not reported frequently but could be serious where it occurs in pregnancy. Wilson and Thorp (2008) reported that cannabis use during pregnancy has been associated with few short-term or long- term effects on the exposed neonate, its risks are dose-dependent, with an increased incidence of intrauterine growth retardation and sudden infant death syndrome seen in the infants born to heavy users.

4.4 Limitations of the study

As a retrospective record review, the study is limited by the quality of the data, being dependent on routine clinical notes. In addition to incomplete or inaccurate data, a limitation of retrospective record reviews includes unreliable or inconsistent record keeping. Importantly, the large number of missing records (approximately 570 records were not retrieved from the records office) may have skewed the sample. It is possible that it includes a larger proportion of women who delivered babies by Caesarean section, as these records appeared to be better maintained. It also means that the sample cannot be generalised to the population of women who deliver at the hospital. In addition, Rahima Moosa Mother and Child hospital is a tertiary hospital. As such, the study sample does not represent the broader population of pregnant women in the catchment area but rather those with some degree of obstetric risk requiring referral up from a primary health care centre.

Chapter 5 – Conclusion and Recommendations

Notwithstanding the limitations, this study indicates a high prevalence of substance use among pregnant women delivering at Rahima Moosa Mother and Child hospital. Consistent with the literature, it found substance use to be associated with being preterm delivery, low birth weight, and positive HIV status. Although it contributes to the understanding of substance use in pregnancy in Gauteng province, South Africa, there is a dire need for greater research.

5.1 Recommendations

From the findings of this study, the following may be recommended:

- Intensified identification of substance use among pregnant women with brief intervention, and referral for treatment is likely to be needed. This may include strategies such as:
    - Training antenatal staff on how to approach women who use substances in a compassionate and non-discriminatory manner, with awareness of the need to reduce stigma.
    - The use of educational posters and pamphlets to inform patients and improve self-report.
    - Systematic substance use enquiry as part of the antenatal case record.

- More research is needed in South Africa on substance use among women of reproductive age and during and after pregnancy. There is a need to understand risk factors and to develop effective biopsychosocial interventions.

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Appendix 1 – Data collection sheet

AGE

12–20 (12 – 19 years)	20-30	30–40 (31 – 40 years)	> 40 (≥41 years)
1	2	3	4

RACE

BLACK	WHITE	ASIAN	COLOURED	OTHER
1	2	3	4	5

RELATIONSHIP STATUS

SINGLE	MARRIED	WIDOWED	SEPARATED	UNKNOWN
1	2	3	4	5

EMPLOYMENT

UNEMPLOYED	EMPLOYED	UNKNOWN
1	2	3

HIGHEST LEVEL OF EDUCATION

NONE	PRIMARY	< GRADE 7	GRADE 7-12	TERTIARY	UNKNOWN
1	2	3	4	5	6

GESTATIONAL AGE

PRETERM	TERM	UNKNOWN
1	2	3

HIV STATUS

HIV +	HIV -	UNKNOWN
1	2	3

PARITY

0 - 2 CHILDREN	3 – 5	> 5 (Para 6 or more)
1	2	3

METHOD OF DELIVERY

NORMAL VAGINAL DELIVERY	CEASARIAN SECTION
1	2

BOOKING STATUS

BOOKED	UNBOOKED
1	2

SUBSTANCE OF ABUSE

ALCOHOL	TOBACCO	CANNABIS	OTHER	UNKNOWN
1	2	3	4	5

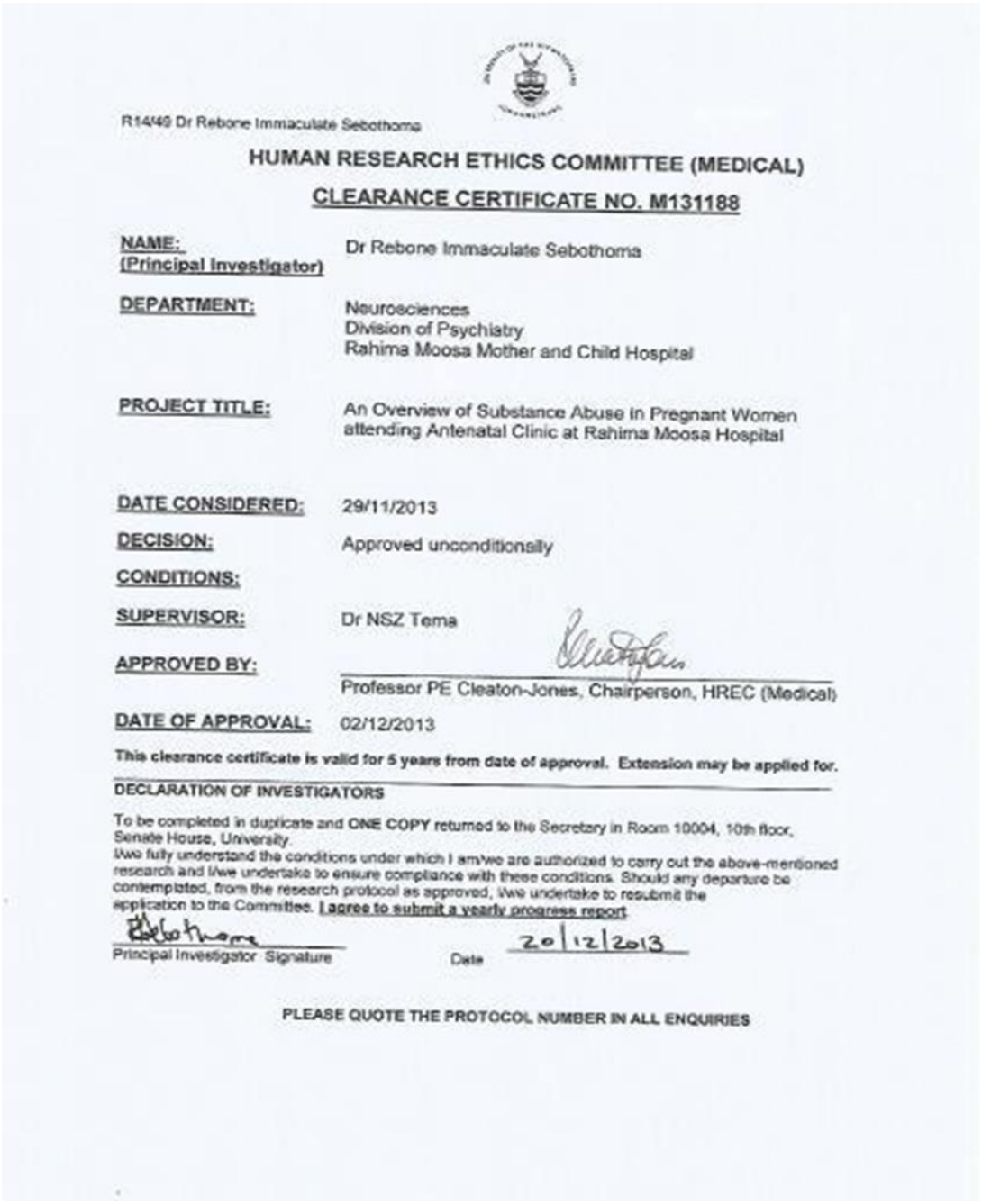
CONTACT WITH PSYCHOLOGICAL/PSYCHIATRIC SERVICES

YES	NO
1	2

BIRTH WEIGHT

NORMAL	LOW BIRTH WEIGHT
1	2

Appendix 2 – Ethics approval



R14/49 Dr Rebone Immaculate Sebothoma

HUMAN RESEARCH ETHICS COMMITTEE (MEDICAL)

CLEARANCE CERTIFICATE NO. M131188

NAME: (Principal Investigator)	Dr Rebone Immaculate Sebothoma
DEPARTMENT:	Neurosciences Division of Psychiatry Rahima Moosa Mother and Child Hospital
PROJECT TITLE:	An Overview of Substance Abuse in Pregnant Women attending Antenatal Clinic at Rahima Moosa Hospital
DATE CONSIDERED:	29/11/2013
DECISION:	Approved unconditionally
CONDITIONS:	
SUPERVISOR:	Dr NSZ Tema
APPROVED BY:	Professor PE Cleaton-Jones, Chairperson, HREC (Medical)
DATE OF APPROVAL:	02/12/2013

This clearance certificate is valid for 5 years from date of approval. Extension may be applied for.

DECLARATION OF INVESTIGATORS

To be completed in duplicate and **ONE COPY** returned to the Secretary in Room 10004, 10th floor, Senate House, University.

I/we fully understand the conditions under which I am/we are authorized to carry out the above-mentioned research and I/we undertake to ensure compliance with these conditions. Should any departure be contemplated, from the research protocol as approved, I/we undertake to resubmit the application to the Committee. **I agree to submit a yearly progress report.**

Principal Investigator Signature

Date 20/12/2013

PLEASE QUOTE THE PROTOCOL NUMBER IN ALL ENQUIRIES

Appendix 3 – Permission to conduct research

UNIVERSITY OF THE
WITWATERSRAND,
JOHANNESBURG

DEPARTMENT OF PAEDIATRICS & CHILD HEALTH
RAHIMA MOOSA MOTHER AND CHILD HOSPITAL

Private Bag X20, Newclare 2112, South Africa Telephone: +27 11 470-9100/9284-E-Mail: Ashraf.Coovadia@wits.ac.za

7 May 2019

TO WHOM IT MAY CONCERN:

RE: APPROVAL TO CONDUCT RESEARCH

This letter serves to confirm that Dr RI Sebothoma applied for approval to conduct research entitled "AN OVERVIEW OF SUBSTANCE ABUSE IN PREGNANT WOMEN ATTENDING ANTENATAL CLINIC AT RAHIMA MOOSA HOSPITAL" at this institution in 2013.

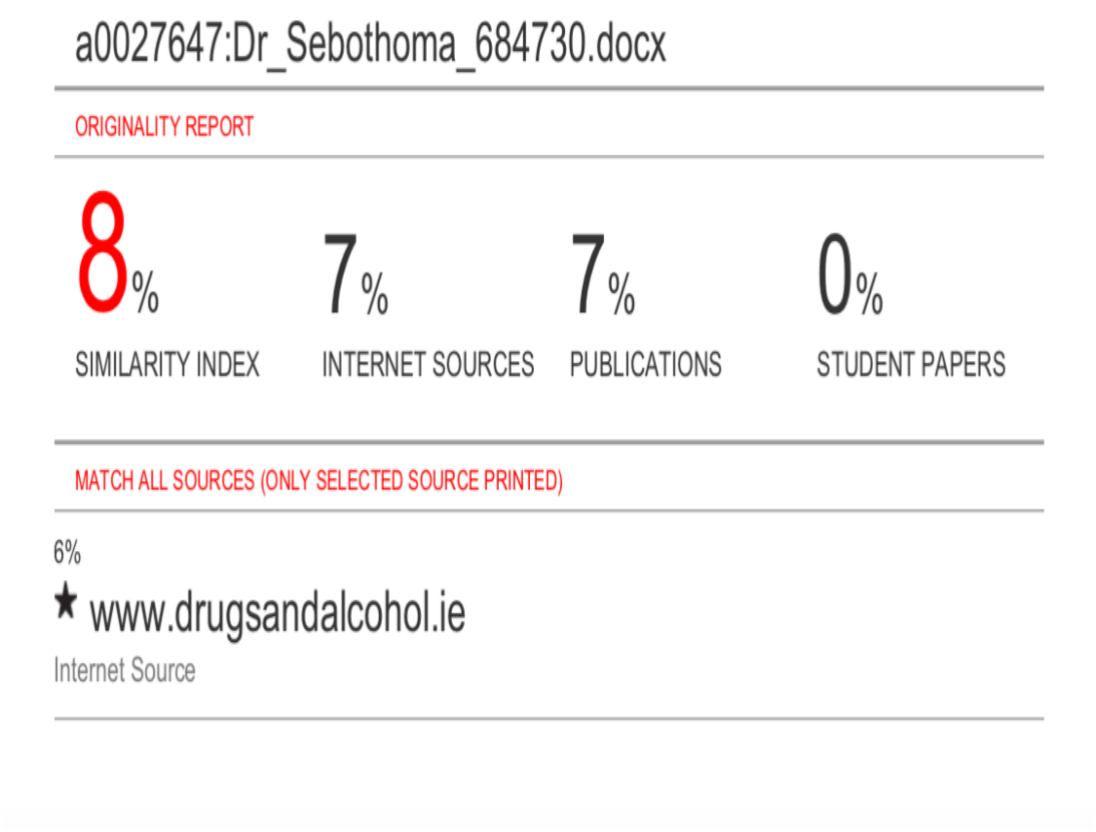
She subsequently lost her only copy of the letter and came to the hospital today to request a copy of the original document. She was informed by the person responsible for overseeing the administrative process when she initially applied that she had no records of the specific letter.

Dr Sebothoma was indeed granted the necessary permission by the Chief Executive Officer at the time, Mrs. S Jordaan.

Sincerely,

ADJUNCT PROFESSOR ASHRAF HASSEN COOVADIA
Academic Head of Paediatrics and Child Health (Director: Research)
Rahima Moosa Mother and Child Hospital

Appendix 4 – Plagiarism report



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ORIGINALITY REPORT

8%	7%	7%	0%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

MATCH ALL SOURCES (ONLY SELECTED SOURCE PRINTED)

6%

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