Back pain and its relationship to socio-demographic and psycho-social factors in a cohort of pregnant women attending a primary health care clinic in the eThekwini municipality

By

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Dissertation submitted in partial compliance with the requirements for the Master's Degree in Technology: Chiropractic.

I, Carmen Hawker, do declare that this dissertation is representative of my own work in both conception and execution (except where acknowledgements indicate to the contrary).

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Dedication

To my Mom and Dad, Phyl and Rob Hawker – words can't describe how much I appreciate the both of you. You have stood by me on what seemed to be an endless journey, with your love and support never wavering, and always with an endless amount of encouragement. I could not have done this without you. I am privileged to be your daughter, I hope I have made you proud.

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Abstract

Background: The prevalence of back pain and general discomfort is not uncommon in pregnant women, often being under-reported until it affects their daily routine. South Africa, a third world developing country has unique risk factors and demographic profile. Although many studies have previously studied the various factors relating to back pain in pregnancy, this topic is far from being exhausted as a research area. Specifically, new studies should be conducted on the prevalence of back pain in pregnancy to analyse the impact it has on women worldwide. Little research has been conducted on rural communities in Africa especially in South Africa, to assess the risk of pregnancy-related back pain. Therefore, the information obtained from this study will provide a better understanding of the demographics, physical demands and psycho-social stresses experienced by pregnant women in this understudied population.

Back pain and general discomfort is not uncommon in pregnant women, but it is often under-reported and can be disabling. International studies report a high prevalence especially in the last trimester. Little is known about the prevalence of and risk factors for back pain in South African pregnant women. Thus, this study aimed to determine the relationship between socio-demographic and psychosocial factors in a cohort of pregnant women attending a primary health care clinic in the eThekwini municipality of the province of KwaZulu-Natal, South Africa.

Method: A retrospective descriptive cohort design was utilized whereby 382 participants' files were assessed for eligibility. The files consisted of a socio-demographic questionnaire, a chart review and two epidemiological questionnaires that were administered to the participants during the first and third trimester. Permission to access these files was obtained from the principle investigator of the MRC/DUT project. All participants signed consent forms for research purposes. The data relevant to this study was extracted and analysed using Statistical Package for the Social Science version 24.0 (IMB Analytics). Descriptive statistics were used to describe the data in terms of means and standard deviations or frequencies and count where appropriate. Inferential statistics allowed for relationships between the variables to be assessed. A p - value of less than 0.05 was used to indicate statistical significance.

Results: The total of 303 files were included. Participants were Black Africans, mostly single (81.2%, n=229) with a mean age of 25.84 (±SD 6.04). There was a high unemployment rate (70.8%, n=199), with most having obtained a secondary education

(77.1%, n=213), and 44.1% (n=122) residing in squatter camps. There was a high human immunodeficiency infection rate (40.5%, n=94). Of the 303 participant files eligible for the study only 46 returned for the third trimester follow up. The prevalence of BP in the first trimester was 12.4% (n=35) and 10.9% (n=5) in the third trimester. LBP was the most (8.5%, n=24) in the first and 10.9% (n=5) in the third trimester, followed by UBP and NP. The incidence of back pain over the duration of pregnancy was zero. Being single (p = 0.03), reporting no stress (p = 0.04), not using pain killers (p = 0.01), and no alcohol consumption in the current pregnancy (p = 0.03) were associated with a decreased risk of back pain. There were no relationships found between the variables and back pain prevalence in the third trimester.

Conclusion: The women attending this primary health care clinic are relatively young, come from a low socio-economic area with low reported levels of stress and substance abuse. They reported low levels of back pain. The follow up rate at the third trimester was low and this may skew the results of this study. Further research is needed in this community and South Africa to appreciate the prevalence and impact of back pain in pregnancy.

Keywords: Pregnancy, back, cervical, thoracic, lumbar, pain, prevalence, risk factors, demographic, psycho-social, epidemiology, South Africa.

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Definitions

Acute: Pain that has been present for less than or equal to four weeks (Dorland, 2007).

Antenatal care (ANC): defined as the care provided by skilled health-care professionals to pregnant women and adolescent girls in order to ensure the best health conditions for both mother and baby during pregnancy (WHO, 2016)

Antenatal: before birth; during or relating to pregnancy (also known as prenatal) (Encyclopaedia Britannica, 2018).

Back pain: Pertains to pain originating from the spinal column and related structures e.g. muscles, ligaments and nerves in the cervical, thoracic and lumbosacral regions (Vernon, 2012).

Chiropractic: comes from the Greek word for "being done by hand" and its principle bases around that the body can heal itself when the skeletal system is correctly aligned and the nervous system is working properly (Ramasubramaniam *et. al*., 2012).

Chronic: Pain that is present for twelve weeks or more (Treede *et. al.,* 2015)

Co-morbidity: A disease or condition that coexists with but is independent of another disease or condition (Encyclopaedia Britannica, 2018).

Gravida: the number of pregnancies a woman has had (Merriam Webster Medical Dictionary, 2018)

Incidence: The occurrence of new cases of disease, injury or medical conditions over a specific time period (Encyclopaedia Britannica, 2018).

KwaZulu-Natal: One of nine provinces in South Africa.

Lordosis: the normal curvature of the cervical and lumbar regions of the spine (Merriam Webster Medical Dictionary, 2018).

Multigravida: a woman who has been pregnant more than once (Merriam Webster Medical Dictionary, 2018).

Multiparous: having borne more than one child (Merriam Webster Medical Dictionary, 2018).

Musculoskeletal: relating to or involving both the musculature and skeleton (Merriam Webster Medical Dictionary, 2018).

Non-communicable disease: condition or disease that is non-infectious and non-transmissible (WHO, 2018).

Nulliparous: never having been pregnant before (Merriam Webster Medical Dictionary, 2018).

Pain: An unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage (International Society of Pain, 2018).

Parity: the number of times a woman has given birth (Merriam Webster Medical Dictionary, 2018).

Post-partum: the period following childbirth (Merriam Webster Medical Dictionary, 2018).

Prevalence: the number of people in a defined population who have a specified disease or condition at a point in time. Thus, prevalence equals the number of people with a health problem at a point in time divided by the total defined population alive at this point in time (Encyclopaedia Britannica, 2018).

Primigravida: an individual is pregnant for the first time (Merriam Webster Medical Dictionary, 2018).

Primiparous: has only given birth once (Merriam Webster Medical Dictionary, 2018).

Psycho-social: relating to the interrelation of social factors and psychological factors (Merriam Webster Medical Dictionary, 2018).

Radicular: of, relating to, or involving a nerve root (Merriam Webster Medical Dictionary, 2018).

Abbreviations and Acronyms

%	Percentage
<	refers to a figure “less than” the figure reported
>	refers to a figure “more than” the figure reported
BP	Back pain
MSK	Musculoskeletal
HIV	Human Immunodeficiency Virus
KZN	KwaZulu-Natal
PHC	Primary Health Care
ANC	Antenatal Care
N	Total sample size
n	Sub sample size
DUT	Durban University of Technology
MRC	Medical Research Council
IREC	Institutional Research Ethics Committee
SPSS	Social Package for the Social Sciences
LBP	Low Back Pain
UBP	Upper Back Pain
NP	Neck Pain
p-value	Probability value
±SD	Standard deviation
UK	United Kingdom
USA	United States of America
CVS	Cardiovascular
NSAIDS	Non-steroidal anti-inflammatories
SA	South Africa
TB	Tuberculosis
ARV	Anti-retroviral

Chapter One

Introduction

1.1 Introduction

Back pain (BP) is an important health and economic problem affecting a significant amount of the population. It is a highly prevalent disabling musculoskeletal (MSK) condition (Williams *et al.* 2015) with a severe impact on both society and the individual (Docking *et al.* 2011). Pregnancy related BP is a common complication of pregnancy and represents a significant health problem during and after pregnancy (Bergström *et al.* 2016). The prevalence of pregnancy-related BP varies from 20%-90%, with most studies having results above 50% (Katonis *et al.* 2011; Bergström *et al.* 2016; Usman *et al.* 2017). International literature on the effects of BP in pregnancy is well established, and has attracted much attention (Orvieto *et al.* 1994; Östgaard 1996; Borggren, 2007; Louw *et al.* 2007; Pierce *et al.* 2012; Jimoh *et al.* 2013; Ramachandra *et al.* 2015). In comparison, there is a paucity of information in developing countries (Charpentier *et al.* 2012). Few studies have reported BP prevalence and characteristics during pregnancy in African countries. Those that have been done reported the prevalence of BP to be between 52,5% and 90% (Nwuga 1982; Ayanniyi *et al.* 2006; Jimoh *et al.* 2013), which is not dis-similar to that seen in first world populations. In the South African context this area of investigation has received little attention thus it is unknown if South Africa women suffer with BP during pregnancy at a similar rate as those described elsewhere.

Pregnancy has a profound physiological effect on a woman's body, affecting not only the cardiovascular, endocrine, and renal systems, but also the MSK system (Casagrande *et al.* 2015), particularly the axial skeleton (Usman *et al.* 2017). Postural changes, weight gain, and joint and ligament laxity all are possible contributors to MSK pain (Ramachandra *et al.* 2015) as well as risk factors such as previous history of BP, strenuous work, BP in previous pregnancies, an increasing gravidity, as well as demographic and psycho-social factors (Charpentier *et al.* 2012). Most women fail to seek help until the pain interferes with their daily lives (Sencan *et al.* 2017). Multiple studies have identified high rates of sick leave during pregnancy (Dørheim *et al.* 2013; Malmqvist *et al.* 2012; Truong *et al.* 2017), whereby BP is one of the most common causes (Dørheim *et al.* 2013; Malmqvist *et al.* 2012). BP has not only physical but also psychological and social consequences on the pregnant women (Backhausen 2017).

South Africa is the southernmost country of Africa, and is a multi-ethnic society encompassing a wide variety of cultures, languages and religions. South Africa is home to an estimated 56 million people, with five racial population groups (Black Africans, Whites, Coloureds, Indian or Asians, and other unspecified) (www.statssa.gov.za/census/census_2011/census_products/Census_2011_Census_in_brief.pdf, 2011). There is a high prevalence of Human Immunodeficiency Virus (HIV) in South Africans (13.1%), with approximately one-fifth of women in South Africa in their reproductive ages (15-49) being HIV positive (www.iol.co.za/news/south-africa/gauteng/, 2018). The eThekwini municipality, in the province of KwaZulu-Natal (KZN), is home to some 3,5 million people. It consists of a diverse society, which faces various social, economic and environmental challenges. There is a high unemployment rate (30.2%) with 40% female headed households (www.statssa.gov.za/ethekwini-municipality/, 2011). About 84% of the population depends on the public healthcare system, which is afflicted with human resource shortages and limited resources. This has large health implications on the population (www.brandsouthafrica.com/south-africa-fast-facts/health-facts/health-care-in-south-africa, 2012). It has been shown that current management of BP at primary health care (PHC) levels in South Africa has been ineffective with no conformity to guidelines (Major-Helsloot *et al.* 2014).

This highlights the unique context of this study, and it has been reported that factors such as low socio-economic profile and high disease prevalence predisposed communities to a greater prevalence of disease and disability (Worku 2000; Louw *et al.* 2007). The impact that these factors have on the prevalence of pregnancy related back pain in South Africa is under researched. This research aims to provide quantifiable information that may aid in the future management of pregnant women by health care professionals in the South African context. This research may provide a stance for future studies to be conducted, as well as adding to the existing body of research.

1.2 Problem statement, study aims and objectives

1.2.1 Problem statement

It is known that BP can create a significant burden during pregnancy. Despite international literature being well established, little research has been conducted in the African context, specifically in South Africa. The South Africa setting is unique as it has a high rate of unemployment, struggling health care system, large burden of disease and a multi-cultural population. Indicating that the findings of BP prevalence in developed or other developing countries cannot be extrapolated to this country. In addition little has been documented in

South Africa regarding BP in pregnancy. Thus this study aims to determine the socio-demographic and psycho-social factors and their relationship to pregnancy related back pain in South Africa.

1.2.2 Aim of the study

The aim of this study was to determine the incidence and prevalence of BP in pregnancy and its relationship to socio-demographic and psycho-social factors in a pregnant cohort in a Primary Health Care (PHC) clinic in eThekwini municipality.

1.2.3 Objectives

1. To determine the prevalence of BP pre-pregnancy, at the first and third trimester, and to determine the incidence of BP in participants attending a PHC in KZN.
2. To determine the profile of BP in terms of location, duration and severity during pregnancy.
3. To determine the socio-demographic, medical history, psycho-social and pregnancy related information of the participants and its relationship to BP in pregnancy.

1.3 Rationale

The prevalence of BP and general discomfort is not uncommon in pregnant women, often being under-reported until it affects their daily routine (Ramachandra *et al.* 2015). South Africa, a third world developing country (Young 2014), has unique risk factors and demographic profile. Although many studies have been previously conducted to study various aspects of factors relating to BP in pregnancy, this topic is far from being exhausted as a research area. Specifically, new studies should be conducted on the prevalence of BP in pregnancy to analyse the impact it has on women worldwide. Little research has been conducted on rural communities in Africa (Worku 2000), especially in South Africa, to assess the risk of pregnancy related BP. Therefore, the information obtained from this study will provide a better understanding of the demographic and psycho-social stresses experienced by pregnant women in this understudied population.

1.4 Delimitations

On conducting descriptive research, as in this study, there are numerous variables that can be used to describe the characteristics of a population (Brink and Van Rensburg 2018). In order to meet the aim of this study, this study was designed to determine the prevalence

and incidence of BP during pregnancy, to profile BP in terms of location, duration and severity, as well as the characteristics of the population in terms of the following variables: age, marital status, education, employment status, living conditions, medical history, psycho-social profile.

1.5 Background to the study

The current study utilised data collected by the Durban University of Technology (DUT) and the Medical Research Council (MRC) of South Africa collaboration project titled "A multi-staged multi-disciplinary health care approach in reducing maternal morbidity and mortality rates in a PHC clinic in Cato Manor" that took place between the 10th of October 2015 to the 11th of October 2016, and will hereafter be referred to as the DUT/MRC project.

Permission to access the participant research files (N=383) was obtained from the principle investigator, Prof N. Sibiya (Appendix E). The current study will fulfil the MRC/DUT projects expected output goals which included interdisciplinary research between allied health professions, including Chiropractic and the development of postgraduate Masters' students.

The MRC/DUT project was conducted in a PHC facility in Cato Manor, which is located in Umkhumbane (Mayville), in the eThekwini District Municipality of KZN. The clinic services people from a disadvantaged socio-economic community including informal settlements. A convenient, non-probability sampling method was utilized by the MRC/DUT project. All pregnant women who attended the clinic for their first antenatal visit before 24 weeks were approached to participate. All participants who agreed to participate were followed from their first antennal visit up until their delivery and to six weeks post-delivery.

Prospective participants were informed of the research study by the research nurse and recruitment personnel, who were trained. In addition, advertisements were placed in the clinic via a MRC flagship advertisement banner. All participants were given a letter of information and a consent form to sign (Appendix B). The participants were required to complete a socio-demographic questionnaire (Appendix D (I)) at the first antenatal visit, and an epidemiology questionnaire at both the first antenatal visit and in the third trimester (Appendix D (II) and D (IV)). A research assistant filled in the chart review at three different stages in the pregnancy (4-24 weeks gestational age, 24-32 gestational age, and 32-40 gestational age) which provided information from the participants clinic chart.

Ethical approval for the MRC/DUT collaboration project was granted from the Institutional Research Ethics Committee (IREC) of the DUT and eThekwini Health District and KZN Provincial Department of Health (Appendix C).

1.6 Flow of dissertation

Chapter One provides an introduction to the study and includes the problem statement, the aims and objectives, rationale and delimitations of the study, as well as a background to the study.

Chapter Two will provide a review of relevant literature for this study.

Chapter Three will provide the methods and materials used in this study and are discussed and explained.

Chapter Four presents the analysis of the data in the form of tables and figures.

Chapter Five will discuss the results relevant to the current literature.

Chapter Six will provide the conclusion, recommendations and limitations of the study.

Chapter Two

Literature Review

2.1 Introduction

In the life of a woman, becoming a mother is one of the most important and challenging events that she will experience. The body undergoes profound changes, which is sometimes accompanied by physical and psycho-social problems. To a new mother, pregnancy is a time that is supposed to be a joyous and happy period, and a preparation period to welcome her unborn child into the world. In a woman's mind, there are great prospects for the future which include the pregnancy, the delivery, the new born child and motherhood. A woman experiences remarkable changes as a new human life is conceived and grown within her womb. Her anatomy and physiology change to support and nurture the unborn child, until its birth (www.who.int/topics/pregnancy/en/, 2018). However, a large percentage of women will experience MSK pain during pregnancy, particularly BP, which has a negative impact on women's daily activities, quality of life, and ability to work (Mota *et al.* 2015)

Back pain is a widespread disorder associated with enormous health care costs and work loss (Sitthipornvorakul *et al.* 2011). It is more common in women than men attributable to hormones, pain sensitivity, and social and psychological factors (Sencan *et al.* 2017). Pregnancy is a predisposing factor for BP (Sencan *et al.* 2017), with BP being one of the most common symptoms to appear in pregnancy (Bergström *et al.* 2016).

This chapter will discuss the prevalence and incidence of BP in pregnancy, its associated risk factors and the MSK changes occurring in pregnancy. The scholarly sources used to inform this literature review were sourced using the following search engines: Google scholar, DUT institutional repository, Research Gate, Medline, PubMed, ScienceDirect, Summon and EBSCOhost. The key terms used included: pregnancy, spinal, back, cervical, thoracic, lumbar, pain, prevalence, incidence, risk factors, demographics, psycho-social, aetiology, epidemiology, chiropractic, South Africa, Africa.

2.2 Back pain in pregnancy

Pregnancy-related BP is pain of a MSK origin that is experienced in the neck, thoracic region or lower back. Low back pain (LBP) is by far reported to be the most prevalent during pregnancy (Endresen 1995; Kristiansson *et al.* 1996; Ayanniyi *et al.* 2006; Sabino and

Grauer 2008). BP in pregnancy with the absence of a specific cause is classified as mechanical in origin (Katonis *et al.* 2011). Although many women experience BP during pregnancy, it is not seen or considered as an important health concern (Quaresma *et al.* 2010). BP is one of the most common problems affecting women of childbearing age, and will affect half of all women at some stage during their pregnancy (Katonis *et al.* 2011; Abebe *et al.* 2014; Usman *et al.* 2017). Many women will experience their first episode of BP during pregnancy, and some women will have persisting BP post-partum (Ayanniyi *et al.* 2006).

For many women there is an expectation that while pregnant, life continues more or less normally (Mota *et al.* 2015) however, the problem of BP in pregnancy has attracted the attention of researchers globally (Östgaard *et al.* 1996; Louw *et al.* 2007; Jimoh *et al.* 2013; Ramachandra *et al.* 2015) and according to Ayanniyi *et al.* (2006) there is no doubt that BP is one of the most common complications associated with pregnancy and is often accepted as inevitable (Stuber and Smith 2008). Women are encouraged to believe that their symptoms are temporary and self-limiting (which may not always be the case) (Östgaard and Andersson 1992; Ayanniyi *et al.* 2006; Abebe *et al.* 2014) and their complaints are often dismissed as "normal aches and pains of pregnancy" (Vermani *et al.* 2009; Usman *et al.* 2017). Recent research (Backhausen 2017) has demonstrated that BP has a huge impact on women's functioning and well-being, and not only will BP persist in many women after pregnancy, many have linked their onset of chronic BP to pregnancy (Abebe *et al.* 2014).

2.3 Prevalence and incidence of BP in pregnancy

Epidemiological studies indicate that virtually all women will experience some degree of MSK discomfort during pregnancy (Borg-Stein *et al.* 2005) of which BP is by far the most prevalent (Morgan and Pohjanen 2005). When assessing the incidence of BP during pregnancy it has been reported to be relatively high, with researchers worldwide having suggested it may be between 30% and 70% (Endresen 1995; Kristiansson *et al.* 1996; Ayanniyi *et al.* 2006) which is above the average compared to the general population (Leboucher *et al.* 2017) - which is between 4.4% to 33% (Thiese *et al.* 2014). Studies investigating the incidence of BP over the duration of pregnancy are uncommon. However, in a study conducted in Nigeria (Usman *et al.* 2017), the incidence of BP during pregnancy was reported to 34.3% (N=309).

The prevalence of BP in pregnancy is substantial (Katonis *et al.* 2011; Usman *et al.* 2017). Wu *et al.* (2004), in a systematic review, reported that the average prevalence of BP in pregnancy was 45.3% (range from 3.9 to 89.9%, median 49%). The authors indicated that

the prevalence rates varied due to different study methodologies being used, variations in the definition of BP, variations in populations being investigated and prevalence periods, and often small sample sizes. Since this review there have been many more studies, as can be seen in Table 2.1.

Table 2.1: Prevalence of BP in pregnancy

AUTHOR	DATE	COUNTRY	POUULATION GROUP (n)	LOCATION	PERIOD/POINT(*) PREVALENCE %			
Sencan *et al*.	2017	Turkey	National (N=1500)	LBP	53.9%			
Backhausen	2017	Denmark	National (N=566)	LBP	1st Trim *		3rd Trim *	
					76%		90%	
Parikh and Mishra	2015	India	National (N=116)	LBP	48.2%			
Carvalho *et al*.	2015	Brazil	National (N=97)	LBP	68%			
Mota *et al*.	2015	Portugal	National (N=105)	LBP	67.6%			
Ramachandra *et al*.	2015	India	National (N=261)		1st Trim *		3rd Trim *	
				LBP	3.3%		33.7%	
				UBP	0%		3.4%	
				NP	0%		2.5%	
Abebe *et al*.	2014	Ethiopia	National (N=300)	LBP	33.2%			
Yasobant *et al*.	2014	India	National (N=410)	LBP	55.6%			
				NP	4.9%			
Jimoh *et al*.	2013	Nigeria	National (N=200)	LBP	55.4%			
Al-Sayegh *et al*.	2012	Kuwait	National (N=400)	LBP	36.2%			
Malmqvist *et a*l.	2012	Norway	National (N=1204)	LBP	10%			
Charpentier *et al*.	2012	Benin vs	Socio-demographic comparison (N=80)	BP	83%			
		Canada			58%			
Quaresma *et al*.	2010	Portugal	National (N=49)	BP	12 wks *	20 wks *	32 wks*	37 wks *
					71.4 %	14.3%	75%	91.7%
Mohseni-Bandpei *et al*.	2009	Iran	National (N=1100)	LBP	40.2%			
Cheng *et al*.	2008	Canada	National (N=73)	BP	1st Trim *		3rd Trim *	
					81%		87%	
Skaggs *et al*.	2007	U.S.A.	Low-socioeconomic population (N=599)	BP (general)	67%			
Ayanniyi *et al*.	2006	Nigeria	National (N=1919)	BP	52.5%			
Shaheen Kauser and Sheikh	2006	Pakistan	National (N=918)	BP	47.05%			
Wang *et al*.	2004	U.S.A.	National (N=950)	LBP	68.5%			

Stapleton *et al*.	2002	Australia	National (N=1531)	BP	35.5%
Lindal *et al*.	2000	Iceland	National (N=111)	LBP	58.5%
Worku	2000	Lesotho	Rural community (N=4001)	LBP	58.49%
Kristiansson *et al*.	1996	Sweden	National (N=200)	BP	76.4%
Orvieto *et al*.	1994	U.K.	National (N=449)	LBP	54.8%
Östgaard *et al*.	1991	Sweden	National (N=855)	BP	49%
Nwuga	1982	Nigeria	National (N=99)	BP	89.8%

Of the 26 studies presented above, 12 were conducted in developing countries. Those from developed countries showed prevalence rates between 35.5% (in Australia) to 90% (in Denmark). Whereas the rate from developing countries range between 33.2% (in Ethiopia) to 89.8% (in Nigeria). This would indicate that there appears to be little difference between pregnancy related BP in those residing in developed and developing countries.

Few studies have reported BP prevalence and characteristics during pregnancy in African countries. In an early study Nwuga (1982) reported that nearly 90% of upper class Nigerian women (N=99) experienced some BP during pregnancy. Later Ayanniyi *et al.* (2006) found that more than half (52.5%) of the pregnant women attending antenatal clinics in Nigeria (N=1900) reported BP during pregnancy. Similar results were found by Jimoh *et al.* (2013) where 55.4% of the women attending antenatal clinics in Nigeria (N=200) experienced BP.

In contrast, in Ethiopian pregnant women (N=300), a prevalence of 33.2% was reported (Abebe *et al.* 2014). This result was less compared to other studies conducted in Africa. The authors discussed how the perception of pain by Ethiopian mothers could explain the low rate as it was perceived as normal and expected, thus the women may have chosen not to disclose their pain. Despite the growing recognition of the importance of BP in pregnancy, there is a paucity of data regarding the prevalence and severity of this problem in Africa (Worku 2000; Ayanniyi *et al.* 2006), particularly South Africa.

2.4 Characteristics and impact of BP in pregnancy

Pain can be defined as an emotional and unpleasant experience associated with actual or potential tissue damage (International Society of Pain 2018). It is a subjective experience and an individual's perception of pain is dependent on their emotional state and circumstantial factors regarding how the pain was acquired (Świeboda *et al.* 2013). Defining BP is complex, as it is neither a disease nor a diagnostic entity. According to Ayanniyi *et al.* (2006), BP is not a diagnosis, but a symptom that occurs in a wide variety of medical, MSK, and neurological conditions (Abebe *et al.* 2014). It presents with set signs and symptoms, it seldom has a single identifiable cause and a specific pathological diagnosis is often not made in many cases therefore it is often labelled as non-specific (Ehrlich 2003).

Back pain can be divided into mechanical or non-mechanical pain (Chien and Bajwa 2008). Mechanical BP (otherwise known as non-specific) is the most common case of BP where no pathology can be clearly identified but the pain arises from spinal structures such as bone, ligaments, discs, joints, nerves and meninges. It accounts for 97% of cases, and some common diagnoses include: spinal stenosis, herniated discs, zygapophysial (facet) joint pain, discogenic pain, sacro-iliac joint pain, and myofascial pain (Chien and Bajwa 2008). One of the most common causes of mechanical BP is from soft tissue disorders, which include myofascial trigger points, muscular spasms, and muscular/ligamentous sprains and strains (Ramsook and Malanga 2012). Non-mechanical BP (or specific) BP is when the cause is pathological and known. For example, BP from rheumatologic, vascular, gastrointestinal, renal, infectious, or oncologic causes only makes up 3% of BP aetiologies. (Chien and Bajwa 2008; Balague *et al.* 2012). Serious spinal pathology would also be considered specific and accounts for less than one percent of spinal pain (Sell and Longworth 2010).

Wang *et al.* (2004) reported that only 32% of women reported BP to their prenatal providers, and only 25% of the prenatal providers provided specific treatment. Their recommendations were stretching/exercise (10.4%), frequent rest (9.8%), cold and hot compress (8.7%) and combinations of therapies and allopathic treatments such as massage, acupuncture, chiropractic, osteopathy and aromatherapy (13.6%). The majority of pregnant women do not seek medical advice until their discomfort starts interfering with daily activities (Ramachandra *et al.* 2015). A possible reason as to why a large percentage of women do not report their symptoms can be put down to their assumption that it is an inevitable part of pregnancy (Stuber and Smith 2008).

As the structure of the society changes, BP in pregnancy has a negative impact across many areas of a woman's daily life, including work, household responsibilities, leisure activities, and sleep (Wang *et al.* 2004). Physical ability decreases in the last trimester of pregnancy, and a woman with BP is even more limited in her activities (Çoban *et al.* 2011). Wang *et al.* (2004) reported a high disability level in pregnant women surveyed in their study (N=950), with over half of the pregnant women (57%) having complained that BP impaired their daily activities. Of which 49% avoided performing tasks that caused them great difficulty such as climbing stairs (46.7%), running (39.7%), heavy work (28.2%), lifting heavy objects (28.2%) and participating in exercise (30.5%).

The onset of BP has been said to occur between the 20th and 28th week of gestation (Katonis *et al.* 2011), and 65% of the affected women experience pain on a daily basis (Mota *et al.* 2015). The duration of BP during pregnancy varies from a single episode to three months in 75% of women, and 25% experience a duration of four months or more (Kristiansson *et al.* 1996; Wang *et al.* 2004) which is regarded as chronic. Intensity of BP varies greatly among pregnant women. Wu *et al*. (2004) reported that pain may be mild or quite bearable in about half of the cases and very serious in about 25%. In a Nigerian study (Usman *et al.* 2017), of respondents (N=309) the majority (72.5%) experienced mild/moderate pain while only 9.2% experienced severe pain during pregnancy. This is similar to the findings of Nwuga (1982), where only 10.1% of the respondents had severe pain and 81.3% with mild to moderate consistency. As well as to the findings of Worku (2000) who reported approximately 10% (n=405) had severe BP and approximately 50% (n=1935) had moderate or mild BP. Severe BP was associated with intensive farm work, residing in a rural (rather than urban) area, and gravidity.

2.5 Musculoskeletal changes in pregnancy

During the 280 days of a woman's pregnancy, many physiological changes affecting the MSK system take place (Opala-Berdzik *et al.* 2009). These changes may cause various MSK complaints, predispose to injury, or alter the course of pre-existing conditions (Yasobant *et al.* 2014). Pregnancy-induced physiological changes that occur include: weight gain due to the foetus, amniotic fluid, the placenta, uterine enlargement and increased total body weight; marked breast enlargement; and lordosis (Tortora and Derrickson 2013). In addition, there are hormonal changes such as progesterone, oestrogen, prolactin and relaxin which play an important role in MSK and biomechanical changes (Thabah and Ravindran 2015). The hormone relaxin, which is first produced by the corpus luteum of the ovary and later by the placenta, has been suggested to increase 10-fold in concentration

during pregnancy (Sabino and Grauer 2008). This increases the flexibility of the pubis symphysis and ligaments of the sacroiliac and sacro-coccygeal joints, and helps to dilate the uterine cervix during labour. All of these actions help ease the delivery of the baby (Tortora and Derrickson 2013). This contributes to joint hypermobility, and leads to the alteration in pelvic architecture and widening of the pubic symphysis (Thabah and Ravindran 2015. If ligament laxity within the sacroiliac joints leads to instability of the pelvic girdle, and during pregnancy the centre of gravity changes due to the growing uterus this results in a postural change involving an increased pelvic tilt, shortening of the para-spinal muscles, and over-stretching of the abdominal muscles – resulting in a hyper-lordosis (Kluge *et al.* 2011).

Progesterone is important during pregnancy as it promotes smooth muscle relaxation. However, a significant portion of women first experience pain in the first trimester (Mogren and Pohjanen, 2005), when mechanical changes do not play a significant role in the aetiology of the pain, which could suggest that some pain may be secondary to hormonal changes rather than physical stresses (Sabino and Grauer 2008).

Weight gain during pregnancy is normal (Borg-Stein *et al.* 2005). It is one of the most significant changes and should be between 9-14 kg for the foetus to develop properly (Opala-Berdzik *et al.* 2009) with a mean of 11 kilograms. Weight gain is maximal toward the third trimester, and increases mechanical strain on the joints. A weight increase of 20% during pregnancy can increase the force on a joint by 100% (Ritchie 2003). An increase in body mass in the trunk area results in the shifting of the body's centre of gravity, as well as weakening of the abdominal muscles, which may predispose pregnant women to postural changes (Opala-Berdzik *et al.* 2009). The position of the gravid uterus causes the centre of gravity to shift, causing hyper-lordosis and an accentuation of an anterior pelvic tilt, which contributes to the mechanical strain on the back and sacroiliac joints (Thabah and Ravindran 2015). During pregnancy, the axial loading of the spine may compress the intervertebral discs, reduce disc height and may cause disc protrusion which may give rise to radicular symptoms (Sehmbi *et al.* 2017).

The abdominal muscles are stretched to their elastic limit by the end of pregnancy, the distance between the two rectus abdominas muscles widen, and the linea alba splits under strain which is called diastasis recti (Thabah and Ravindran 2015). Structural imbalances created by weakened abdominal muscles (due to enlarged gravid uterus), compensatory hyper-lordosis (sagittal rotation of the pelvis) and the shifting of the centre of gravity anteriorly increases the load on the lumbar spine and sacroiliac joints (Sneag and Bendo

2007), as seen in Figure 2.1. Such changes, together with low muscle endurance, compromise the strength and stability of the back and pelvis (Gutke *et al.* 2008) and contribute to BP (Sneag and Bendo 2007; Sehmbi *et al.* 2017).

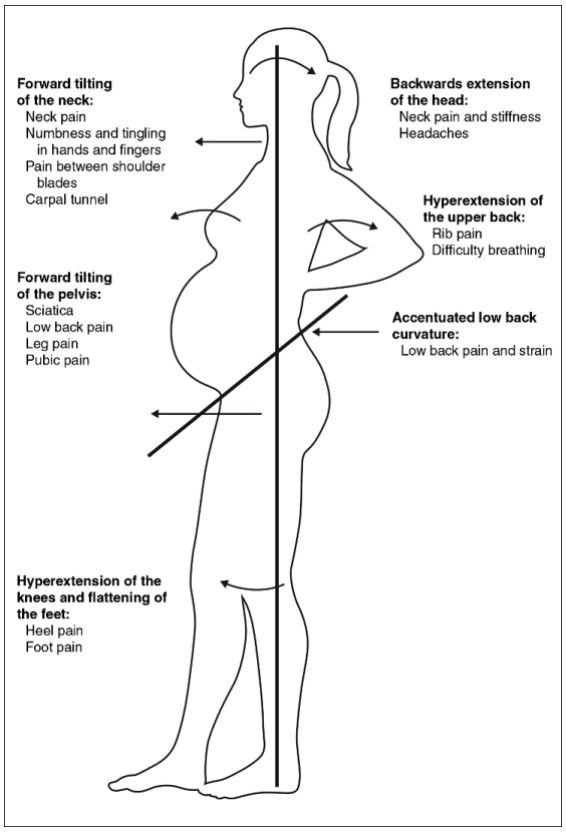


Figure 2.1: Illustration describing musculoskeletal compensations during pregnancy (www.researchgate.net/publication/280947687_Low_Back_Pain_and_Pelvic_Girdle_Pain_in_Pregnancy, 2015)

Although pregnancy related symptoms may be regarded as normal, they cause significant discomfort for women, and may place them at risk of experiencing similar symptoms in subsequent pregnancies (Rodriquez *et al.* 2001) with around half of women still complaining of BP symptoms one year after their delivery (Padua *et al.* 2005). The majority of discomfort experienced during pregnancy can be directly related to physical changes that occur and their resultant biomechanical effects upon functional movement (Ramachandra *et al.* 2015) however, psycho-social factors play a significant role on BP during pregnancy (Cedraschi *et al.* 2018). Figure 2.2 illustrates the potential influences on a woman's health during pregnancy, and shows a relationship between biomedical, biomechanical and biopsycho-social factors.

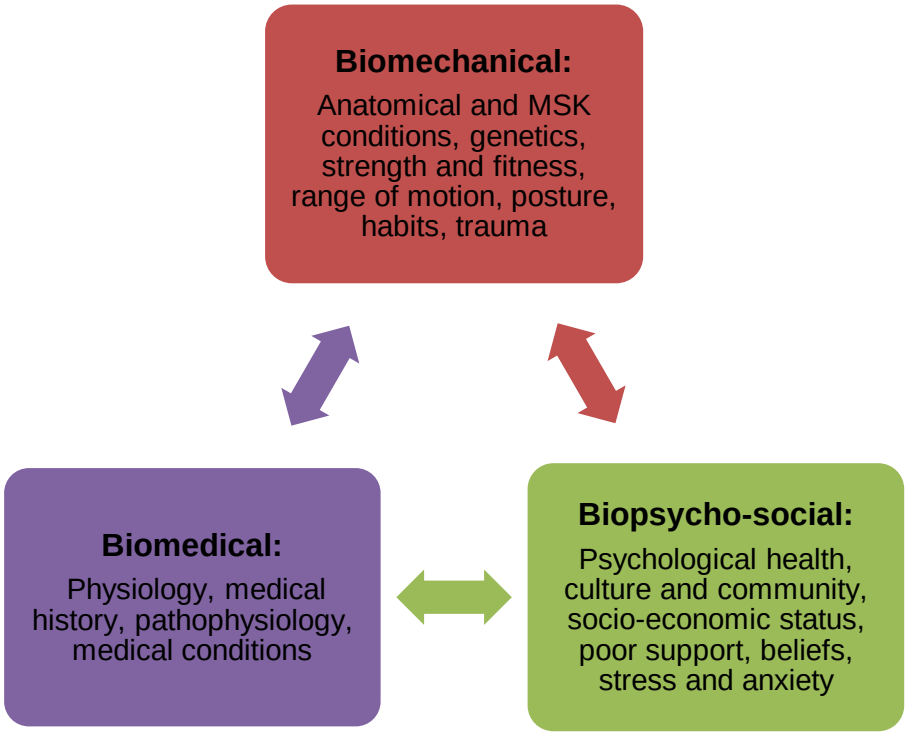


Figure 2.2: The potential influences on a woman's health outcomes during pregnancy

2.6 Medical history, pregnancy and BP

2.6.1 Body mass index (BMI)

Obesity is a predictor and has been significantly associated with chronic widespread MSK pain (Heuch *et al.* 2013). The prevalence of obesity is increasing globally, with South Africa being particularly affected with socio-economic and behavioural variables as possible causes. In South Africa, high risk groups have been identified: those from high socio-economic status, rural dwellers, young women, the physically inactive and those that smoke (Cois and Day 2015). There is some evidence that shows that a Black African woman's concept of body size does not always correspond with their BMI. This has been found in Black African women in South Africa, in that although overweight women were aware of obesity related risk factors, they still considered themselves attractive and perceived themselves as "healthy" (Puoane *et al.* 2010).

Ferreira and de Luca (2017), in a non-pregnant population, found a significant association between BP, obesity and being overweight. Mogren and Pohjanen (2005), reported that pregnant women with BP weighed significantly more and had a higher BMI compared to women without BP. In a similar manner it has been reported that pregnancy-related weight changes were also associated with an increased risk of developing a MSK condition which included BP, compared to women of normal weight. The risk was 28% greater for

overweight women, and 26% greater for obese women (Bliddal *et al.* 2016). In contrast, Mohseni-Bandpei *et al*. (2009) found no association between the prevalence of BP and BMI in Iranian pregnant women (N=1100).

2.6.2 Co-morbidities and BP

Co-morbid diseases place a considerable burden on individuals, communities, and health care services (Ferreira and de Luca 2017). Co-morbidity may be the effect of medical diseases existing simultaneously, but independently of each other (Valderas *et al.* 2009). The study of co-morbidities and its relation to BP is relatively unknown (Ferreira and de Luca 2017). Developing countries, such as South Africa have many challenges with diseases rising in rural communities as a result of uneven access to health care services and inadequate quality of education (van Zyl *et al.* 2010).

Lack of access to clean water and sanitation, good nutrition and quality health services predisposes communities to a greater prevalence of disease and disability (Louw *et al.* 2007), and other African-specific factors such as the HIV and AIDS epidemic may influence BP prevalence among Africans. With prevalence rates of HIV in pregnant women in excess of 40% in women aged 20-24 years, and over 50% in women aged 25-34 years in KwaZulu-Natal (Kharsany *et al.* 2015), HIV-infected patients with chronic pain can have diverse aetiologies including HIV-related MSK pain, BP or headaches, or be due to the impact of HIV-related conditions such as neuropathy or osteonecrosis (Merlin *et al.* 2014). South Africa has one of the highest burdens of TB, with it currently being the leading cause of death (www.tbfacts.org/tb-statistics-south-africa/, 2016). Medication used to treat TB can also have MSK side effects such as joint and muscle pain, and sometimes weakness and altered sensory perceptions caused by damage to peripheral nerves known as neuropathy (Denholm *et al.* 2014).

Pregnancy is a state during which physiological changes occur in the MSK system, as well as effecting the physical and emotional life of a woman whose body must adapt to the changes that take place during this period (Quaresma *et al.* 2010). Having a co-morbid disease during pregnancy could be a considerable burden on this already trying time. A study done on Australian women (Ferreira and de Luca 2017), found that the proportion of women with BP and a co-morbidity ranged from, 1.2% for stroke, to 40.2% for obesity. Diabetes, cardiovascular (CVS) disease, pulmonary disease, mental disorder, and obesity were all found to be significantly more common among Australian women with BP compared

to women without. Yasobant *et al*. (2014) found that those with current and/or past medical conditions were more susceptible to developing MSK pain in pregnancy.

2.6.3 Medication use in pregnancy

Back pain is a complex disorder that is challenging to treat but there has been an increasing emphasis on self-management. BP is associated with adverse consequences such as physical disability, psychological disturbance and an increased use of healthcare resources. People suffering with BP often take medication, such as prescribed medication (e.g. oxycodone and other pain killers) and more commonly paracetamol and non-steroidal anti-inflammatories (NSAIDS) to ease the pain (Crowe *et al.* 2010). The safety of medication use, specifically NSAIDS, during pregnancy and its impact on foetal development has been well researched (Casagrande *et al.* 2015) and are unsafe to use during pregnancy (Andrade *et al.* 2004). In light of this it has been reported in an underserved American population of pregnant women (Skaggs *et al.* 2007), that 75% of women with BP reported using pain medication. The type of medication in the study was not identified as over-the-counter or prescription medication, therefore the use of medication was not clearly expressed, however there was a high use of it.

2.6.4 Gravida and parity

A high parity has been associated with an increased incidence of BP during pregnancy (Mogren and Pohjanen 2005), but others found no significance (Wu *et al.* 2004; Schröder *et al.* 2016). Mogren and Pohjanen (2005) found that even after adjusting for confounding variables, multiparous women had twice the risk of BP compared to nulliparous women. This risk factor was also identified in other studies (Kristiansson *et al.* 1996; Östgaard *et al.* 1991; Pierce *et al.* 2012). Mota *et al*. (2015) reported BP in 67.6% (n=71) of women in their study (N=105), divided into primiparous (55.3%) and multiparous (43.7%) with little significance in characteristics between them.

In a comparative study between Beninese and Canadian women, Beninese women, although younger in age had on average one more child than Canadian women. The study found Beninese women reported a higher percentage of BP during pregnancy (83%), as opposed to Canadian women (58%) (Charpentier *et al.* 2012). The differences in number of births may explain the differences in BP incidence between the two countries, or that Beninese women on average care for more than one child compared to Canadian women. This could put an added strain on financial resources. In Nigerian pregnant women

(N=1919), it was found that 52.5% (n=1008) experienced BP, with the BP group having a higher gravidity (Ayanniyi *et al.* 2006). Breastfeeding, caring for, carrying and lifting more than one child, could impact BP prevalence in pregnancy (DiMarco n.d.).

In contrast, parity in pregnant Iranian women (Mohseni-Bandpei *et al.* 2009) was found to be insignificant as a risk factor for developing BP. Similar results were reported by Wang *et al*. (2004) and Wu *et al*. (2004) where number of pregnancies was not a significant predictor for BP. The differences between the above studies mentioned could possibly be attributable to cultural differences between countries, or due to the social expectation of childbearing after marriage often seen in Africa (Fledderjohann 2017).

2.7 Socio-demographic risk factors

2.7.1. Age

Age is commonly an associated risk factor for developing BP in the general population, and those in the third decade of life are more at risk for developing BP, with the prevalence increasing till 60 or 65 years then gradually declining (Hoy *et al.* 2012). This is reportedly due to the spine naturally degenerating over time (Balague *et al.* 2012). In a literature review of the prevalence of LBP in Africa the average lifetime prevalence among adolescents was reported at 36% and 62% for adults (Louw *et al.* 2007).

Regarding age and pregnancy, several studies have reported a higher prevalence of BP with increasing age (Mantle *et al.* 1977; Sneag and Bendo 2007), while others described a higher risk of BP with younger age (Östgaard *et al.* 1991; Orvieto *et al.* 1994; Endresen *et al.* 1995; Kristiansson *et al.* 1996; Wang *et al.* 2004; Carvalho *et al.* 2015). Wang *et al.* (2004) reported that in a population of pregnant women (N=645) it was found that 90% of those under the age of 20 years reported BP, compared with 67% between the ages of 31 and 40 years, and only 45% of pregnant women older than 41 years reported experiencing BP.

2.7.2 Race

Back pain has been found to occur in a large proportion of pregnant women, across many different ethnicities (Dumas *et al.* 2014). Different countries and cultures, perceptions, attitudes and beliefs, and pain experience may vary and affect reported disability. Several reviews of the literature have studied and recognised the ethnic disparities and inequalities

in perception of pain, in both clinical and experimental settings (Anderson *et al.* 2009; Kerns *et al.* 2011).

Sanders *et al.* (1992) identified that there were important cross-cultural differences in self perceived dysfunction. In Africa, culture has been identified as a major barrier toward pain relief. Failing to recognise cultural influences in pain management can contribute to mismanagement, misdiagnosis, cultural conflict and inappropriate and ineffective patient care. In the African culture, the significance of pain is often seen as a natural part of disease or injury, misfortune, witchcraft or unappeased ancestral spirits (Nortjé and Albertyn 2015). This shows that an increased awareness of the influence of culture on pain should be noted by health care professionals.

The frequency and reasons for pain complaints may vary between societies. Thus it is necessary to establish whether prevalence is equal or different between these societies (Lindal *et al.* 2000). In support of this a study, authors (Abebe *et al.* 2014) described Ethiopian mothers' experience of BP as subjective and likely dependent on their perception of pain, which was influenced by social and cultural circumstances. The women considered BP as normal and expected, and were not always open to disclosing their pain. This resulted in an overall low prevalence of BP in the group of women (33.2%).

There is limited evidence on the relationship between ethnicity and the prevalence of BP in pregnancy. On this account, a selection of studies concluded that BP in pregnancy has been found to occur in a large portion of women across many different ethnicities (Wang *et al.* 2004; Wu *et al.* 2004; Dumas *et al.* 2014). However, one study (Wang *et al.* 2004) found a significantly larger proportion of African-American women (N=950) had experienced BP (89.3%) in pregnancy compared to other ethnicities (60.5-62.7%). Whereas, Wu *et al*. (2004) proposed that BP is a legitimate condition in pregnancy, it occurs in all countries at all times, and that maternal ethnicity is not a risk factor, as it is multicultural.

2.7.3 Marital status

Several studies have investigated marital status and its effect on BP in the general population (Geisser *et al.* 2005; Nakao *et al.* 2011). Chronic pain conditions may have a profound effect on pain patients and their families (Geisser *et al.* 2005). It has been shown that being separated, divorced or widowed may result in a higher incidence of BP compared to those who are single or married (Nakao *et al.* 2011). Being married increases social support, has health benefits, and significantly less stress with regards to social, financial

and living situations (Reblin and Uchino 2008). Individuals who live alone or in social isolation have been found to be more prone to develop and report MSK complaints due to lack of this support (Nakao *et al.* 2011).

Childbearing expectations in some parts of Africa remain high, where women suffer tremendous pressure to have children, as it is perceived to be the primary goal of marriage and women are expected to start having children shortly after they are married (Fledderjohann 2017).

In developing countries, a substantial proportion of teen births are intended, with many women marrying young (Sedgh *et al.* 2015). On the contrary, there is a high rate (70%) of unintended pregnancies in sub-Saharan Africa, compounded by poor access to reproductive healthcare in countries such as Ghana (Eliason *et al.* 2014). Family planning, influenced by religious beliefs, inadequate understanding of contraception and reproduction health education, lack of inter-partner communication and sexual violence (Khajehpour *et al.* 2013; Haffejee *et al.* 2018). In a study in KwaZulu-Natal, South Africa. Haffejee *et al.* (2018) reported that only 36% (n=118) of pregnant women attending a public healthcare facility, had planned their pregnancies. Manzini (2001) reported that adolescent girls in KwaZulu-Natal commenced sexual activity at an early age, with pregnancy being very common among unmarried single school girls.

In contrast to young marriage, marriage rates in South Africa in particular are very low and have declined in recent years especially in young Black Africans. Coincidentally, rates of cohabitation out of marriage among young Africans has considerably risen in recent years. This directly relates to the costs of weddings and the payment of *ilobolo* (bride wealth) becoming financially arduous, and an unaffordable option for many young African couples. This has been a factor related to racial differences in marriage rates in South Africa (Posel *et al.* 2011).

2.8 Socio-economic risk factors

According to statistics SA, in South Africa poverty is on the rise with continuing unemployment levels (unemployment rose to 27.2% in the second quarter of 2018), high consumer prices and low economic growth. The main victims of poverty in South Africa are children younger than 17, Black Africans, females, people from rural areas and those with little or no education. According to Statistics SA, the South African labour market is more favourable to men, and men are more likely to be paid in employment than women,

regardless of race (www.statssa.gov.za, 2018). Internationally, inequalities in health with special reference to the burden of ill-health on the poor has received considerable attention from researchers. Suboptimal health conditions and behaviours are consistently found to be more prevalent among people from lower socio-economic status groups (Antaguba *et al.* 2011). Higher incomes allow the promotion of good health by the economic ability to access services not available to communities of a lower socio-economic status (Worku 2000). In South Africa, there is a movement for the re-engineering of Primary Health care whereby it aims to increase health services to the general public and to improve quality of health services in general.

Low socio-economic status has been associated with increased prevalence of BP (Orvieto *et al.* 1994; Worku 2000). Socio-economic factors such as a lack of education, low income/unemployment and disadvantaged living areas predispose females to BP (Croft *et al.* 1994; Kopec *et al.* 2004; Davies *et al.* 2009; Silva *et al.* 2008; Rios *et al.* 2011). Low educational status has been shown to be associated with an increased prevalence of BP, and even stronger predictor of longer BP episode durations and poorer outcomes (Hoy *et al.* 2012). Chronic widespread pain was associated with females who lived in lower social housing areas (Bergman *et al.* 2001).

Low socio-economic status and low education are often associated with strenuous work activities (Charpentier *et al.* 2012). Toroptsova *et al.* (1995) found that the prevalence of BP complaints was significantly higher in those who had low educations levels. In Ethiopia, in pregnant women (N=101) with current BP, 21.8% were often uneducated (Abebe *et al.* 2014). In Lesotho (N=4001), it was shown that 78.8% of the mothers with severe BP were poor, illiterate, and from rural communities, and that severe BP was strongly associated with intensive farm work, the residential area of the mother and gravida. It was also noted that those from lower socio-economic groups experienced more severe BP due to limited access to basic health services and poor education (Worku 2000).

In contrast, two studies have shown that women living in urban areas were more at risk. In Iranian women (N=398), there was a significant relationship between living area and the prevalence of BP, where those who lived in urban areas seemed to be more at risk (Mohseni-Bandpei *et al.* 2009). Similarly, in Ethiopia (N=101), of the women with current BP, 84.2% were from an urban area and the remaining 15.8% from rural areas (Abebe *et al.* 2014). The differences in these studies could be due to the definitions of rural and urban areas, whereby some rural areas may be worse off than others, and differ from country to country. However, differences in lifestyles could also be an influencing factor. Those in rural

areas were more physically active compared to urban lifestyles, which can be sedentary (Mohseni-Bandpei *et al.* 2009).

Occupational factors have been shown to be associated with BP and one of the leading causes of occupational injury and disability in both developed and developing countries (Hoy *et al.* 2010; Himalowa and Frantz 2012). Certain occupational groups run a higher risk of BP due to their working conditions and the constraints imposed by their jobs (Silva *et al.* 2016). According to Waddell and Burton (2001), there is strong epidemiological evidence that physically demanding work such as awkward postures, repetitive work, heavy loads and standing for long periods may be risk factors for developing BP. Specifically, blue collar workers have higher physical demands and are generally considered to be the main cause of work disability and MSK pain (Jørgensen *et al.* 2013).

Women in West Africa participate in laborious daily activities, ranging from farm work, drawing water from wells and carrying the water for long distances, as well as commercial activities that require the carriage of heavy loads on their heads (Beaucage-Gauvreau *et al.* 2012), that sometimes equate up to 70% of their body weight (Dumas *et al.* 2014). Many of these women continue to complete their physical activities while pregnant (Dumas *et al.* 2014).

The characteristics of daily activities and its contribution to MSK disorders, especially BP is not well documented (Beaucage-Gauvreau *et al.* 2012). According to Worku (2000) intensive farm work and heavy weight-lifting were found to be factors associated with the increased severity of BP in pregnant women. In a comparative study between Beninese and Canadian women (of which 83% of the Beninese women reported BP, and 58% of Canadian women reported BP), just over half of the Beninese women reported working in retail and the other half reported being a housewife as an occupation. Retail sales in sub-Saharan Africa can be physically demanding occupations, whereby the merchant has to carry goods on her head every day to sell at markets (Charpentier *et al.* 2012). Strenuous work has been strongly associated with BP during pregnancy (Wu *et al.* 2004), as well as bending or twisting several times an hour during the work day were associated with the greatest risk for developing BP during pregnancy (Dumas *et al.* 2014).

2.9 Psycho-social risk factors

2.9.1 Stress, depression and anxiety in pregnancy

"Yellow flags" are psychological risk factors associated with the development and persistence of BP. They include depression, catastrophizing, anxiety, and stress; beliefs and attitudes about BP; function and coping abilities; and anticipation that passive treatments, instead of active participation, will help the pain (Olsson *et al.* 2009; Nicholas *et al.* 2011). In addition, factors related to the patients social context can influence the outcome of an episode of BP. Things like poor work satisfaction, lack of support, work stress and compensation issues (Kopec *et al.* 2004; Cedraschi *et al.* 2018) may indicate the role that psychosocial factors play in BP. In a review of the literature by Cedraschi *et al*. (2018) studies of higher income settings suggested higher levels of anxiety, depression, obsessive-compulsive behaviours, and somatization were associated with a longer duration of BP symptoms, and interestingly evidence from low to middle income communities were consistent with the data from higher income settings.

It has been shown that social and psychological factors contribute to BP and disability and that BP is not always directly related to documentable spinal pathology. When pain becomes chronic, non-physical factors become increasingly important and the interaction between psychological, social and physical traits must be considered simultaneously (Cedraschi *et al.* 2018). The social and psychological challenges are described as a lack of control of everyday life, being dependent on others or on one's partner, fear that the condition may become permanent, reconsideration of having a larger family, physical challenges leading to difficulty performing work tasks and sick leave with concern about ones employers reaction to diminished work capacity (Backhausen 2017).

Stress in pregnancy has been defined as the imbalance that a pregnant woman feels when she cannot cope with demands, which is shown both behaviourally and physiologically (Woods *et al.* 2010). BP in pregnancy also has physical, psychological and social consequences. High levels of antenatal psychological stress have been significantly associated with depression, panic disorder, drug abuse, domestic violence, and having co-morbidities (Woods *et al.* 2010). Pain has been described as exhausting, affecting ones mood, sexual life and having a negative effect on family relations (Close *et al.* 2016). Being a burden and questioning the ability of being a mother, as well as being concerned about other people's reactions has also been described (Persson *et al.* 2013).

Albert *et al.* (2006) found associations between both physical (such as non-alignment of joints, muscle imbalance, trauma, and increased weight) and psycho-social factors including parity, stress and poor job satisfaction, and pregnancy-related pelvic girdle pain. Pregnancy related BP can reduce the ability of women to perform their regular work and it has been shown that women with more control over their work pace and breaks had better health and less BP (Cheng *et al.* 2008). Sick leave for BP during pregnancy has been shown to occur in 37% to 72%, and the period of sick leave is on average between 12 and 15 weeks (Orvieto *et al.* 1994; Wu *et al.* 2004; Truong *et al.* 2017), further highlighting its impact. Although the influence of physical demands is undeniable, psycho-social risk factors play a definite role on the prevalence of BP (Silva *et al.* 2016).

2.9.2 Smoking during pregnancy

Smoking has not received a lot of recognition in the contribution to BP in pregnancy (Lindal *et al.* 2000). Research on its direct link as a risk factor is limited, and only few studies have found a relationship (Lindal *et al.* 2000; Albert *et al.* 2006). A significant relationship was found between smoking and BP in adult Americans, where it was reported that BP increased with smoking exposure (Green *et al.* 2016). A systematic review of LBP in Africa found that smoking was a risk factor for BP in non-pregnant populations (Louw *et al.* 2007).

In one of few studies investigating smoking in pregnancy, Lindal *et al.* (2000), found that BP was more common among smokers and directly after delivery compared with non-smokers. These results were supported by Albert *et al*. (2006). In contrast, Wang *et al.* (2004) and Wu *et al*. (2004) found no significant relationship between smoking and pregnancy related BP. The explanation for the controversy between these studies could be due to under-reporting of smoking habits when pregnant due to stigma.

2.9.3 Alcohol and drug abuse

Clinical and government guidelines worldwide advocate for pregnant women to abstain from alcohol consumption and drug abuse during pregnancy due to potential adverse effects on pregnancy outcomes (O'Keeffe *et al.* 2015). The shame associated with alcohol use in many South African communities makes it likely that the prevalence and intensity of drinking is under-reported in surveys (Vellios and van Walbeek 2018). In a population based study in Ireland, the U.K., Australia and New Zealand, alcohol consumption ranged from 20% to 80% during pregnancy. Compared to Caucasian ethnicities, it was reported that non-Caucasian women in all cohorts were less likely to drink alcohol during pregnancy (O'Keeffe

et al. 2015). However, on review of the literature, alcohol consumption and drug abuse in pregnancy and its relationship to BP is not well documented and there is a paucity of information.

2.9.4 Quality of sleep

Sleep problems have become a significant health issue with a direct impact on one's health as well as mental health (Xu *et al.* 2017). During pregnancy sleep duration and poor sleep quality are commonly experienced (Facco *et al.* 2010; Naud *et al.* 2010; Hutchison *et al.* 2012; Xu *et al.* 2017). Changes in sleep patterns are likely influenced by important hormonal fluctuations (Naud *et al.* 2010). Sleep is a quality of life measure that can affect many activities of daily living, and it has been reported that sleep disturbances are frequently associated with BP in pregnancy (Skaggs *et al.* 2007).

During pregnancy lying down as well as tossing and turning have been related to the intensity of BP (Morino *et al.* 2017). A study in Nigeria interestingly found that of the pregnant participants (N=200) who experienced BP (n=93), an alarming 71% experienced some form of insomnia (Jimoh *et al.* 2013). Pain can influence the ability to have restful sleep (Finan *et al.* 2013). In American pregnant women, it was reported that over half of women (58%) with BP reported sleep disturbances secondary to pain (Wang *et al.* 2004). While Skaggs *et al.* (2007) found that sleep problems were reported in 37% (n=222) of the pregnant participants, of which 80% of these women had BP.

2.10 Treatment of BP in pregnancy

Most women consider BP inevitable during pregnancy, and do not seek treatment from health care professionals (Pennick and Young 2007; Sabino and Grauer 2008). The majority of treatment strategies centre on prevention, as treatment late into pregnancy is often difficult to implement. Numerous conservative treatments have been advocated for BP during pregnancy including chiropractic, physiotherapy, transcutaneous nerve stimulation, pharmacological treatment, and stabilization belts (Sabino and Grauer 2008), as well as exercise, proper ergonomics, hot and cold therapy, relaxation exercises, rest, stretching and massage (Stuber and Smith 2008).

'Chiropractic' comes from the Greek word for "being done by hand" and its principle basis is that the body can heal itself when the skeletal system is correctly aligned and the nervous system is working properly (Ramasubramaniam *et al.* 2012). Regular chiropractic care

during pregnancy can be an integral part of antenatal and post-partum care, as it helps women to feel good and assists them in coping with the physical stresses of their changing bodies (Borggren 2007). It has been shown that pregnant women benefit from chiropractic treatment during pregnancy, and that it is a safe and effective means of treating MSK complaints during pregnancy. Although studies have demonstrated a reduction in pain and/or disability following chiropractic care (Stuber and Smith 2008), the use of chiropractic care during pregnancy is prevalent.

2.11 Conclusion

BP is a common complaint among pregnant women in international countries and has been the subject of many publications. Literature on the effects of BP, among other complaints during pregnancy is established in developed countries while in South Africa and other developing countries there is a paucity of information. Further investigation into the prevalence and incidence of BP in pregnancy and its relationship to socio-demographic and psycho-social factors, in a South African context, will elaborate the existing literature.

Chapter Three

Methodology

3.1 Introduction

This chapter describes the study design and details the methodology and data analysis strategy utilised in this study.

3.2 Study design, approval and background

This study used a quantitative approach and a retrospective descriptive cohort design. The quantitative approach allowed the researcher to use structured instruments to collect and statistically analyse information related to a particular phenomenon (Creswell and Creswell 2018). When combined with a retrospective descriptive cohort research design, it allowed for information to be gathered from a representative sample of the population over time, where the phenomena of interest could be detailed, with no intention of establishing a cause-and-effect relationship (Brink and Van Rensburg 2018). The disadvantage of this design is that it limits the type of statistical analysis that can be performed and that the researcher cannot control the exposure or the outcome (Sedgwick 2013).

This study utilised retrospective design as the data necessary to answer the aims and objectives in this study came from research questionnaires and a chart review which were collected between the 10th October 2015 and 11th October 2016 as part of a collaborative project between the DUT and the MRC of South Africa. The project was given ethical clearance by the IREC of the DUT, eThekwini Health District and KZN Provincial Department of Health (Appendix C). It was titled “A multi-staged multi-disciplinary health care approach in reducing maternal morbidity and mortality rates in a PHC in Cato Manor”.

Prior to commencement, the research proposal for the current study was approved by the Faculty of Health Sciences Research Committee and the IREC at the DUT, REC106/17 (Appendix A). This committee operates in accordance with the Declaration of Helsinki and Nuremburg, 1987 (www.kznhealth.gov.za/research/ethics1.pdf, 2018). Permission to access the studies participant research files for inclusion in this study was obtained from Prof N. Sibiya, the principle investigator of the MRC/DUT project (Appendix E).

3.3 Study Population

The study population was pregnant women who were in their first trimester of pregnancy who attended the PHC Clinic located in Umkhumbane (Mayville) in Ethekwini District of KZN between the 10th October 2015 and the 11th October 2016, who agreed to participate in the DUT/MRC project. The clinic has a total of 16 beds in its Medical Outpatient Unit and is run by the Provincial and eThekwini Municipality. It is situated in a very populated area and services a community where there is a high unemployment rate and low socio economic conditions with informal and formal houses (www.kznhealth.gov.za/catomanor.htm, 2018).

3.4 Sample characteristics

In order to meet the aim and objectives of this study the research files from the DUT/MRC project had to meet the following criteria:

Inclusion criteria:

- Each research file had to have a signed informed consent form for participation in the DUT/MRC project.

Exclusions criteria:

- If one or more of the three questionnaires completed at the first trimester were not filled out.

3.5 Sampling size and method

Using purposeful sampling the total number of DUT/MRC research files (N=382) were assessed for their eligibility to meet this study's inclusion and exclusion criteria. This resulted in a total sample of 303 research files being eligible for this study. Purposeful sampling uses a process whereby the researcher chooses data that is useful, where the main goal is to focus on particular characteristics of a population that are of interest to the researcher, which will best enable the researcher to answer the research aims and objectives (Palinkas *et al.* 2015). Due to the interdisciplinary manner of the MRC/DUT project, the questionnaires in this project expanded over many areas including epidemiology, socio-demographics, antenatal health as well as nutrition. Due to this, the remainder of the questions from the questionnaires were excluded from the current study because they did not relate to the research objectives.

3.6 Data collection tool

3.6.1 First trimester data

3.6.1.1 Socio-demographic questionnaire

A pre-tested, socio-demographic questionnaire that was designed and utilised by Oldewage-Theron *et al.* (2006) in a study observing poverty, household food insecurity and nutrition in informal settlements in the Vaal triangle, South Africa, was utilized to collect information pertaining to the participants socio-demographic characteristics (Appendix D (I)) at the first trimester. Table 3.1 shows the questions relative to this study.

Table 3.1: Questions obtained from the socio-demographic questionnaire

No.	Question
3.1	Do you live in: Town/city, farm, squatter camp, rural village, hostel, township, other.
3.2	How are you currently living? Homeless, living with relatives, living with friends, hostel accommodation, squatter home, rented house/flat, own house/flat, employees property, other.
4.1	Are you currently employed? Yes/No
5.1	What is your highest education level? None, Primary school, Standard 8, Standard 10, College/FET, other post school.

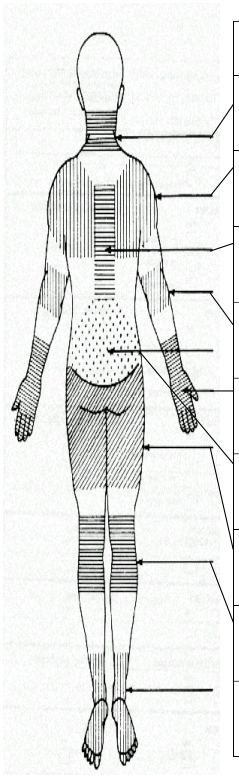
3.6.1.2 First trimester epidemiology questionnaire

An epidemiology questionnaire (Appendix D (II)) was compiled by the MRC/DUT researchers using available literature. It was validated by means of a focus group to determine face validity and content validity. Face validity occurs when experts' judge the measurement tool and it appears to measure what it was intended to measure. Content validity was ensured through the expert's evaluation of each item on the measurement tool ensuring that the variable being tested was represented and suitable for use (Brink and Van Rensburg 2018). The focus group members critiqued the questionnaire, made relevant comments and suggestions that provided feedback with regards to the how well the instrument measured the phenomena being investigated. Relevant changes were made to the questionnaires. The questionnaires then underwent pilot testing, whereby four to five people, representative of the community completed the questionnaire in its entirety to ensure that the tools could be implemented. Table 3.2 shows the data that was extracted from this questionnaire for use in the current study.

Table 3.2: Questions obtained from the first trimester epidemiology questionnaire

No.	Question
1.	What is your marital status?
26.	We wish to find out about your past medical history. Please select all the conditions that you were treated by a doctor for **before you became pregnant?**
27.	Are you currently on any medication?
34.	Have you been smoking/using snuff while pregnant?
36.	Have you ever had alcohol?
37.	How often did you drink alcohol in the 3 months before you became pregnant?
38.	How often do you consume alcohol during this pregnancy?
40.	How many hours sleep do you currently get a night?
42.	Do you do any of the following activities on a daily basis?
43.	Do you currently have musculoskeletal pain?
46.	Has the pain prevented you from spending time with your family and friends?
47.	Has the pain made you feel concerned or worried about your health?
48.	Has the pain made you feel sad or down?
49.	Are you able to cope with the pain?
50.	Have you treated your pain?

Musculoskeletal table first trimester



Have you experienced MSK pain in any of the areas in the during your pregnancy:		When did the pain starts	Is your pain:	Has your pain interfered with your ability to perform your daily activities, such as gardening, house work etc.	Has the pain affected your ability to work?
Neck	☐ Yes ☐ No	☐ 2 weeks ago ☐ 3-8 weeks ago ☐ 3-6 months ago ☐ + 6 months	☐ Mild ☐ Moderate ☐ Severe	☐ Yes ☐ No If yes comment _____	☐ Yes ☐ No If yes comment _____
Shoulders	☐ Yes ☐ No	☐ 2 weeks ago ☐ 3-8 weeks ago ☐ 3-6 months ago ☐ + 6 months	☐ Mild ☐ Moderate ☐ Severe	☐ Yes ☐ No If yes comment _____	☐ Yes ☐ No If yes comment _____
Upper Back	☐ Yes ☐ No	☐ 2 weeks ago ☐ 3-8 weeks ago ☐ 3-6 months ago ☐ + 6 months	☐ Mild ☐ Moderate ☐ Severe	☐ Yes ☐ No If yes comment _____	☐ Yes ☐ No If yes comment _____
Elbows	☐ Yes ☐ No	☐ 2 weeks ago ☐ 3-8 weeks ago ☐ 3-6 months ago ☐ + 6 months	☐ Mild ☐ Moderate ☐ Severe	☐ Yes ☐ No If yes comment _____	☐ Yes ☐ No If yes comment _____
Wrist/ Hands	☐ Yes ☐ No	☐ 2 weeks ago ☐ 3-8 weeks ago ☐ 3-6 months ago ☐ + 6 months	☐ Mild ☐ Moderate ☐ Severe	☐ Yes ☐ No If yes comment _____	☐ Yes ☐ No If yes comment _____
Low Back	☐ Yes ☐ No	☐ 2 weeks ago ☐ 3-8 weeks ago ☐ 3-6 months ago ☐ + 6 months	☐ Mild ☐ Moderate ☐ Severe	☐ Yes ☐ No If yes comment _____	☐ Yes ☐ No If yes comment _____
Hips/ Thighs	☐ Yes ☐ No	☐ 2 weeks ago ☐ 3-8 weeks ago ☐ 3-6 months ago ☐ + 6 months	☐ Mild ☐ Moderate ☐ Severe	☐ Yes ☐ No If yes comment _____	☐ Yes ☐ No If yes comment _____
Knees	☐ Yes ☐ No	☐ 2 weeks ago ☐ 3-8 weeks ago ☐ 3-6 months ago ☐ + 6 months	☐ Mild ☐ Moderate ☐ Severe	☐ Yes ☐ No If yes comment _____	☐ Yes ☐ No If yes comment _____
Ankles/ Feet	☐ Yes ☐ No	☐ 2 weeks ago ☐ 3-8 weeks ago ☐ 3-6 months ago ☐ + 6 months	☐ Mild ☐ Moderate ☐ Severe	☐ Yes ☐ No If yes comment _____	☐ Yes ☐ No If yes comment _____

3.6.1.3 Chart review

In addition, information was extracted from the patients file from the PHC clinic and documented by the research nurse into the first trimester clinic chart (Appendix D (III)) . This study extracted the following data from the chart review:

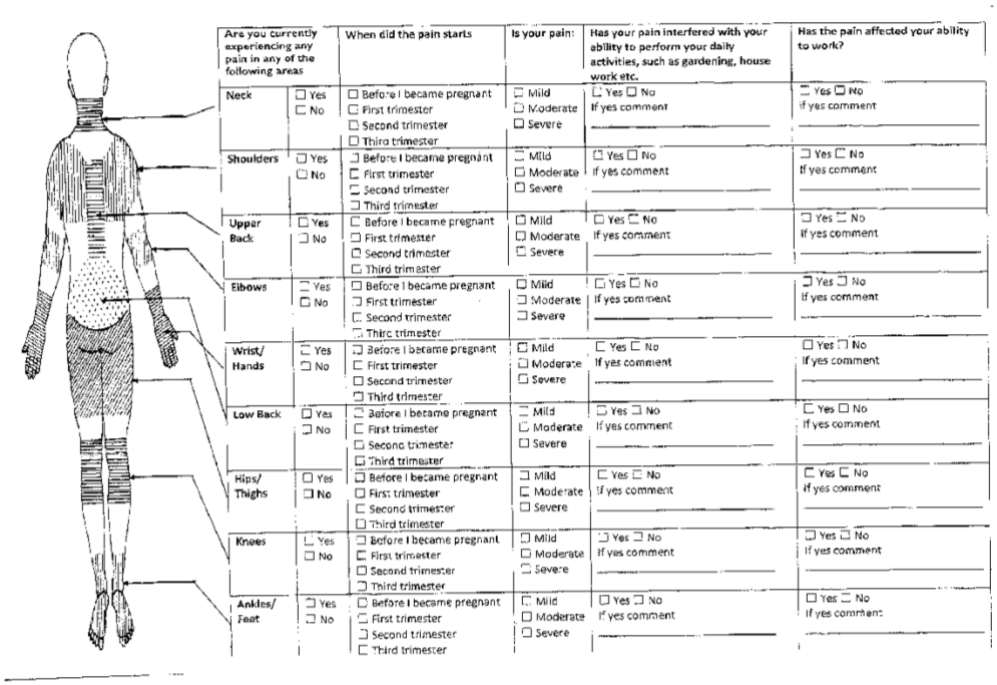
- maternal
- age
- race
- weight
- height
- parity
- gravida
- and HIV status (tested on site)

3.6.2 Third trimester data

3.6.2.1 Third trimester epidemiology questionnaire

At the third trimester visit the participants completed the third trimester epidemiological questionnaire (Appendix D (IV)). The third trimester epidemiology questionnaire was validated, like the first trimester epidemiology questionnaire as detailed in section 3.6.1.2 face and content validity. Table 3.3 shows the data that was extracted from this questionnaire relevant to this study.

Table 3.3: Questions obtained from the third trimester epidemiology questionnaire

<table>
<tr><th>No.</th><th>Question</th></tr>
<tr><td>23.</td><td>Please indicate if you are currently experiencing any musculoskeletal pain:</td></tr>
<tr><td colspan="2"> 
</td></tr>
<tr><td colspan="2">Only answer the following questions if you have indicated that you have experienced musculoskeletal pain during this pregnancy</td></tr>
<tr><td>24.</td><td>Has the pain prevented you from spending time with your family and friends?</td></tr>
<tr><td>25.</td><td>Has the pain made you feel concerned or worried about your health?</td></tr>
<tr><td>26.</td><td>Has the pain made you feel sad or down?</td></tr>
<tr><td>27.</td><td>Are you able to cope with the pain?</td></tr>
<tr><td>28.</td><td>How have you treated your pain?</td></tr>
</table>

3.6.3 Pilot study

The data collection tool was validated through a pilot study:

The post-focus group questionnaire was pilot tested the representative population for which the questionnaire was intended to be used. The questionnaire was administered in the exact manner as it was administered to the main sample. The purpose of the pilot study was to determine whether the instructions could be clearly followed, to determine the expected duration for completion of the questionnaire and finally to test the participant's comprehension of the questions. The pilot study group consisted of 5 pregnant women who presented to the Cato Manor PHC facility, who fit the inclusion criteria. The participants of the pilot study were excluded from the main study. The MRC study commenced after the pilot study was completed.

3.7 Research procedure

Once this study received ethical clearance from the DUT IREC (Appendix A) the researcher was given the research files from the project coordinator of the MRC/DUT project (N=382). Each participant file was assessed, by the researcher, for its eligibility for inclusion into this study. Once a file was deemed to meet the study criteria all necessary data was extracted from the research files, coded, reduced, if necessary, (for example body mass index was calculated) and placed into Social Package for the Social Sciences (SPSS) version 24 (IMB Analytics) for data analysis.

All data was captured at the DUT, in the Chiropractic department, no research files were removed from the premises and only the researcher and supervisor had access to the files. On completion of data capturing the research files were returned to the project coordinator of the MRC/DUT project. Data capturing took place from the 29th of November 2017 to the 1st of December 2017.

3.6 Data analysis

The IBM statistical package SPSS version 24 (IMB Analytics) was used for statistical analyses. Data analysis was conducted by the researcher and overseen by a qualified statistician. The dependent variable in this study was BP, and the independent variables were the socio-demographic and psychosocial variables. A *p*-value of less than 0.05 was used to indicate statistical significance. Descriptive statistics were used to describe the data in terms of means and standard deviations for quantitative variables, and frequency and count was used for categorical variables. Graphs and cross tabulations were used to

describe the demographic and disease characteristics of the participants. Relationships between data were assessed using the Chi-squared test for categorical data. Where this test was not applicable, Fischer's exact tests were used. No numerical variables were assessed for relationships.

3.9 Ethical considerations

In order to ensure that the ethical requirements for research on human participants were adhered to the following was ensured:

1. Ethical clearance for the current study was obtained by the DUT IREC (Appendix A). Permission to access data from the MRC/DUT project was obtained (Appendix E) from Prof N. Sibiya, the principal investigator.
2. The MRC/DUT project required all participants to read a letter of information and sign informed consent (Appendix B) prior to being enrolled in the study, in line with the ethical principle of autonomy.
3. Justice was achieved by the MRC/DUT project by fair selection of research participants. Prospective participants were informed of the research study by the research nurse and recruitment personnel and through advertisements placed in the clinic via the MRC flagship advertisement banner. Participation was voluntary and no coercion was used to recruit participants.
4. Non-maleficence has been upheld in ethical standards, based on that no harm was caused to any participant during the MRC/DUT project.
5. Beneficence has been upheld in that the current research will be of benefit to the community.
6. During the research process, only the supervisor and researcher had access to the research files during data collection, thereby protecting the confidentiality of the data and the participants.
7. All data capturing by the researcher was done at the DUT and no research files were removed from the campus.
8. All data recorded from the research files was captured with a research file number; no patient names were recorded to ensure confidentiality; the researcher signed a confidentiality agreement (Appendix F).

Chapter Four

Results

4.1 Introduction

This chapter presents the results obtained from the analysis of the data collected in this study. The results are presented by first presenting the prevalence and incidence, followed by the profile of BP, and then a description of the socio-demographic, medical history and psycho-social characteristics of the participants and their relationships to BP, pertaining to the research objectives.

4.2. Sample size

Figure 4.1 shows that from the 382 participant files that were eligible for inclusion in this study, 303 met the inclusion criteria from the first antenatal visit. There was significant drop out of participants from the first to the third trimester resulting in only 46 files from this trimester being included in the study.

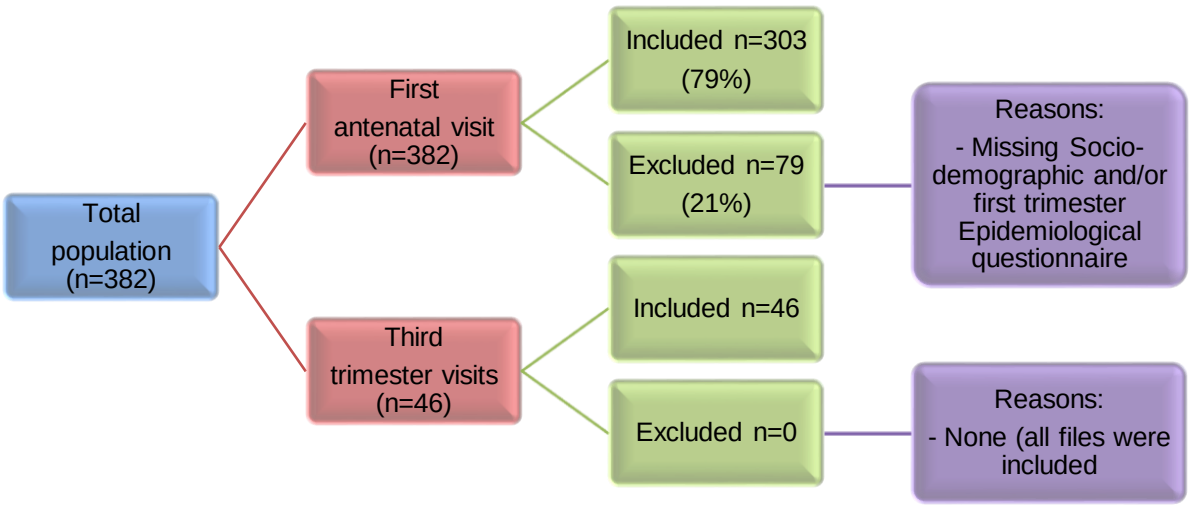


Figure 4.1: Diagrammatic representation of how the study sample was obtained

4.3. Objective one: To determine the prevalence of BP pre-pregnancy, at the first and third trimester, and to determine the incidence of BP in participants attending a PHC in KZN.

4.3.1 Prevalence of BP in pregnancy

The prevalence of reported BP pre-pregnancy was low. In the first trimester and third trimester approximately one in ten women reported BP as seen in Figure 4.2.

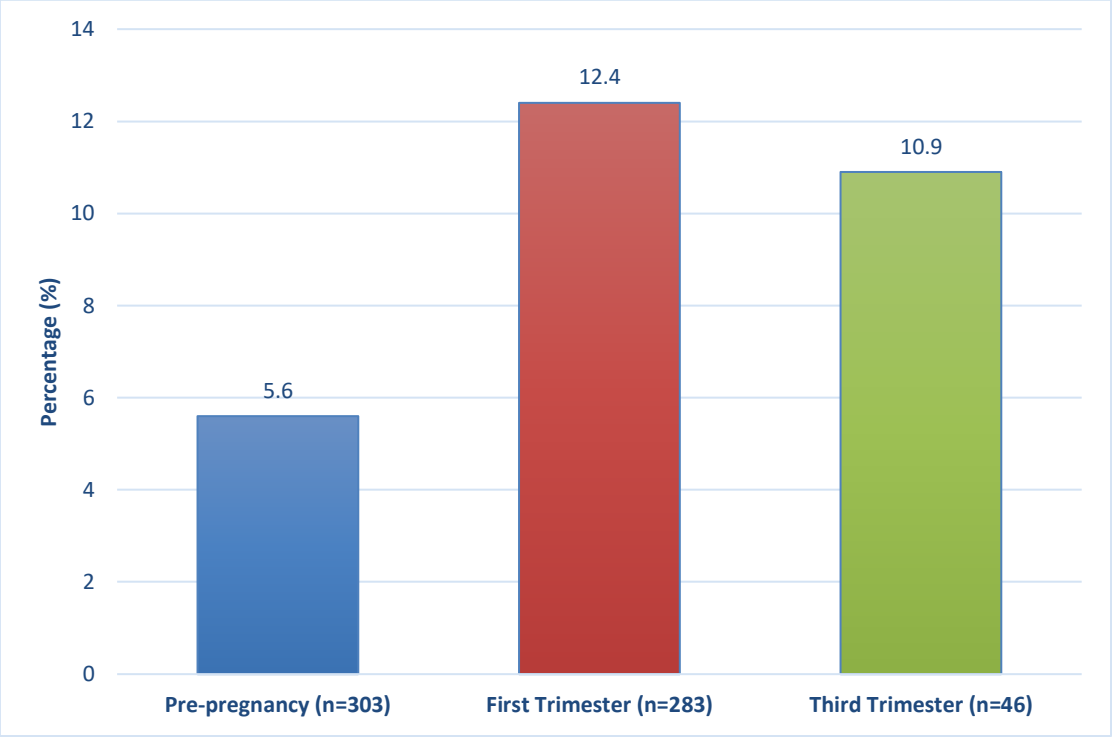


Figure 4.2: Prevalence of BP in pregnancy

4.3.2 Incidence of BP during pregnancy

None of the 46 women who answered the third trimester questionnaire reported a new experience of BP during pregnancy, thus the incidence was zero.

4.4 Objective two: To determine the profile of BP in terms of location, duration and severity during pregnancy.

4.4.1 Location of BP in pregnancy

Low back pain, irrespective of trimester, was the main back complaint by the participants, with no participants reporting UBP or NP at the third trimester as seen in Figure 4.3.

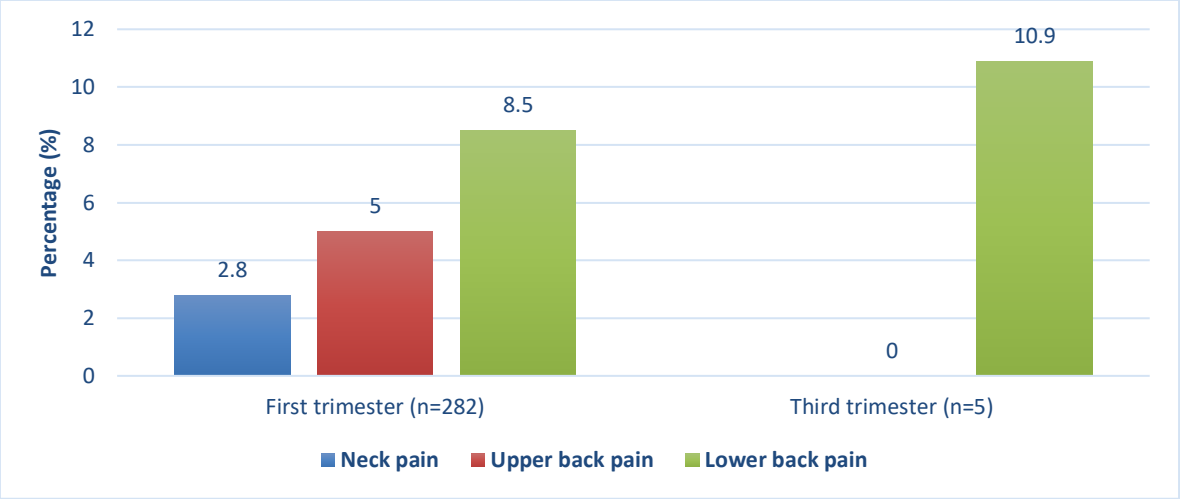


Figure 4.3: Location of BP at the first and third trimesters

4.4.2 Duration of BP in pregnancy

In the first trimester the duration of BP varied per area, as seen in Figure 4.4. Acute and chronic pain was found in all areas, with UBP being more acute in nature.

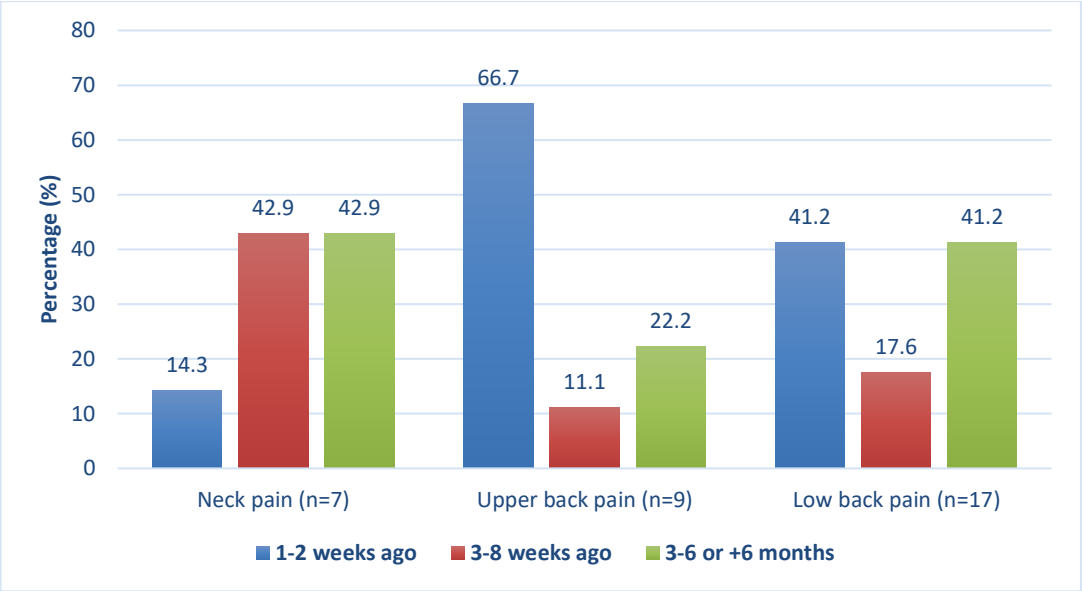


Figure 4.4: Duration of BP in the first trimester

In the third trimester, a third of the participants reported that their pain started during the first trimester, as seen in Figure 4.5. This indicates that there were no new onsets of pain in the third trimester.

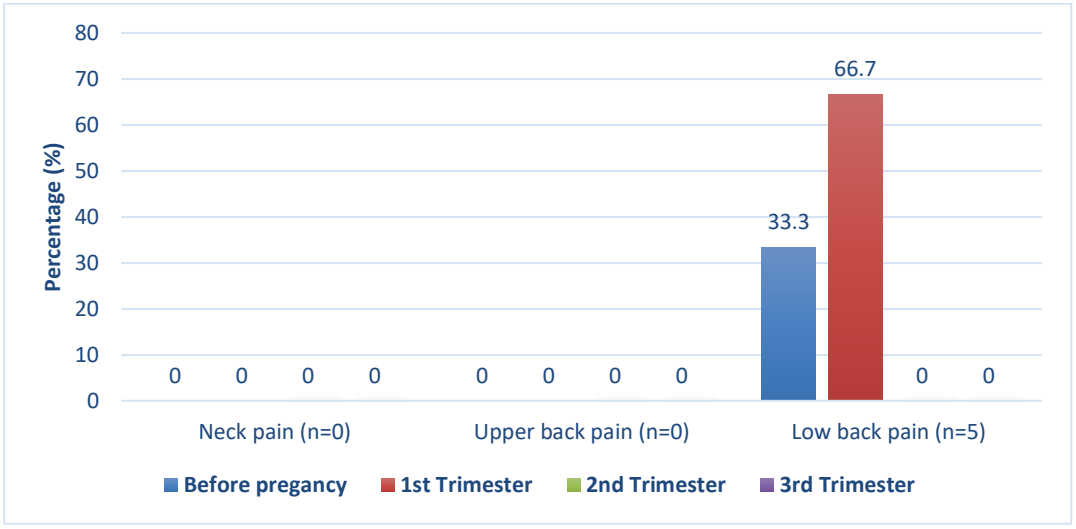


Figure 4.5: Duration of BP in the third trimester

4.4.3 Severity of BP in pregnancy

Figure 4.6 shows the rating of the pain severity by the participants at the first trimester. Most reported mild to moderate pain.

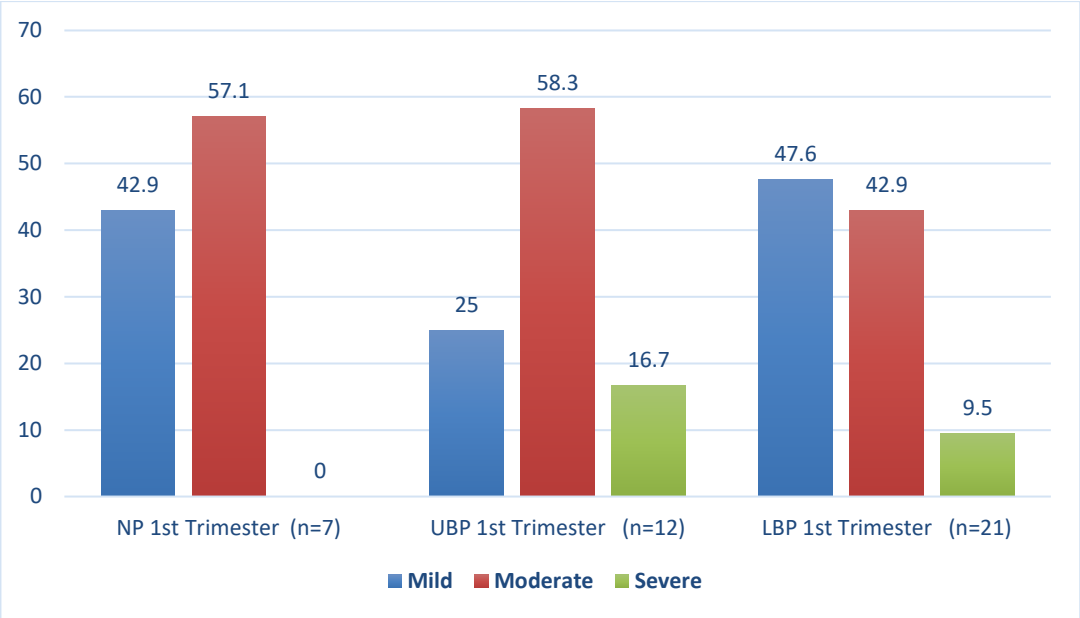


Figure 4.6: Severity of BP in pregnancy at the first trimester

Figure 4.7 shows that the overall severity of BP in the third trimester was mostly reported to be mild or moderate in nature.

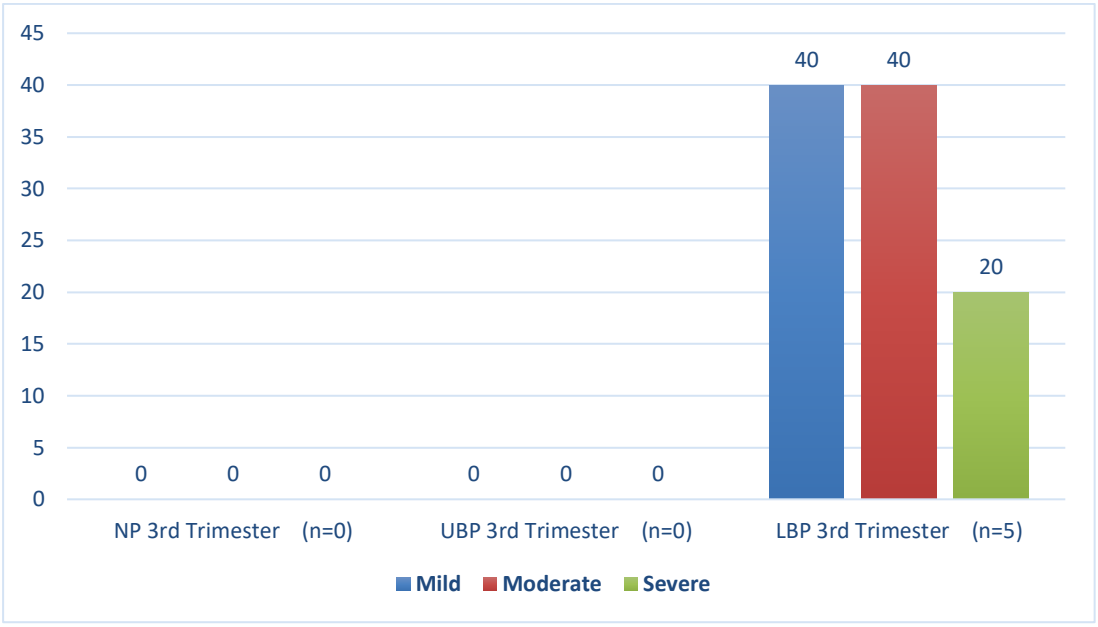


Figure 4.7: Severity of BP in pregnancy at the third trimester

4.5 Objective three: To determine the socio-demographic, medical history, psycho-social and pregnancy related information of the participants and its relationship to BP in pregnancy.

4.5.1 Demographic characteristics of the participants at the first and third trimester

The participants had a mean age of 25.84 (±SD 6.04) with a range from 15 to 44 years of age. Table 4.1 shows that most participants were between 18 and 35 years of age (86.3 %, n=244), were single (81.2%, n= 229), with all being from the Black African race group.

Table 4.1 Demographic characteristics of the participants and its relationship to BP in pregnancy

	First Trimester				Third Trimester			
	Back pain				Back pain			
Characteristic	**Total n (%)**	**Yes n (%)**	**No n (%)**	***p* value**	**Total n (%)**	**Yes n (%)**	**No n (%)**	***p* value**
Age	(n=283)			0.76	(n=46)			0.15
<18	17 (6)	2 (0.7)	15 (5.3)		2 (4.4)	1 (2.2)	1 (2.2)	
18-24	127 (44.9)	16 (5.7)	111 (39.2)		20 (43.5)	1 (2.2)	19 (41.3)	
25-35	117 (41.4)	16 (5.7)	101 (35.7)		21 (45.6)	2 (4.3)	19 (41.3)	
>35	22 (7.8)	1 (0.4)	21 (7.4)		3 (6.5)	1 (2.2)	2 (4.3)	
Race	(n=232)			-	(n=4)			-
Black African	232 (100)	32 (13.8)	200 (86.2)		4 (100)	4 (100)	0 (0)	
White	0 (0)	0 (0)	0 (0)		0 (0)	0 (0)	0 (0)	
Indian	0 (0)	0 (0)	0 (0)		0 (0)	0 (0)	0 (0)	
Coloured	0 (0)	0 (0)	0 (0)		0 (0)	0 (0)	0 (0)	
Marital Status	(n=282)			**0.03**	(n=46)			0.63
Married/Living together	46 (16.3)	9 (3.2)	37 (13.1)		6 (13.1)	1 (2.2)	5 (10.9)	
Single	229 (81.2)	24 (8.5)	205 (72.7)		38 (82.6)	4 (8.7)	34 (73.9)	
Divorced/ Separated	6 (2.2)	1 (0.4)	5 (1.8)		2 (4.3)	0 (0)	2 (4.3)	
Widow/other	1 (0.4)	1 (0.4)	0 (0)		0 (0)	0 (0)	0 (0)	

No significant relationships were found between the demographic characteristics of the participants and BP prevalence, in eth first or third trimester, except for marital status (p = 0.03, Fischer's Exact Test) in the first trimester. Being single (p = 0.03), with those who were single having a lower frequency of BP.

4.5.2 Socio-economic characteristics of the participants at the first and third trimester.

The majority of the participants were unemployed (70.8%, n=199), had completed secondary education (77.1%, n=213), lived in a town, city or township (54.2%, n=150) where they were either renting, staying in their own house or flat (36.1%, n=98) or residing with a relative or friend (32.5%, n=87), as seen in Table 4.2.

Table 4.2: Socio-economic characteristics of the participants and its relationship to BP in pregnancy

	First Trimester				Third Trimester			
	Back pain				Back pain			
Characteristic	**Total n (%)**	**Yes n (%)**	**No n (%)**	***p* value**	**Total n (%)**	**Yes n (%)**	**No n (%)**	***p* value**
Currently Employed	(n=281)			0.42	(n=46)			0.65
Yes	82 (29.2)	12 (4.3)	70 (24.9)		16 (34.8)	1 (2.2)	15 (32.6)	
No	199 (70.8)	22 (7.8)	177 (63)		30 (65.2)	4 (8.7)	26 (56.5)	
Level of education	(n=278)			0.8	(n=45)			1
None	4 (1.4)	0 (0)	4 (1.4)		2 (4.4)	0 (0)	2 (4.4)	
Secondary education	213 (77.1)	28 (10.1)	185 (67)		29 (65.5)	3 (7.7)	26 (57.8)	
Tertiary education	58 (21.4)	6 (2.2)	53 (19.2)		14 (31.1)	1 (2.2)	13 (28.9)	
Place of residence	(n=277)			0.72	(n=46)			0.63
Town/City/Township	150 (54.2)	21 (7.6)	129 (46.6)		27 (60)	4 (8.9)	23 (51.1)	
Squatter camp	122 (44.1)	13 (4.7)	109 (39.4)		18 (40)	1 (2.2)	17 (37.8)	
Rural village /farm/other	5 (1.8)	0 (0)	5 (1.8)		0 (0)	0 (0)	0 (0)	
Living situation	(n=272)			0.07	(n=42)			0.77
Renting/Own house or flat	98 (36.1)	13 (4.8)	85 (31.3)		18 (42.9)	2 (4.8)	16 (38.1)	
Living with friend/relative	87 (32.5)	10 (3.7)	77 (28.8)		13 (31)	1 (2.4)	12 (28.6)	
Squatter camp	66 (24.3)	4 (1.5)	62 (22.8)		6 (14.3)	1 (2.4)	5 (11.9)	
Hostel/ Employees property/Other	18 (6.6)	5 (1.8)	13 (4.8)		5 (21.4)	1 (2.4)	4 (9.5)	
Homeless	3 (1.1)	1 (0.4)	2 (0.7)		0 (0)	0 (0)	0 (0)	

In the first and third trimester there were no significant relationships found between the investigated socio-economic factors and BP occurrence in pregnancy. Relationships were assessed using Fischer's Exact Tests.

4.5.3 Activities of daily living

When asked about their activities of daily living in a normal day, most performed housework (73%, n=214) with 30% (n=88) reporting carrying water daily and 14.3% (n=42) walking long distances, as seen in Figure 4.8.

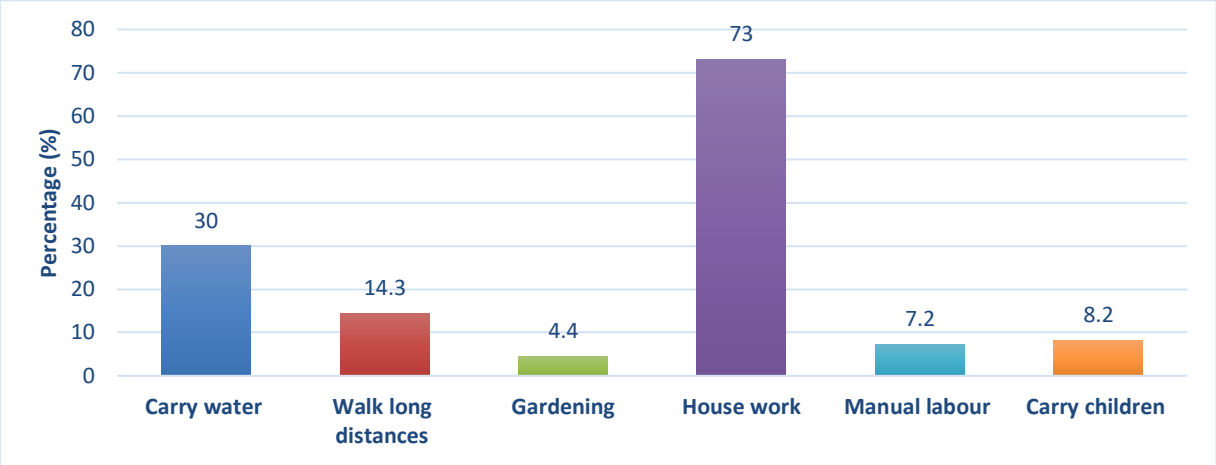


Figure 4.8: Activities of daily living (n=293)

4.5.4 Medical history of participants at the first antenatal visit

4.3.4.1 Self-reported pre-pregnancy medical history and medication use by the participants at the first trimester visit

Figure 4.9 shows the conditions that the participants self-reported in their past medical history. Less than half reported pre-pregnancy conditions (44.6%, n=135), with the most prevalent being headaches (8.3%; n=25) followed by TB (4.6%; n=14). There was a low prevalence of self-reported MSK prior to pregnancy.

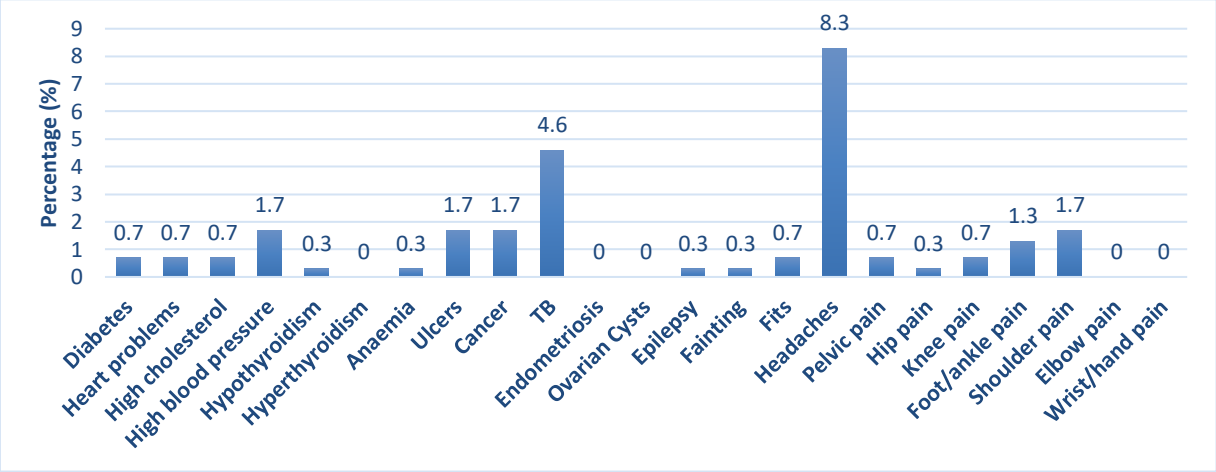


Figure 4.9: Self-reported, pre-pregnancy medical history of the participants (n=303)

Table 4.3 indicates the medication used by the participants. Medication was currently been taken by (27.3%, n=69) with 9% (n=23) taking pain medication, of which only 2.7% (n=7) of them suffered with BP. There was a significant relationship between pain killer use and BP prevalence, whereby those taking pain medication were more likely to suffer with BP (*p* = 0.01; Fischer's Exact Test). No other significant relationships were found for medication use related to BP.

Table 4.3: Self-reported medication use by the participants and its relationship to BP in pregnancy

	First Trimester				Third Trimester			
	Back pain				Back pain			
Characteristics	**Total n (%)**	**Yes n (%)**	**No n (%)**	***p* value**	**Total n (%)**	**Yes n (%)**	**No n (%)**	***p* value**
Current medication use	(n=253)			1.00	(n=39)			0.63
Yes	69 (27.3)	8 (3.2)	61 (24.1)		12 (30.7)	2 (5.1)	10 (25.6)	
No	184 (72.7)	21 (8.3)	163 (64.4)		27 (69.2)	3 (7.7)	24 (61.5)	
Pain killers	(n=255)			**0.01**	(n=41)			1.00
Yes	23 (9)	7 (2.7)	16 (6.3)		6 (14.6)	0 (0)	6 (14.6)	
No	232 (91)	24 (9.4)	208 (81.6)		35 (85.4)	4 (9.8)	31 (75.6)	
ARV treatment	(n=255)			0.83	(n=41)			0.60
Yes	68 (26.6)	9 (3.5)	59 (23.1)		14 (34.2)	2 (4.9)	12 (29.3)	
No	187 (73.3)	22 (8.6)	165 (64.7)		27 (65.9)	2 (4.9)	25 (61)	

4.3.4.2 Medical history of the participants obtained from the clinic chart at the first trimester visit

Table 4.4. shows that there was a high prevalence of HIV infection (40.5%, n=94), with the majority of the women being nulliparous or primiparous (38.5%, n=91; 36%, n=85), with most being overweight (58.9%, n=137). The mean weight of the participants in the first trimester was 67.58kg's (±SD 14.28), with a range from 40.5kg's to 126.15kgs.

Table 4.4: Medical history of the participants and its relationship to BP in pregnancy

	First Trimester				Third Trimester			
	Back pain				Back pain			
Characteristics	**Total n (%)**	**Yes n (%)**	**No n (%)**	***p* value**		**Yes n (%)**	**No n (%)**	***p* value**
HIV status	(n=232)			0.34	(n=31)			0.28
Positive	94 (40.5)	9 (3.9)	85 (36.6)		18 (58)	1 (3.2)	17 (54.8)	
Negative	138 (59.5)	22 (9.5)	116 (50)		13 (42)	3 (9.7)	10 (32.3)	
Parity	(n=236)			0.86	(n=9)			0.27
Nulliparous	91 (38.5)	12 (5)	79 (33.5)		8 (27.5)	1 (3.4)	7 (24.1)	
Primiparous	85 (36)	13 (5.5)	72 (30.5)		12 (41.3)	3 (10.3)	9 (31)	
Multiparous	60 (25.5)	7 (3)	53 (22.5)		9 (31)	0 (0)	9 (31)	
Gravida	(n=235)			1.00	(n=29)			0.59
Primigravida	90 (38.3)	12 (5.1)	78 (33.2)		10 (34.5)	2 (6.9)	8 (27.6)	
Multigravida	145 (38.3)	19 (8.1)	126 (53.6)		19 (65.5)	2 (6.9)	17 (58.6)	
BMI	(n=231)			0.54	(n=4)			-
Underweight <18.5	2 (0.9)	0 (0)	2 (0.9)		0 (0)	0 (0)	0 (0)	
Normal weight 18.5-24.9	94 (40.3)	11 (4.7)	83 (35.6)		2 (50)	2 (50)	0 (0)	
Overweight 25-29.9	75 (32.2)	9 (3.9)	66 (28.3)		1 (25)	1 (25)	0 (0)	
Obese >30	62 (26.7)	12 (5.2)	50 (21.5)		1 (25)	1 (25)	0 (0)	

No significant relationships, when using Fischer's Exact Test, were found between the variables assessed from the chart review and the prevalence of BP in the participants.

4.5.4.3 Self-reported MSK pain during pregnancy

During the first trimester (n=283), less than a third of the women (27.6, n=78) reported suffering from MSK pain. Table 4.5 shows the types of pain reported.

Table 4.5: Types of MSK pain reported in the first trimester

Location	**n (%)**
Neck pain	8 (2.8)
Upper back pain	14 (5)
Low back pain	24 (8.5)
Shoulder	10 (3.5)
Elbow	2 (0.7)
Wrist/hand	3 (1.1)
Hip/thigh	6 (2.1)
Knee	6 (2.1)
Ankle	12 (4.3)

When asked about the impact of the pain, as seen in Figure 4.10, most felt that they could cope with the pain (80.3%, n=53) and only a third sought treatment for the pain (31.3%, n=21).

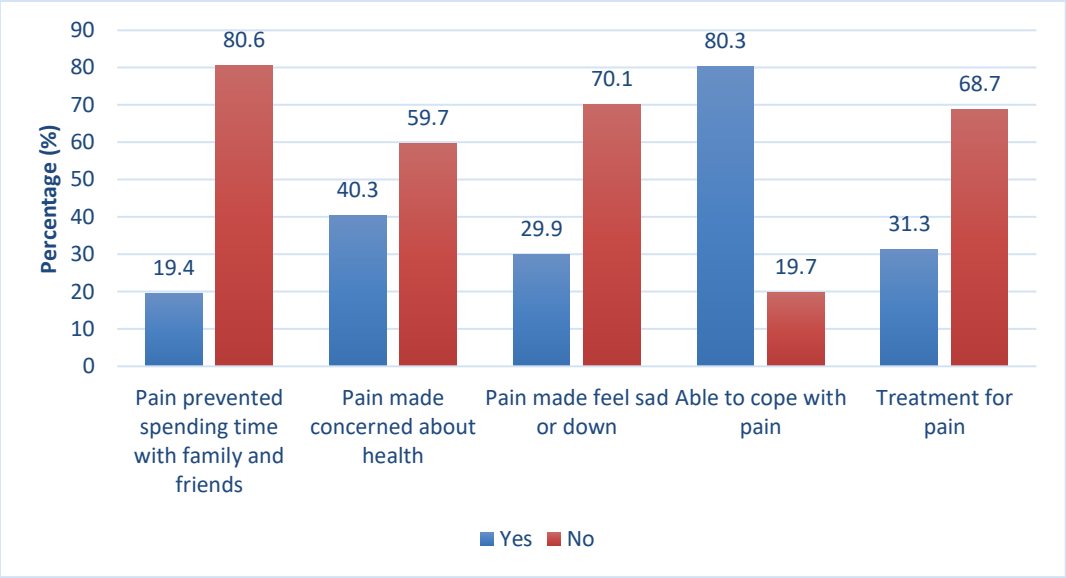


Figure 4.10: Impact of MSK pain in the 1st Trimester (n=67)

In the third trimester (n=46), only nine participant's reported MSK pain (20%).

Table 4.6: Types of MSK pain reported in the third trimester

Location	n (%)
Neck pain	0 (0)
Upper back pain	0 (0)
Low back pain	5 (10.9)
Shoulder	0 (0)
Elbow	0 (0)
Wrist/hand	1 (2.2)
Hip/thigh	2 (4.4)
Knee	0 (0)
Ankle	1 (2.2)

Inability to cope with the pain was reported more frequently than in the first trimester, however a lesser proportion sought treatment for their pain (7.1%, n=1), as represented in Figure 4.11.

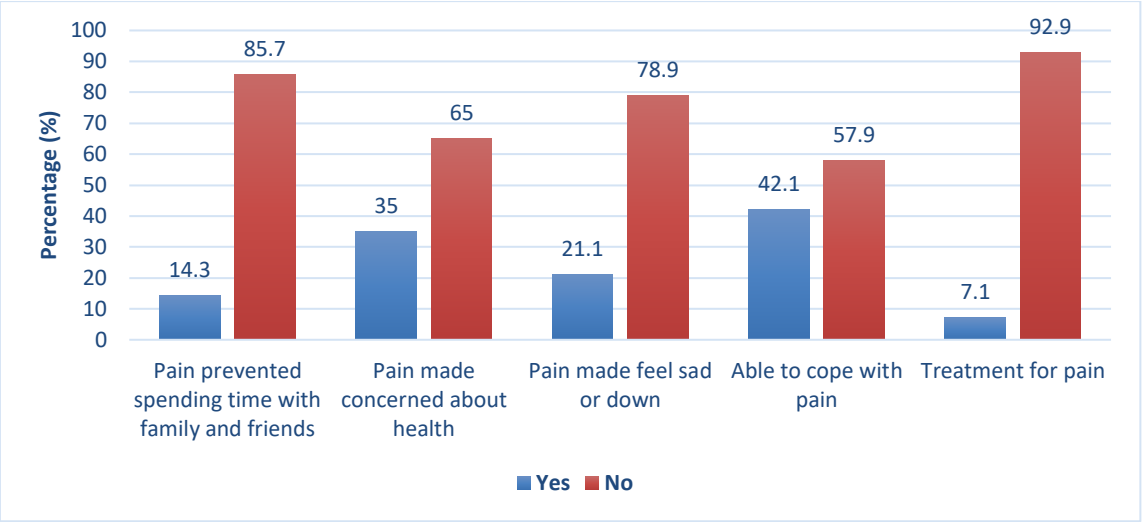


Figure 4.11: Impact of MSK pain in the 3rd Trimester (n=21)

4.5.4 Psycho-social factors of the participants at the first and third trimester

4.5.4.1 Depression/anxiety, stress and hours slept

Overall, there was a low prevalence of self-reported stress, depression or anxiety and more than half of the respondents (58.5%, n=159) reported sleeping “all night”, as seen in Table 4.5.

Table 4.7: Psycho-social variables of the participants and its relationship to BP in pregnancy

	First Trimester				Third Trimester			
	Back pain				Back pain			
Psycho-social variables:	**Total n (%)**	**Yes n (%)**	**No n (%)**	***p* value**	**Total n (%)**	**Yes n (%)**	**No n (%)**	***p* value**
Depression/anxiety	(n=280)			0.08	(n=6)			-
Yes	4 (1.4)	2 (0.7)	2 (0.7)		0 (0)	0 (0)	0 (0)	
No	276 (98.6)	33 (11.8)	243 (86.8)		6 (100)	5 (83.3)	1 (16.7)	
Stress	(n=280)			**0.04**	(n=6)			-
Yes	3 (1.1)	2 (0.7)	1 (0.4)		0 (0)	0 (0)	0 (0)	
No	277 (98.9)	33 (11.8)	244 (87.1)		6 (100)	5 (83.3)	1 (16.7)	
Hours of sleep per night	(n=272)			0.09	(n=42)			0.49
>4 hours	8 (2.9)	3 (1.1)	5 (1.8)		4 (9.5)	1 (2.4)	3 (7.1)	
4-8 hours	105 (38.6)	13 (4.8)	92 (33.8)		16 (38.1)	2 (4.8)	14 (33.3)	
All night	159 (58.5)	17 (6.3)	142 (52.2)		22 (52.4)	2 (4.8)	20 (47.6)	

No significant relationships were found between psycho-social factors and BP prevalence except for stress and back pain in the first trimester (p = 0.04), however due to the low numbers finding should be interpreted with caution.

4.3.5.2. Substance abuse

Table 4.6 shows that recreational drug use, smoking and alcohol consumption was low in the participants pre- and during pregnancy.

Table 4.8: Substance abuse and its relationship to BP in pregnancy

	First Trimester				Third Trimester			
	Back pain				Back pain			
Type of substances:	**Total n (%)**	**Yes n (%)**	**No n (%)**	***p* value**	**Total n (%)**	**Yes n (%)**	**No n (%)**	***p* value**
Pre-pregnancy recreational drug use	(n=277)			1.00	(n=42)			-
Yes	3 (1.1)	0 (0)	3 (1.1)		0 (0)	0 (0)	0 (0)	
No	274 (98.9)	35 (12.6)	239 (86.3)		42 (100)	5 (11.9)	37 (88.1)	
Current recreational drug use	(n=277)			1.00	(n=42)			-
Yes	2 (0.7)	0 (0)	2 (0.7)		0 (0)	0 (0)	0 (0)	
No	275 (99.3)	35 (12.6)	240 (86.6)		42 (100)	5 (11.9)	37 (88.1)	
Smoke/Snuff during pregnancy	(n=277)			0.06	(n=43)			1.00
Sometimes	3 (1.1)	2 (0.7)	1 (0.4)		1 (2.3)	0 (0)	1 (2.3)	
Daily	2 (0.7)	0 (0)	2 (0.7)		0 (0)	0 (0)	0 (0)	
None	272 (98.2)	32 (11.6)	240 (86.6)		42 (97.6)	5 (11.6)	37 (86)	
Smoking during current pregnancy	(n=278)			0.24	(n=45)			1.00
Yes	2 (0.8)	1 (0.4)	1 (0.4)		1 (2.2)	0 (0)	1 (2.2)	
No	276 (99.2)	34 (12.2)	242 (87.1)		44 (97.8)	5 (11.1)	39 (86.7)	
Ever consumed alcohol	(n=282)			0.85	(n=45)			0.64
Yes	101 (35.8)	13 (4.6)	88 (31.2)		17 (37.8)	1 (2.2)	16 (35.6)	
No	181 (64.2)	22 (7.8)	159 (56.4)		28 (62.2)	4 (8.9)	24 (53.3)	
Alcohol consumption during pregnancy	(n=241)			**0.03**	(n=39)			1.00
1-4 weekly	2 (0.8)	1 (0.4)	1 (0.4)		3 (7.7)	0 (0)	3 (7.7)	
5-6 monthly	0 (0)	0 (0)	0 (0)		0 (0)	0 (0)	0 (0)	
Less than once a month	4 (1.6)	2 (0.8)	2 (0.8)		2 (5.1)	0 (0)	2 (5.1)	
Never	237 (97.6)	24 (9.9)	213 (87.7)		34 (87.2)	5 (12.8)	29 (74.4)	

A significant relationship was found when ‘alcohol consumption during pregnancy’ was compared to BP prevalence in the first trimester (p = 0.03, Fischer’s Exact Test), due to the low cell counts this should be viewed with cation. No other significant relationships were found between substance abuse and BP prevalence.

Chapter 5

Discussion

5.1 Introduction

This chapter discusses the results of this study relative to the study aims and objectives and in context with the available literature.

5.2 Sample size

At the Cato Manor PHC facility, the clinic had an average of 667 antenatal visits per month over a 12 month period from 2015 to 2016, before the MRC/DUT project started. Pregnant patients at this facility are scheduled six antenatal visits during pregnancy. The clinic had an average of 110 new patients attending the clinic per month, with a yearly average of 1316 new patients (Sister Patience Ngcobo 2018). In this study the data from 303 pregnant women was utilised, of which 303 records were reviewed for the first trimester data, which would represent approximately 23% of the annual population of pregnant women attending this clinic.

In contrast, for the third trimester only 46 records were available for inclusion. This had a negative impact on the ability to report data for this part of the pregnancy. Birth cohort studies have been documented to be difficult to conduct (Eskenazi *et al.* 2005), especially in populations where there is migration to the city for work, and then during pregnancy and for the birth of the baby the mothers return to the rural areas.

5.3. Prevalence and incidence of BP in pregnancy

There have been a variety of reports in the literature on the prevalence of BP among pregnant women, with ranges from 25% to 90% (Abebe *et al.* 2014; Katonis *et al.* 2011). This study found the prevalence of BP to be low, with 12.4% (n=35) reporting BP in the first trimester and only 10.9% (n=5) of the 46 women reporting BP in the third trimester. This is relatively lower than existing literature, with the exception of Malmqvist *et al*. (2012) who found a 10% prevalence rate in pregnant women in Norway. This study was the exception for studies conducted in developed countries. Prevalence rates in other Africa countries like Nigeria (Ayanniyi *et al.* 2006; Jimoh *et al.* 2013; Nwuga 1982) and Benin (Charpentier *et al.* 2015); had prevalence rates in line with those in developed countries. However, an Ethiopian study had a lower prevalence of BP of 33.2% (n=101) (Abebe *et al.* 2014).

A woman's experience of BP is subjective and likely dependent on their perception of pain (Świeboda *et al.* 2013), this would be influenced by their social and cultural circumstances (Kerns *et al.* 2011). It has been reported that some women view BP in pregnancy as 'normal' and thus many do not disclose their pain (Abebe *et al.* 2014). It is possible that in the current study, cultural beliefs about pain influenced the participants reporting of BP. In addition, the participants in this study were young and this may have influenced their risk for BP.

It has been reported that the incidence of back pain in pregnancy is 50% to 80% (Sabino and Grauer 2008), with it usually starting between the 20th and 28th week of gestation (Katonis *et al.* 2011). Mogren and Pohjanen (2005) reported a mean gestation age of 22.1 weeks as the start of BP, however of these women 20% claimed that pain started as early as 16 weeks with some claiming pain started within the first month, which could suggest that some pain may be secondary to hormonal changes rather than physical stresses (Sabino and Grauer 2008). In this study 35 (12.4%) women reported BP in the first trimester.

As pregnancy progresses and there is weight gain and a shift in the centre of gravity the prevalence of BP increases (Borg-Stein *et al.* 2005; Casagrande *et al.* 2015) and new cases of BP are reported. However, in this study no new cases of BP were reported in the third trimester. This result could be due to the high rate of non-returns to the clinic.

5.4 Profile of BP in pregnancy

Pain can be defined as an emotional and unpleasant experience associated with actual or potential tissue damage (International Society of Pain 2018). It is a subjective experience and an individual's perception of pain is dependent on their emotional state and circumstantial factors as to how the pain was acquired (Świeboda *et al.* 2013). In a Nigerian study (Usman *et al.* 2017) (N=309), 72.5% (n=205) experienced moderate pain while only 9.2% (n=26) experienced severe pain during pregnancy. This is similar to the findings of Nwuga (1982) (N=99), where only 10.1% (n=10) of the respondents had severe pain and 81.3% (n=80) with mild to moderate consistency, similar to the findings of Worku (2000) (N=4001) who reported approximately 10% (n=405) had severe BP and approximately 50% (n=1935) had moderate or mild BP. According to the literature, mild to moderate pain intensities during pregnancy are in the majority, with a very low prevalence of severe pain. Similar results were seen in the current study.

LBP was most commonly reported by the participants in this study. The changes in a women's body during pregnancy make this area vulnerable to developing pain (Thabah and

Ravindran 2015). Many studies on pregnant women focus specifically on LBP as opposed to BP, as was done in this study, due to the prevalence of pain in this area during pregnancy. There was a low reporting of UBP in this study, however it was often described as severe. Ramachandra *et al.* (2015) and Ayanninyi *et al.* (2006) also found low reporting of pain in this region during pregnancy, however these studies found it more common in the latter part of pregnancy as opposed to this study where it was reported in the early stages of pregnancy.

NP during pregnancy has not been well established, with only two studies reporting its prevalence. In India, the pregnancy prevalence was low in the second (6.2%) and third (2.5%) trimesters (Ramachandra *et al.* 2015). With similar results being found in a Nigerian pregnant population (Yasobant *et al.* 2014). The results in the current study are in alignment with these studies indicating that NP in pregnancy is rare.

In this study, of those who reported LBP in the first trimester, the majority developed BP before pregnancy with 42.2% reporting their BP in the first trimester. In the third trimester, the majority reported the onset of their BP in the first trimester with the rest reporting it starting before pregnancy (33.3%). UBP was mostly acute pain (66.7%), with NP most likely started before pregnancy (which is therefore not pregnancy-related), with only 14.3% reporting acute pain (within 1-2 weeks). This shows that BP before pregnancy may result in BP in the current pregnancy (Östgaard *et al.* 1991), and that BP can present in the first trimester (Kristiansson *et al.* 1996; Östgaard *et al.* 1991), and continue throughout pregnancy (Kristiansson *et al.* 1996; Wang *et al.* 2004).

5.5 Socio-demographic characteristics of the participants

In South Africa, early childbearing is common, with a high prevalence of teenage pregnancies (aged 15-19). Early childbearing is more common in non-urban areas (19%) than urban areas (14%), with 16% of girls aged 15 to 19 having begun childbearing. Teenage mothers are more likely to experience adverse pregnancy outcomes, and have difficulty perusing educational goals post-pregnancy. This lack of education can lead to less job opportunities and financial burden and therefore predispose young women to lower socio-economic standards which can make them more susceptible to BP (www.statssa.gov.za/publications/Report%2003-00-09/Report%2003-00-092016.pdf, 2011).

In this study the youngest participant was 15 and the eldest 44 years of age, with the majority being between the ages of 18-24 years (n=127). This finding confirms that sexual activity commences at an early age, with pregnancy being very common among unmarried single adolescent girls in KZN (Manzini 2001).

During pregnancy, age has been widely debated on its relationship to BP (Carvalho *et al.* 2015). Kristiasson *et al*. (1996) reported no association between age and BP in pregnancy. Other studies reported that young mothers were more likely to have BP than older mothers (Carvalho *et al.* 2015; Endresen *et al.* 1995; Kristiansson *et al.* 1996; Östgaard *et al.* 1991; Orvieto *et al.* 1994; Wang *et al.* 2004). In this study, there was no significant relationship found between age and BP in the first or the third trimester. These results are consistent with studies conducted in Nigeria (Ayanniyi *et al.* 2006) and Ethiopia (Abebe *et al.* 2014).

There is limited evidence supporting a relationship between ethnicity and the prevalence of BP in pregnancy (Dumas *et al.* 2014). The majority of studies show that BP in pregnancy occurs in women across the globe of varying ethnicities (Wang *et al.* 2004; Wu *et al.* 2004; Dumas *et al.* 2014). Cultural differences in terms of the perception of pain are well documented (Anderson *et al.* 2009; Kerns *et al.* 2011) and its influence on reporting BP in pregnancy has been noted (Abebe *et al.* 2014). South Africa is a culturally diverse country, with five ethnic/racial groups (www.statssa.gov.za/census/census_2011/census_products/Census_2011_Census_in_brief.pdf, 2011). However in this study all participants were from the Black African race group. The Cato Manor PHC is situated in Umkhumbane (Mayville) in Ethekwini District of KZN. This area is predominately occupied by Black Africans (www.statssa.gov.za/ethekwini-municipality, 2011) explaining the finding in this study.

Although there is limited literature on the relationship of marital status and BP in pregnancy, it has been shown that being married is associated with a lower incidence of BP in a non-pregnant population in the U.S.A. (Nakao *et al.* 2011). It is suggested that being married increases social support, has health benefits, and reduces stress with regards to social, financial and living situations (Reblin and Uchino 2008). This is supported by Morylowska-Topolska *et al.* (2014) who found that unmarried pregnant women had a greater severity of depressive symptoms in the first and third trimester than their married counterparts. In a time when physiological changes occur in the body, as well as physical and emotional effects on the life of a woman whose body must adapt to the changes that take place during this period (Quaresma *et al.* 2010) it places a great burden on a woman. During this trying time, the support of a lifelong partner would be beneficial.

Yet in some parts of Africa, childbearing pressures in marriage can have negative effects (Fledderjohann 2017). African women have reported that they fear that their relationships are at risk due to fertility issues (Fledderjohann 2017). On the other hand there is also a high risk of unintended pregnancies in sub-Saharan Africa, where there is poor access to reproductive healthcare (Eliason *et al.* 2014; Haffejee *et al.* 2018). Marriage rates in South Africa, specifically, are low and have declined in recent years, especially in young Black Africans due to the costs of cultural weddings and the payment of *ilobolo* (bride wealth) which has become an unaffordable option for many young Black African couples (Posel *et al.* 2011) making marriage difficult. Despite the young age of the participants in this study it is possible that this is a reason for most (81.2%; n=229) of the participants being single.

In addition, in the South African culture, it is very common for grandparents, specifically grandmothers to take on parental responsibilities, while parents attend to work demands and support families, or other responsibilities (Mtshali 2015). This could offer the support that marriage brings when raising a child. The impact this has on the prevalence of BP should be further explored.

5.6 Socio-economic characteristics of the participants

Inadequate access to ANC is a significant concern in developing countries, where there is a major focus on reducing pregnancy-related mortality, as well as taking measures to make the gestational period as tolerable as possible, especially for mothers and their families (Gorginzadeh *et al.* 2016). Factors that make the South African setting unique and may alter the relationship dynamics of BP in pregnancy is the HIV and AIDS epidemic, types of work tasks, a lack of access to clean water and sanitation, good nutrition and good quality health care services (Bloom 2000), which all contribute to socio-economic status.

It has been reported that people of a lower socio-economic status commonly experience BP compared to those of a higher economic status (Orvieto *et al.* 1994; Worku 2000) and socio-demographic factors have been related to disease and disability profiles in communities (Louw *et al.* 2007). Rurality is commonly assumed to be a barrier to health care. Compared to urban areas, rural female residents in India were reported to be more prone to developing BP generally (Gupta and Nandini 2014) as well as in pregnancy (Mohseni-Bandpei *et al.* 2009). Residing in a rural area often requires that the residents partake in farming and household work. This could be associated with poor posture, improper techniques for lifting heavy objects or carrying loads (Gupta and Nandini 2014), and may account for the presence of BP. In contrast, Yasobant *et al*. (2014) when

comparing rural and urban dwellers found that those in urban areas (54.4%) had a higher prevalence of BP.

The women in the current study resided in a peri-urban area, were mostly young and unemployed with a secondary education. Although none of these factors was significantly associated with BP, low educational status has been shown to be associated with an increased prevalence of BP, and to be an even stronger predictor of episode duration and poor outcomes (Hoy *et al.* 2012). The participants reported that their most common activity of daily living was house cleaning. In rural India it was found that women spent 4-5 hours in household activities daily (Gupta and Nandini 2014). Like farming, household activities can create strain in the MSK system and lead to pain. Yet there was a low report of BP in pregnancy in the current study.

5.7 Medical history

Although there has been much research done, on chronic illnesses, still relatively little is known about the role of co-morbidities in pregnancy (Ferreira and de Luca 2017). Co-morbidities during pregnancy ensue a considerable burden (www.afro.who.int/sites/default/files/2017-06/report-of-the-commission-on-womens-health-in-the-african-region---full-who_acreport-comp%20(1).pdf, 2017). The three leading causes of death in South Africa are TB, diabetes mellites (DM) and CVS disease. Non-communicable diseases, a disease by definition that is non-infectious or transferrable (such as DM or CVS disease) accounted for 60% of deaths in SA (www.statssa.gov.za/?p=9604, 2015). The overall HIV prevalence rate in South Africa is approximately 13.1%, with an estimated prevalence of 18% among people aged 15-49 years of age (www.statssa.gov.za, 2018).

In this study the prevalence of HIV infection was high with 40.5% (n=94) of the participants testing positive which is comparable to Kharsany *et al.* (2015) who reported the rural HIV prevalence rate in pregnant women to be in excess of 40% in women aged 20-24 years, and over 50% in women aged 25-34 years.

Chronic pain is very common in those who suffer with HIV (Molony *et al.* 2014) and has a major impact on the patient's life (Uebelacker *et al.* 2015). In HIV-infected patients, chronic pain can have diverse aetiologies including HIV-related MSK pain, BP or headaches, or may be due to the impact of HIV-related conditions such as neuropathy or osteonecrosis (Merlin *et al.* 2014). HIV/AIDS exacerbates and prolongs pain, increases health care usage and expenses, and increases the percentage of those living in poverty (Institute of Medicine

2011). Despite this there were no significant relationships found between HIV infection and BP in this study, possibly due to the low number of people reporting BP.

South Africa has one of the highest burdens of TB, with it currently being the leading cause of death (www.tbfacts.org/tb-statistics-south-africa/, 2016), yet only 4.6% (n=14) participants reported having TB. TB drugs are known to have MSK effects often resulting in pain and disability (Denholm *et al.* 2014). Headaches, which are commonly experienced during pregnancy (Digre 2013), were reported by 8.3% (n=25), and non-communicable diseases like DM and CVS disease were low, possibly due to the young population represented in this study.

Medicine use, unless essential is often not encouraged in pregnancy due to possible complications for the developing foetus (Andrade *et al.* 2004). In a population of underserved American pregnant women, Wang *et al*. (2004) reported that 75% of the women who had BP reported using pain medication during pregnancy. In contrast 24.53% (n=106) of pregnant women in Pakistan used analgesics for pain relief (Shaheen Kauser and Sheikh 2006). In the current study far fewer participants (9%, n=23) reported using pain killers during pregnancy, but their reason for using this medication is unclear. An association between painkiller use and BP in pregnancy was found in the first trimester (p = 0.01), however, due to the low numbers this relationship should be treated with caution.

In this study, over a quarter of the participants were using ARV treatment (26.6%, n=68), however, 40.5% had HIV infection, the discrepancy in these results may stem from women being diagnosed as HIV positive on presenting to the clinic in their first trimester, thus they would not have reported using ARV's as their status would not have been known at that point.

Some studies are suggestive that there is an association between BP during pregnancy and parity and gravida (Kristiansson *et al.* 1996; Jimoh *et al.* 2006; Mogren and Pohjanen, 2005; Mohseni-Bandpei *et al.* 2009; Östgaard *et al.* 1991; Pierce *et al.* 2012). Whereas others have found it not to be a risk factor for developing BP during pregnancy (Mota *et al.* 2015, Wu *et al.* 2004). In this study most of the women had been pregnant before, and given birth more than once, indicating a high fertility rate in this population. However, no associations were found between BP in pregnancy and parity or gravida. Obstetrical and foetal factors such as weight of baby and mother are also essential together with parity, but were not investigated in this study.

Mogren and Pohjanen (2005) reported that pregnant women with BP weighed significantly more and had a significantly higher BMI compared to women without BP. The risk for non-

communicable disease risk factors in South Africa is high, where high body mass index (BMI) was ranked fifth as a risk factor causing death. Obesity has also been associated with increased risk of developing other non-communicable diseases, for example coronary heart disease, DM, stroke (van Zyl *et al.* 2010) and osteoarthritis (South Africa Demographic and Health Survey 2016). The prevalence of obesity in South Africa is very high, and it has been indicated that 56% of women and 29% of men have a BMI > 25 kg/m2 (van Zyl *et al.* 2010), with severe obesity most common among African women (South Africa, Demographic and Health Survey 2016). One-third of South African women over the age of 15 have been classified as obese, compared to 10% of men (South Africa Demographic and Health Survey 2016). The obese also tend to have a low self-esteem, a negative perception of body image, and/or depression (Voelker *et al.* 2015).

In this study, the participants weight in the first trimester ranged from 40.5kg – 126.15kg, with only 40.3 % (n=94) of the participants having a normal BMI, indicating that at the start of pregnancy the majority of the participants were already overweight. During pregnancy weight gain is inevitable (Borg-Stein *et al.* 2005). Women with weight gain outside the recommended ranges during pregnancy may experience various adverse maternal outcomes, including pregnancy-related hypertension, gestational diabetes, complications during labour and delivery, post-partum weight retention and subsequent maternal obesity, and an increased risk of unsuccessful breastfeeding (Rasmussen and Yaktine 2009). The possible reason for the majority of participants in this study being overweight could be that some African women's concepts of body size do not always correspond with their BMI and that overweight Black African women in South Africa often perceive themselves as "healthy" (Puoane *et al.* 2010). Being overweight can also predispose one to BP in pregnancy (Bliddal *et al.* 2016) due to the extra weight on the body, as a weight increase of 20% during pregnancy can increase the force on a joint by 100% (Ritchie 2003). In this study, no significant relationships were found between BMI and BP in pregnancy.

5.8 Psycho-social stress in pregnancy

Pregnancy is a life changing event that can bring cheerful and positive emotions; at the same time, the physical and emotional changes of nearing motherhood can be overwhelming and stressful (Jesse *et al.* 2014). It has been shown that up to 51% of pregnant women may encounter antepartum depression with those from rural, and low income areas being disproportionately affected (Jesse *et al.* 2014). These women often have inadequate access to health care resources during pregnancy (Bloom *et al.* 2012; Jesse *et al.* 2014).

In this study, a low prevalence of depression, anxiety (1.4%; n=4) and stress (1.1%; n=3) was self-reported by the participants. The low prevalence could be due to under-reporting or not understanding the question, this could have impacted the results. Little research exists regarding which factors contribute to or coexist with psycho-social stress during pregnancy (Woods *et al.* 2010). In terms of BP, high levels of anxiety, depression, obsessive-compulsive behaviours, and somatization have been associated with a longer duration of BP symptoms (Cedraschi *et al.* 2018). With chronic BP patients being three to four more times more likely to suffer with depression when compared to general populations (Edit *et al.* 2013).

Rodriquez *et al*. (2001) reported that the psycho-social factors such as perceived stress and the lack of social support were associated with the prevalence of 27 pregnancy symptoms (one of which was BP). In this study, an association was found between BP and stress, yet due to the small response rate this must be viewed with caution.

Although the participants did not indicate that they felt stressed or depressed a significant portion felt that their pain prevented them spending time with their family and friends, it made them concerned for their health and made them feel sad or down in both the first and third trimester. And when asked if they could cope with their pain, 57.9% reported “no” in the third trimester. These psycho-social factors associated with MSK pain should be further investigated in this population, with further evaluation of their symptoms with a qualitative study.

Poor sleep has been associated with BP as well as having an impact on quality of life, and through pregnancy changes such as size and shape, it is a common notion that pregnancy involves some pain and difficulty while sleeping (Skaggs *et al.* 2007). Many studies have found a strong association between sleep disturbances in pregnancy and BP (Skaggs *et al.* 2007; Jimoh *et al.* 2013; Wang *et al.* 2004). However, in this study only 2.9% (n=8) of the participants reported having less than 4 hours sleep a night, with the majority having four to eight or more hours of sleep per night. The quality of the participants’ sleep was not explored in this study and no relationships between sleep and BP in pregnancy were found.

In South Africa, the three most used substances are tobacco, alcohol and cannabis. Reported reasons for use were poverty, unemployment, stress related to unemployment, long work shifts, family problems, and work pressures (Ramlagan *et al.* 2010). The participants in the current study reported low cigarette use which is supported by Statistics SA where it was reported that Black African women are less likely to smoke compared to their White or Coloured counterparts. In addition, those residing in KwaZulu-Natal have a

lower cigarette usage than other provinces (www.statssa.gov.za, 2018). Cigarette smoke contains more than 7000 harmful substances, and the harm of smoking during pregnancy is well documented (Tweed *et al.* 2017) yet many smokers continue to smoke while pregnant (Truong *et al.* 2017). Smoking has been associated with BP in international studies (Lindal *et al.* 2000), however no associations with smoking were found in this study at either the first or third visit, as only 0.8% (n=2) reported smoking during pregnancy.

Alcohol use is a growing problem in SA, with only 26% (n=4300) of women over the age of 15 years of age being found to not have ever consumed alcohol, and one in 10 women consumed alcohol in the past seven days (South Africa Demographic and Health survey 2016: 39). Only 5% of South African women reported risky drinking (i.e. drinking more than five standard units of alcohol on a single occasion). The stigma associated with alcohol use in many South African communities, makes it likely that the prevalence and intensity of drinking is under-reported in surveys (Vellios and van Walbeek 2018). Only 2.4% (n=6) of pregnant women in this study reported consuming alcohol during their current pregnancy, which is very low compared to a study in the Scandinavian countries where 16% (n=1069) of mothers reported drinking alcohol during pregnancy (Truong *et al.* 2017). Alcohol use and the prevalence of BP is not well understood as yet, as not many studies have assessed the relationship between the two in pregnancy. In this study, a significant relationship was found between no alcohol consumption during pregnancy - that those who did not consume alcohol during pregnancy were less likely to experience BP in the first trimester (p = 0.03), yet due to the small response rate this must be viewed with caution.

Maternal drug use in pregnancy is a major health concern, as most drugs are used within limited knowledge of safety and efficacy for the mother and may have undetermined risks and potential adverse effects on the foetus (Neyro and Jacqz-Aigrain 2017). Illicit drug use during pregnancy has been associated with a wide range of adverse neonatal outcomes such as intrauterine growth restriction, preterm birth, low birth weight, foetal distress, neurocognitive delays and impairment, and drug misuse later in adolescence (Farr *et al.* 2014; Terplan *et al.* 2015). In addition, it has been found that in the general population of the U.S.A, people with chronic BP are more likely to have used illicit drugs (including marijuana, cocaine, heroin, and methamphetamine) compared to those without BP, with a lifetime prevalence of 49%. They reported that there was no evidence that illicit drug use caused BP, only that there was an association between them (Shmagel *et al.* 2016). However, there is a paucity of literature assessing illicit drug use and its relationship to BP in pregnancy. Recreational drug use was very low in this study, with only 0.7% (n=2) of the

participants reporting recreational drug use during pregnancy, with no significant associations.

Chapter Six

Conclusions, Limitations and Recommendations

6.1 Introduction

This chapter will provide a summary of the results of the study as well as the conclusions drawn from the study, together with the limitations and recommendations for future research.

6.2 Conclusions

The aim of this study was to determine the incidence and prevalence of BP in pregnancy and its relationship to socio-demographic and psycho-social factors in a pregnant cohort in a PHC clinic in the eThekwini municipality.

Participants in this study were patients attending a PHC clinic in Cato Manor seeking ANC. They were from a disadvantaged socio-economic community which included informal settlements, with a high percentage of the participants living in squatter camps. The characteristics of the pregnant participants showed that all were Black Africans, they were mostly very young with the majority aged between 18 to 24, and single. Over two-thirds of the participants were unemployed, yet the majority of them were educated, with a secondary level of education. The most reported location of BP was LBP, in the first and third trimesters, with acute and chronic pain noted, with mostly moderate intensity. UBP was the second most reported area of BP. The most common co-morbidity reported was HIV, followed by TB. The participants had an overall low prevalence of any substance abuse, with no significant psycho-social factors other than stress having an effect on BP in pregnancy. In the first trimester, participants who self-reported that they had no stress, were less likely to have BP, which is in line with the literature (Cedraschi *et al.* 2018)

This was a descriptive study to investigate the demographic, psycho-social profile, and BP profile of patients attending a PHC in the eThekwini municipality, KwaZulu-Natal, South Africa. This study was able to provide an understanding and add to a body of knowledge in terms of characteristics of pregnant patients that presented to this PHC clinic. This study failed to find a significant relationship between socio-demographic and psychosocial factors and BP prevalence due to the low number of respondents with pregnancy related BP. Further investigation is warranted to determine if the results seen in this study are reproducible in this community. Marital status, the use of pain killers, self-reported stress,

and alcohol consumption are factors that require further exploration. Little is known about pregnancy-related BP in South Africa, and this study provides a starting point for further exploration.

6.3 Limitations

The retrospective nature of this study relied on the accuracy of the data recorded at the time that the surveys and chart review data was recorded as part of the MRC/DUT project, as well as denied the researcher the ability to do the groundwork of the preliminary preparation of the major study. Recall bias and reluctance to answer the surveys may have influenced the participants reporting of their information. In addition, the lack of participant return for the third trimester visit jeopardised the ability to assess the cohort through their pregnancy, and made the associations seen in this study questionable.

6.4 Recommendations

- This study only included one PHC, that was located in a peri-urban setting, future studies should survey pregnant women from several PHC's to determine if the results from this study represent the larger population or if they are unique to this population.
- A similar study could be conducted in the private sector to see if there are differences between those attending the government versus private facilities, with attention to socio-demographic variances.
- Other risk factors that can affect BP in pregnancy, like BP during menstruation, previous history of BP, and previous pregnancy induced BP should be included in future studies.
- A study assessing the impact of BP during pregnancy on the activities of daily living, as well as occupational factors and productivity should be conducted. Qualitative studies assessing the patient's perception of pain during pregnancy, and whether there are social or cultural influences in this population.
- Site recommendations: A spinal clinic for those suffering with MSK pain (particularly the antenatal clinic); Education and awareness of HIV and reproductive health as well as contraceptive use; education programs on better self-management and prevention of BP before, during and post pregnancy to lower the incidence of BP in the community; and investigation into the cost of LBP in the PHC budget.

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Figures:

Figure 2.1: MSK compensations
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Appendices

Appendix A

Institutional Research Ethics Committee
Research and Postgraduate Support Directorate
2nd Floor, Berwyn Court
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www.dut.ac.za

14 November 2017

IREC Reference Number: **REC 125/17**

Ms C A Hawker
P.O Box 1978
Westville
3630

Dear Ms Hawker

Back pain and its relationship to socio-demographic and psychosocial factors in a cohort of pregnant women attending a primary health care clinic in the eThekwini municipality

I am pleased to inform you that Full Approval has been granted to your proposal REC 125/17.

The Proposal has been allocated the following Ethical Clearance number **IREC 106/17**. Please use this number in all communication with this office.

Approval has been granted for a period of two years, before the expiry of which you are required to apply for safety monitoring and annual recertification. Please use the Safety Monitoring and Annual Recertification Report form which can be found in the Standard Operating Procedures [SOP's] of the IREC. This form must be submitted to the IREC at least 3 months before the ethics approval for the study expires.

Any adverse events [serious or minor] which occur in connection with this study and/or which may alter its ethical consideration must be reported to the IREC according to the IREC SOP's.

Please note that any deviations from the approved proposal require the approval of the IREC as outlined in the IREC SOP's.

Yours Sincerely

[redacted]

Professor J K Adam
Chairperson: IREC

Institutional Research Ethics Committee
Research and Postgraduate Support Directorate
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11 December 2017

Ms C A Hawker
P.O Box 1978
Westville
3630

Dear Ms Hawker

Application for Amendment of Approved Research Proposal

Back pain and its relationship to socio-demographic and psychosocial factors in a cohort of pregnant women attending a primary health care clinic in the eThekwini municipality

I am pleased to inform you that your application to include an exclusion criteria for the study sample whereby you can exclude those participant questionnaires where the participant failed to complete one of the questionnaires required for this study, excluding the epidemiological third trimester questionnaire has been approved.

Yours Sincerely

[redacted]

Professor J K Adam
Chairperson: IREC

DUT DURBAN UNIVERSITY OF TECHNOLOGY
2017 -12- 11
INSITUTUTIONAL RESEARCH ETHICS COMMITTEE
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Appendix B

LETTER OF INFORMATION

Welcome to our research study. Thank you for taking time to consider agreeing to participate in the study.

Title of the Study: A multi-staged multi-disciplinary health care approach in reducing maternal morbidity and mortality rates in a selected district in KwaZulu-Natal.

Principal Investigator: Prof MN Sibiya, D Tech: Nursing.

Co-investigators: Dr P Reddy, PhD and Prof T Puckree, PhD.

Briefly Introduction and Purpose of the Study: Maternal mortality rates continue to be an issue of concern despite improved healthcare. The province of KwaZulu-Natal suffers the highest rate of maternal deaths in South Africa. The purpose of this study is to focus on improving maternal health.

Outline of the Procedures: If you agree to take part in the study, I kindly request you to complete a form which will have a few questions regarding your pregnancy in general. Completion of this form should last for approximately fifteen to twenty minutes. The questions asked will be simple and straight forward information. You are also kindly requested to donate some blood specimens. Research assistants who are professional nurses will withdraw blood samples from you and these blood samples will be used only for this research study.

Discomforts to the Subject: There is no risk or discomfort that will because by partaking in the study.

Benefits: This study may contribute to a reduction in maternal morbidity and mortality rates by providing antenatal and nutritional interventions.

Reason/s why the Subject May Be Withdrawn from the Study: You will be allowed to opt out from the study or withdraw at any time should you wish to do so.

Remuneration: You will not be expected to pay anything for taking part in the study, and also no payment will be given to you for taking part in the study.

Confidentiality: All the information will be kept in strict privacy. Your name will not be written on the field notes with your responses. The information gathered will only be used for the purpose of this study.

Research-related Injury: The nature of the study does not have any risk of injury to you.

Persons to Contact in the Event of Any Problems or Queries:

Principal Investigator: Prof MN Sibiya, Durban University of Technology Tel: 031-373 2606
Co-investigators: Dr P Reddy, Durban University of Technology Tel: 031-373 2609
Co-investigators: Prof T Puckree, Durban University of Technology Tel: 031-373 2704
Institutional Research Ethics administrator, Durban University of Technology Tel: 031-373 2900
Complaints can be reported to the DVC: TIP, Prof F. Otieno on 031-373 2382 or dvctip@dut.ac.za.

CONSENT FORM

Statement of Agreement to Participate in the Research Study:

I,……..(*Full name)*…….... (*ID number*), have read this document in its entirety and understand its contents. Where I have had any questions or queries, these have been explained to me by ……..to my satisfaction. Furthermore, I fully understand that I may withdraw from this study at any stage without any adverse consequences and my future health care will not be compromised. I, therefore, voluntarily agree to participate in this study.

Name (print) ……

Signature: ……Date: ……...……..

Researcher's name (print): ……..…….

Researcher's signature: ……..……..Date :.....

Witness name (print): …….

Witness signature: …….....Date: ……..……..

Appendix C

DUT
DURBAN UNIVERSITY OF TECHNOLOGY

Institutional Research Ethics Committee
Faculty of Health Sciences
Room MS 49, Mansfield School Site
Gate 8, Ritson Campus
Durban University of Technology

P O Box 1334, Durban, South Africa, 4001

Tel: 031 373 2900
Fax: 031 373 2407
Email: lavishad@dut.ac.za
http://www.dut.ac.za/research/institutional_research_ethics

www.dut.ac.za

14 March 2016

Professor M N Sibiya
Department of Nursing
Faculty of Health Sciences
DUT

Dear Professor Sibiya

Application for Amendment of Approved Research Proposal

A multi-staged multi-disciplinary health care approach in reducing maternal morbidity and mortality rates in a selected district in KwaZulu-Natal

I am pleased to inform you that your application for amendment to the third trimester questionnaire of your research proposal has been Approved.

Yours Sincerely

[redacted]

Professor J K Adam
Chairperson: IREC

DUT DURBAN UNIVERSITY OF TECHNOLOGY
2016 -03- 14
INSITUTUTIONAL RESEARCH ETHICS COMMITTEE
P O BOX 1334 DURBAN 4000 SOUTH AFRICA

health

Department:
Health
PROVINCE OF KWAZULU-NATAL

Postal Address: Private Bag X54318 Durban 4000
ss. 83 Jan Smuts Highway, Mayville, Durban 4001
Tel.031 2405308: Fax. 031 2405500
Email: penny.dladla@kznhealth.gov.za
www.kznhealth.gov.za

Enquiries: Ms Ntombifuthi Mthethwa
Tel: 031 240 5342
Date: 22 August 2014

Attention: Prof N.M. Sibiya
E-mail : nokuthulas@dut.ac.za

REQUEST TO CONDUCT RESEARCH:

A multistaged multi- disciplinary health care approach in reducing maternal morbidity and mortality rates in selected districts in KwaZulu natal

Support is hereby granted to conduct research on the above topic.

Please note the following:

1. Please ensure that you adhere to all the policies, procedures, protocols and guidelines of the Department of Health with regard to this research.
2. This research will only commence once this office has received confirmation from the Provincial Health Research Committee in the KZN Department of Health.
3. Please ensure that this office is informed before you commence your research.
4. The District Office will not provide any resources for this research.
5. You will be expected to provide feedback on your findings to the District Office.

Ms. N.B. Mthethwa
[redacted]

For The District Manager
EThekwini Health District
Telephone: 031 2405342
Fax: 031 2405501
Email: ntombifuthi.mthethwa@kznhealth.gov.za

health
Department:
Health
PROVINCE OF KWAZULU-NATAL

Health Research & Knowledge Management sub-component
10 – 103 Natalia Building, 330 Langalibalele Street
Private Bag x9051
Pietermaritzburg
3200
Tel.: 033 – 3953189
Fax.: 033 – 394 3782
Email.: hrkm@kznhealth.gov.za
www.kznhealth.gov.za

Reference : HRKM 234/14
Enquiries : Mr X Xaba
Tel : 033 – 395 2805

Dear Prof MN Sibiya

Subject: Approval of a Research Proposal

1. The research proposal titled **'A multi-staged multi-disciplinary health care approach in reducing maternal morbidity and mortality rates in a selected district hospital in KZN'** was reviewed by the KwaZulu-Natal Department of Health.

   The proposal is hereby **approved** for research to be undertaken at Cato Manor for a period of three years.

2. You are requested to take note of the following:
   a. Make the necessary arrangement with the identified facility before commencing with your research project.
   b. Provide an interim progress report and final report (electronic and hard copies) when your research is complete.

3. Your final report must be posted to **HEALTH RESEARCH AND KNOWLEDGE MANAGEMENT, 10-102, PRIVATE BAG X9051, PIETERMARITZBURG, 3200** and e-mail an electronic copy to hrkm@kznhealth.gov.za

For any additional information please contact Mr X. Xaba on 033-395 2805.

Yours Sincerely

[redacted]

Dr E Lutge
Chairperson, Health Research Committee
Date: 11/09/14

Appendix D (I)

Food and Nutrition Consumer Sciences

SOCIO-DEMOGRAPHIC QUESTIONNAIRE

This questionnaire covers certain aspects of your life, including work and personal details, health and illness, lifestyle and social life that is relevant to health. The answers to these questions will be kept strictly confidential and the information will not be identifiable on any reports or publications.

1. GENERAL INFORMATION

Participant number:……..……. Date: ……

Fieldworker name: ……

Please answer all questions by marking the correct answer with **X,** except where otherwise indicated.

Where do you live?

.....

2. PERSONAL INFORMATION

2.1 Your role in the family

Daughter	Mother	Grandmother	Other, Specify…….

2.2 When were you born? Year: Month: Day:

2.3 How old are you? _____ years

3. ACCOMMODATION AND FAMILY COMPOSITION

3.1 Do you live in?

Town/City	Farm	Squatter camp	Rural village	Hostel	Township	Other, specify……

3.2 How are you currently living?

Homeless	
Living with relatives	
Living with friends	
Hostel accommodation	
Squatter home	
Rented house/flat	
Own house/flat	
Employees Properties	
Other, specify…….	

3.3 Do other people live in the house with you?

Yes	No

3.4 How many people are permanent residents living in the house with you? (Only if these people eat and sleep in this house at least 4 days a week?)

1	2	3	4	5	6	7	8	9	1	10+

3.5 How long have you been staying permanent in this house?

< 1 year	1-5 years	>5 years

3.6 In what type of house are you staying?

Brick	Clay	Wood	Tin/shack

3.7 How many rooms does your house have?

1 room	2 rooms	3 rooms	4 room	>5 rooms

3.8 Are there other houses/shacks within the same yard of the main house?

Yes	No

3.9 Do you have the following facilities/ services at home?

3.9.1 Water

Tap in the house	
Tap outside the house (in yard)	
Borehole	
Spring / river / dam water	
Fetch water from elsewhere	

3.9.2 Toilet facilities

None	
Pit latrine	
Flush / sewage	
Bucket system	
Other, specify……..	

Waste removal	Yes	No	3.9.3
Tarred road in front of house	Yes	No	3.9.4
Gravel road in front of house	Yes	No	3.9.5
Access to electricity	Yes	No	3.9.6

3.10 To what extent do you have problems with the state of your house (e.g. size, repairs, damp, etc.)?

……
……

3.11 Do you have problems with the following?

Mice/ Rats	
Cockroaches	
Ants	
Flees	
Mosquitoes	
Geckos	
Frogs	
Snakes	
Bed Bugs	

3.12. What is the floor inside your house made of?

Cement	
Tiles	
Carpet	
No floor	
Sand/mud	
Dung	
Other, please state	

4. WORK STATUS AND INCOME

4.1. Are you currently employed?

Yes	No

If YES, go to Question 4.5.

4.2. If NO, how would you describe your current status (tick one box only)?

Unemployed	Vendor	Housewife	Student	Other, specify……

4.3. Are you actively looking for paid employment at the moment?

Yes	No

4.4. How long have you been unemployed?

< 6 months	6-12 months	1-3 years	> 3 years

4.5. If YES (question 4.1) is your current job a:

Permanent position	Temporary position	Fixed term contract	Other, specify……..

4.6. Are you doing part time jobs as a second job on weekends and school vacations?

Yes	No

4.7 What is the exact title of your current job?
(Including self-employed)

4.8. What is the total income in the household per month?

< R1500	R1501-R3000	R3001-R5000	R5001-R7000	R7001-R9000	R9001-R11 000
R11 001-R13 000	R13 001-R15 000	R15 001-R17 000	R17 001-R19 000	R19 001-R21 000	> R21 000

4.9. Please specify the monthly income in the household (if willing)……..

4.10 Do you receive any of the South African Government social grants?

Child grant	Disability grant	Foster grant

4.11. How often does it happen that you do not have enough money to buy food? for you and your family?

Always	Often	Sometimes	Seldom	Never

4.12. How many people e.g. partner, relatives & others (including yourself) contributed to your household income from any source, (including wages/salary from paid employment, money from second or odd jobs income from savings investments, pension, rent or property, benefits and or maintenance etc.) in the last 12 months?

People	0	1	2	3	4	5	6	7	8	9

4.13. How often do you buy food?

Every day	Once a week	Once a month	Other, specify……

4.14. Where do you buy food?

Tuck shop	Street vendor	Wholesalers	Supermarket	Other, specify……

4.15 What type of transport do you use to get around?

Taxi	
Bus	
Train	
Own car	
Bicycle/ Motorbike	
Other Specify	

4.16 How much money is spent on food PER MONTH? (Tick only one box)

R 0 – R 500	R 501 – R 1000	R 1001 – R 1500	R 1501 – R 2000	R 2001 – R 2500	R 2501 – R 3000	> R 3000	I do not know

5 EDUCATION AND LANGUAGE

5.1. What is your highest education level?

None	Primary School	Standard 8	Standard 10	College/FET	Other post school

5.2 What language is spoken mostly in the house?

Zulu	Xhosa	English	Afrikaans	Other, specify……

5.3 Do you have any other children of your own?

Yes	No

Number: ……..

5.3 How many of your children have birth certificates?

None	1	2	3	4	5	6	7	8	All

5.4 How many of your children have completed their immunisation schedule?

None	1	2	3	4	5	6	7	8	All

5.5 Have any of your children died in the past?

Yes	No

Reason: ……..

5.6 Number of children attending school

None	1	2	3	4	5	6	7	8	All

5.7 How do the children get to school?

Walk	Bus	Taxi	Parents car	Other, specify…….

Food practices in the household

Tick one block for every question:	Father	Mother	Sibling	Grandma	Grandpa	Aunt	Uncle	Cousin	Friend	Other
5.8 Who is mainly responsible for food preparation in the house?										
5.9 Who decides on what type of food is bought for the household?										
5.10 Who is mainly responsible for feeding/serving the children?										
5.11 Who is the head of this household?										
5.12 Who decides how much is spent on food?										

5.13 How many meals do you eat per day?

0	1	2	3	> 3

5.14 Where do you eat most of your meals?

Home	Friends	Work	School	Other, specify…….

5.15 Where do your children eat most of their meals?

Home	Friends	School	Other, specify…….

6. ASSETS

6.1 Does your home have the following items and how many?

	Yes
Electrical stove	
Gas stove	
Primus or paraffin stove	
Microwave	
Hot plate	
Radio	
Television	
Refrigerator	
Freezer	
Telephone/ Cell phone	
Bed with mattress	
Mattress only	
Lounge suite	
Dining room suite	
Electrical iron	
Electrical, kettle	
Car	
Bicycle	
Motorbike	

6.2 What type of fuel do you usually use for food preparation?

Wood fire	Paraffin	Electricity	Gas	Coal/Charcoal	Other, specify……

6.3 What type/s of material are your pots made off (tick all relevant options)?

Cast iron	Aluminum	Stainless steel	Clay	Other, specify……

Thank you very much for your co-operation. We appreciate the time.

Appendix D (II)

STUDY ID

FIRST TRIMESTER EPIDEMIOLOGY QUESTIONNAIRE

Thank you for agreeing to be part of this study and for taking the time to fill out this questionnaire with us.

Please read this before starting.

- It's your choice whether or not to do the survey.
- Your answers will be kept **confidential**.
- Whether or not you answer the questions will **not** affect your health care or any benefits you may get
- You can skip questions you don't want to answer.
- Please put a cross (X) next to your chosen answer.

	Participation Code	
1.	What is your marital status?	☐1 Married ☐2 Living together ☐3 Single ☐4 Divorced ☐5 Separated ☐6 Widow ☐7 Other _____
2.	Just before I became pregnant… **(Please tick only one)**	☐1 I wanted to have a baby ☐2 I had mixed feelings about having a baby ☐3 I did not want to have a baby
3.	When you got pregnant with your new baby, were you trying to get pregnant?	☐1 Yes ☐2 No
4.	Was this pregnancy forced?	☐1 Yes If yes, please comment; ☐2 No

5.	Have you/your partner at any time during the last year used the following methods to avoid becoming pregnant? ***(Fill in all that apply)***	☐1 Implant ☐2 Injection ☐3 Pill ☐4 Traditional methods ☐5 Condom ☐6 IUD ☐7 Withdrawal ☐8 Spermicides (foam, suppositories, cream) ☐9 Safe period ☐10 Withdrawal ☐11 No such methods ☐88 Other If other, please specify:
6.	Did you use any home remedies to stop your pregnancy?	☐ Yes ☐ No If yes, please specify:
7.	What were your reasons for not using a contraceptive? **Check <u>all</u> that apply.**	☐1 I didn't mind if I got pregnant ☐2 I thought I could not get pregnant at that time ☐3 I had side effects from the birth control method I was using ☐4 I had problems getting birth control when I needed it ☐5 I thought my husband or partner or I was sterile (could not get pregnant at all) ☐6 My husband or partner didn't want to use anything ☐ Religious purposes/beliefs ☐7 Other _____
8.	What age did you become sexually active?	Age:
9.	What age did you first use contraception?	Age:
10.	Have you ever heard of emergency contraception (EC) or the morning after pill (MAP) before?	☐1 Yes ☐2 No
11.	Have you ever used EC/MAP before?	☐1 Yes ☐2 No
12.	If Yes, how many times have you used EC/MAP in the year previous to you falling pregnant?	☐1 Once ☐2 2-4 times ☐3 5-10 times ☐4 over 10 times Other_____
13.	What are the time frames to use EC?	☐1 within 12 hours of sexual intercourse ☐2 within 24 hours of sexual intercourse

		☐3 within 3 days of sexual intercourse ☐4 within a week of sexual intercourse ☐5 Other _____ ☐ I don't know
14.	How many months pregnant were you when you discovered you were pregnant?	_____months
15.	How many months pregnant were you when you had your first antenatal visit?	_____months _____I don't know
16.	Did you receive antenatal care as soon as you found out you were pregnant?	☐1 Yes – From where? ☐2 No – Please comment why not?
17.	Did any of these things keep you from getting antenatal care at all or as early as you wanted? (You may choose more than one reason, if applicable)	☐1 I couldn't get an appointment when I wanted one. ☐2 I had no money for transportation to get to the clinic. ☐3 I had too many other things going on. ☐4 I was trying to hide this pregnancy from my family ☐5 I didn't know that I was pregnant ☐6 I didn't want anyone else to know I was pregnant ☐7 I didn't want antenatal care ☐8 I could not take time off from work ☐9 I had no one to take care of my other children
18.	How many times have you been pregnant (Include all pregnancies that ended in abortion, miscarriage or stillbirth)	_____pregnancies
19.	Did you experience any of the following with your ***previous pregnancies*** (if yes, then state number of times next to it)	☐1 Abortion Number ___ ☐2 Miscarriage Number___ ☐3 Stillbirth Number ___ ☐4 Early neonatal deaths Number___ ☐5 Ectopic Pregnancy Number___
20.	How many live children do you currently have?	_____ Ages_____
21.	Have you had any of the following problems during ***previous pregnancies?*** *(Tick all that apply.)*	☐ Serious nausea and vomiting ☐ Hypertension ☐ Threatened abortion ☐ Diabetes during pregnancy ☐ Sugar in urine ☐ Problems with incontinence

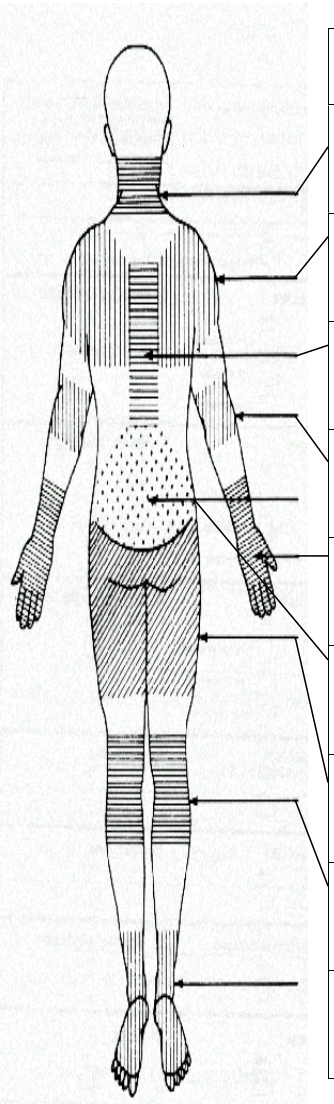
		☐ Bleeding from the vagina ☐ Other:
22.	Do you know what a pap smear is?	☐1 Yes ☐2 No
23.	Have you ever had a pap smear?	☐1 Yes ☐2 No
24.	How often have you had a pap smear?	☐1 Once a year ☐2 Once in 2 years ☐3 Once in 3-5 years ☐4 Don't remember
25.	Why is it important to have a pap smear?	_____ _____ _____
26.	We wish to find out about your past medical history. Please select all the conditions that you were treated by a doctor for **before you became pregnant?**	☐ Diabetes ☐ heart problems ☐ high cholesterol ☐ high blood pressure ☐ hypothyroidism ☐ hyperthyroidism ☐ anemia ☐ ulcers – if so, please state where… ☐ cancer ☐ TB ☐ endometriosis ☐ ovarian cysts ☐ epilepsy ☐ HIV ☐ Stress – please comment… ☐ Depression/Anxiety ☐ Fainting attacks ☐ Fits ☐ headaches ☐ neck pain ☐ mid back pain (pain between the shoulders) ☐ low back pain ☐ pelvic pain (pubic or groin) ☐ hip pain ☐ knee pain ☐ foot and ankle pain ☐ shoulder pain ☐ elbow pain ☐ wrist and hand pain
27.	Are you currently on any medication?	☐1 Yes ☐2 No
28.	If yes, what was the medication for and where did you get it from?	
29.	Have you ever used other medications before?	☐1 Yes ☐2 No

30.	Please indicate which of these medications you have used (at a frequency of more than once) over the 12 months **prior to your pregnancy?**	☐ Antibiotics ☐ Pain Killers ☐ Immune Boosters ☐ ARV ☐ TB Drugs ☐ Isihlambezo ☐ Chronic medication ☐ Traditional Medication ☐ Other Please Specify---------- ----------
31.	Are you currently taking any of the medications indicated above?	☐1 Yes ☐2 No How often? _____
32.	Have you used any drugs prior to your pregnancy?	☐1 Yes ☐2 No How often? _____
33.	Do you use any of these drugs now during your pregnancy?	☐ Dagga ☐ Wonga ☐ heroine ☐ cocaine ☐ sugars ☐ other…
34.	Have you been smoking/using snuff while pregnant?	☐1 No ☐2 Sometimes ☐3 Daily
35.	If yes, how many	_____ cigarettes per week _____ cigarettes per day
36	Have you ever had alcohol?	☐1 Yes ☐2 No
37.	How often did you drink alcohol in the 3 months before you became pregnant?	☐1 Approximately 6-7 times a week ☐2 Approximately 4-5 times a week ☐3 approximately 2-3 times a week ☐4 approximately once a week ☐5 approximately 1-3 times a month ☐6 less than once a month ☐7 Never
38.	How often do you consume alcohol during this pregnancy?	☐1 Approximately 6-7 time a week ☐2 Approximately 4-5 times a week ☐3 approximately 2-3 times a week ☐4 approximately once a week ☐5 approximately 1-3 times a month ☐6 less than once a month ☐7 Never
39.	What type of alcohol do you usually drink? *(Fill in one or several boxes.)*	☐1 Homemade/traditional beer ☐2 Purchased traditional Beer ☐3 Wines ☐5 Ciders ☐6 Spirits (*vodka, gin, whisky, liqueur)*

40.	How many hours sleep do you currently get a night?	☐ Less than 4 hours per night ☐ 4 – 8 hours per night ☐ All night
41.	Are you experiencing any pregnancy cravings?	☐$_1$ Yes ☐$_2$ No Please specify? _____

42.	Do you do any of the following activities on a daily basis?	☐ Carry water ☐ Walk long distances ☐ Gardening work ☐ House work ☐ Manual labour/lifting ☐ Carry Children ☐ Other:_____ _____
43.	Do you currently have musculoskeletal pain?	☐ Never ☐ Rarely ☐ Sometimes ☐ Very Often ☐ Always
	Only answer the following questions if you have indicated that you have musculoskeletal pain during pregnancy	
44.	Has the pain prevented you from spending time with your family and friends?	☐ Yes ☐ No If yes comment _____ _____
45.	Has the pain made you feel concerned or worried about your health?	☐ Yes ☐ No If yes comment _____ _____
46.	Has the pain made you feel sad or down?	☐ Yes ☐ No If yes comment _____ _____
47.	Are you able to cope with the pain?	☐ Yes ☐ No
48.	How have you treated your pain?	☐ Yes

		□ No _____



Have you experienced MSK pain in any of the areas in the during your pregnancy:		When did the pain starts	Is your pain:	Has your pain interfered with your ability to perform your daily activities, such as gardening, house work etc.	Has the pain affected your ability to work?
Neck	☐ Yes ☐ No	☐ 2 weeks ago ☐ 3-8 weeks ago ☐ 3-6 months ago ☐ + 6 months	☐ Mild ☐ Moderate ☐ Severe	☐ Yes ☐ No If yes comment _____	☐ Yes ☐ No If yes comment _____
Shoulders	☐ Yes ☐ No	☐ 2 weeks ago ☐ 3-8 weeks ago ☐ 3-6 months ago ☐ + 6 months	☐ Mild ☐ Moderate ☐ Severe	☐ Yes ☐ No If yes comment _____	☐ Yes ☐ No If yes comment _____
Upper Back	☐ Yes ☐ No	☐ 2 weeks ago ☐ 3-8 weeks ago ☐ 3-6 months ago ☐ + 6 months	☐ Mild ☐ Moderate ☐ Severe	☐ Yes ☐ No If yes comment _____	☐ Yes ☐ No If yes comment _____
Elbows	☐ Yes ☐ No	☐ 2 weeks ago ☐ 3-8 weeks ago ☐ 3-6 months ago ☐ + 6 months	☐ Mild ☐ Moderate ☐ Severe	☐ Yes ☐ No If yes comment _____	☐ Yes ☐ No If yes comment _____
Wrist/ Hands	☐ Yes ☐ No	☐ 2 weeks ago ☐ 3-8 weeks ago ☐ 3-6 months ago ☐ + 6 months	☐ Mild ☐ Moderate ☐ Severe	☐ Yes ☐ No If yes comment _____	☐ Yes ☐ No If yes comment _____
Low Back	☐ Yes ☐ No	☐ 2 weeks ago ☐ 3-8 weeks ago ☐ 3-6 months ago ☐ + 6 months	☐ Mild ☐ Moderate ☐ Severe	☐ Yes ☐ No If yes comment _____	☐ Yes ☐ No If yes comment _____
Hips/ Thighs	☐ Yes ☐ No	☐ 2 weeks ago ☐ 3-8 weeks ago ☐ 3-6 months ago ☐ + 6 months	☐ Mild ☐ Moderate ☐ Severe	☐ Yes ☐ No If yes comment _____	☐ Yes ☐ No If yes comment _____
Knees	☐ Yes ☐ No	☐ 2 weeks ago ☐ 3-8 weeks ago ☐ 3-6 months ago ☐ + 6 months	☐ Mild ☐ Moderate ☐ Severe	☐ Yes ☐ No If yes comment _____	☐ Yes ☐ No If yes comment _____
Ankles/ Feet	☐ Yes ☐ No	☐ 2 weeks ago ☐ 3-8 weeks ago ☐ 3-6 months ago ☐ + 6 months	☐ Mild ☐ Moderate ☐ Severe	☐ Yes ☐ No If yes comment _____	☐ Yes ☐ No If yes comment _____

Thank you for taking the time to complete this questionnaire.

Appendix D (III)

Chart review

Facility No:_____ **Study ID :**_____

CRITERIA	
Age	
Race	
Parity	
Gravida	
HIV status	
History previous pregnancy	
• Anaemia	
• Congenital abnormalities	
• Eclampsia	
• PPH	
• APH	
• Other. State……..	
Chronic medical conditions	
• HIV and AIDS	
• TB	
• Diabetes	
• Hypertension	
• Other, State……..	
Current antenatal data:	
• Last normal menstrual period	
• Estimated Delivery Date	
• Gestational age at booking (weeks)	
• Current gestational age	
• Ultrasound done during this pregnancy	
• Maternal height	
• Weight	
• BP (each visit)	
• Maternal Heart examination	
• Urinalysis test	
• Hemoglobin test	
• Rh factor test	
• Calcium supplements given	
• Folic supplements given	

Appendix D (IV)

THIRD TRIMESTER EPIDEMIOLOGY QUESTIONNAIRE

Thank you for agreeing to be part of this study and for taking the time to fill out this questionnaire with us.

STUDY ID

Please read this before starting.

- It's your choice whether or not to do the survey.
- Your answers will be kept **confidential**.
- Whether or not you answer the questions will **not** affect your health care or any benefits you may get
- You can skip questions you don't want to answer.
- Please put a cross (X) next to your chosen answer.

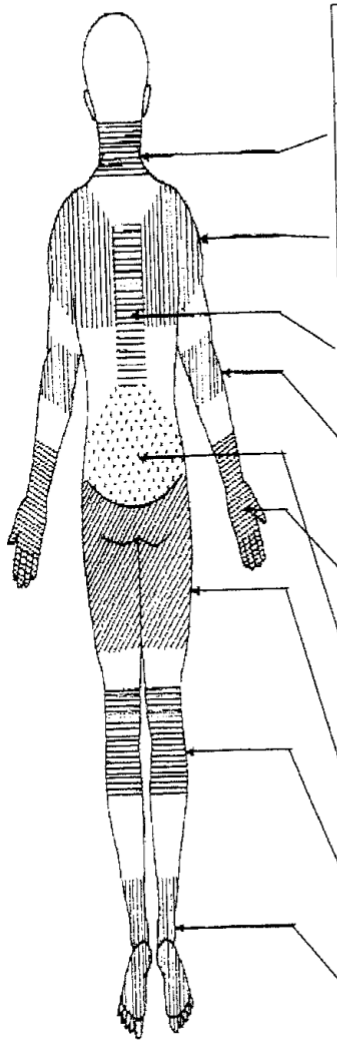
	Participation code			
1.	Are you currently on any medication?	☐$_1$ Yes ☐$_2$ No		
2.	If yes, what is the medication for, where did you get it from and how often are you taking it?	MEDICATION FOR?	WHERE FROM?	HOW OFTEN?
		_____ _____ _____ ___ _____ _____ _____ ___	_____ _____ _____ ___ _____ _____ _____ ___	_____ _____ _____ _____ _____ _____ _____ _____
3.	List the health related problems you have experienced *during this pregnancy* **(you may tick more than one)**	☐ bleeding from the vagina one or more ☐ pelvic relaxation ☐ abdominal pain ☐ headaches ☐ nausea ☐ vomiting ☐ thrush ☐ rash ☐ constipation ☐ heart burn ☐ swelling of legs and feet ☐ fevers		

		☐ diabetes ☐ bronchitis ☐ protein in urine ☐ tuberculosis ☐ iron deficiency ☐ sexually transmitted diseases ☐ heart problems ☐ high blood pressure ☐ neck pain ☐ mid back pain (pain between the shoulders) ☐ low back pain ☐ pelvic pain ☐ hip pain ☐ knee pain ☐ foot and ankle pain ☐ shoulder pain ☐ elbow pain ☐ wrist and hand pain
4.	Did you visit a traditional or religious healer healer after the start of your pregnancy?	☐$_1$ Yes ☐$_2$ No
5.	Please share your reason for visiting the traditional healer?	_____ _____ ____
6.	Do you know what a pap smear is?	☐$_1$ Yes ☐$_2$ No
7.	If yes to the above, Why is it important to have a pap smear?	_____ _____ ____
8.	Did you have a pap smear during your pregnancy?	☐$_1$ Yes ☐$_2$ No
9.	***During any of your prenatal care visits***, did a doctor, nurse, or other health care worker talk with you about any of the things listed below? ***Please count only discussions,*** not reading materials or videos.	☐ How smoking during pregnancy could affect my baby ☐ Breastfeeding my baby ☐ How drinking alcohol during pregnancy could affect my baby ☐ Medicines that are safe to take during my pregnancy ☐ How using illegal drugs could affect my baby ☐ Doing tests to screen for birth defects or diseases that run in my family ☐ The signs and symptoms of preterm labour (labour more than 3 weeks before the baby is due) ☐ What to do if my labour starts early ☐ Getting tested for HIV (the virus that causes AIDS) ☐ What to do if I feel depressed during my pregnancy or after my baby is born ☐ Physical abuse to women by their husbands or partners

		☐ How to prevent back and pelvic pain during pregnancy
10.	Access to health services pre and during pregnancy	Were you ever refused access to any clinic? ☐1 Yes Specify---------- ☐2 No Reasons for using this clinic ☐1 close to home ☐2 close to work ☐3 other(specify)----------
11.	At this clinic what experience did you have?	Attitude of clinic staff 1. Friendly and caring ☐yes ☐no 2. Communication ☐good ☐poor Health care needs met to your satisfaction ☐1 Yes ☐2 No Waiting time ☐too Long ☐appropriate Involvement in the planning of care ☐1 Involved ☐ 2 Not involved
12.	Besides this clinic; have you been anywhere else?	☐$_1$ Yes ☐$_2$ No
13.	At the other clinic what experience did you have?	Attitude of clinic staff 1 friendly and caring ☐yes ☐no 2 Communication ☐good ☐poor Health care needs met to your satisfaction ☐1 Yes ☐2 No Waiting time ☐too Long ☐appropriate Involvement in the planning of care ☐1 Involved ☐ 2 Not involved
14.	During your pregnancy, did a doctor, nurse, or other health care worker offer you a test to see if your baby might have a birth defect?	☐$_1$ Yes ☐$_2$ No
15.	What test did you have? (Check all that apply)	☐$_1$ AFP or expanded AFP (blood test for birth defects) ☐$_2$ Amniocentesis (amnio)

		☐ Ultrasound ☐ ET, Nuchal translucency ☐ Other: _____ ☐ I am not sure
16.	Now we have a few questions about your feelings and experiences during pregnancy. Pregnancy can be a difficult time for some women. This question is about things that may have happened ***before and during*** this pregnancy.	☐ A close family member was very sick and had to go into the hospital ☐ I got separated or divorced from my husband or partner ☐ I moved to a new address ☐ my family are not happy about my pregnancy ☐ I was homeless ☐ My husband or partner lost his job ☐ I lost my job even though I wanted to go on working ☐ I argued with my husband or partner more than usual ☐ My husband or partner said he didn't want me to be pregnant ☐ I had a lot of bills I couldn't pay ☐ I was in a physical fight ☐ My husband or partner or I went to jail ☐ Someone very close to me had a problem with drinking or drugs ☐ Someone very close to me died
17.	During your pregnancy, did you ever have 2 weeks or longer when you felt sad, empty, or depressed for most of the day?	☐$_1$ Yes ☐$_2$ No
18.	During your pregnancy, did you ever have 2 weeks or longer when you lost interest in most things you usually enjoyed (like work, hobbies, or personal relationships)?	☐$_1$ Yes ☐$_2$ No
19.	During your pregnancy, how often was it hard for you to do your daily activities because of emotional problems (like depression or lack of interest)?	☐$_1$ Often ☐$_2$ Sometimes ☐$_3$ Rarely ☐$_4$ Never
20.	During your pregnancy, did a doctor, nurse or other health care worker refer you to a counsellor who helps people who are feeling sad, empty, or depressed?	☐$_1$ Yes ☐$_2$ No
21.	During your pregnancy, did you have someone you could turn to if you needed practical help, like getting a ride somewhere, or help with shopping or cooking a meal?	☐$_1$ Yes ☐$_2$ No

22.	Is your life currently physically demanding? Example: you have to carry heavy loads daily	☐1 Yes ☐2 No
23.	Please indicate if you are currently experiencing any musculoskeletal pain:	



Are you currently experiencing any pain in any of the following areas		When did the pain starts	Is your pain:	Has your pain interfered with your ability to perform your daily activities, such as gardening, house work etc.	Has the pain affected your ability to work?
Neck	☐ Yes ☐ No	☐ Before I became pregnant ☐ First trimester ☐ Second trimester ☐ Third trimester	☐ Mild ☐ Moderate ☐ Severe	☐ Yes ☐ No If yes comment _____	☐ Yes ☐ No If yes comment _____
Shoulders	☐ Yes ☐ No	☐ Before I became pregnant ☐ First trimester ☐ Second trimester ☐ Third trimester	☐ Mild ☐ Moderate ☐ Severe	☐ Yes ☐ No If yes comment _____	☐ Yes ☐ No If yes comment _____
Upper Back	☐ Yes ☐ No	☐ Before I became pregnant ☐ First trimester ☐ Second trimester ☐ Third trimester	☐ Mild ☐ Moderate ☐ Severe	☐ Yes ☐ No If yes comment _____	☐ Yes ☐ No If yes comment _____
Elbows	☐ Yes ☐ No	☐ Before I became pregnant ☐ First trimester ☐ Second trimester ☐ Third trimester	☐ Mild ☐ Moderate ☐ Severe	☐ Yes ☐ No If yes comment _____	☐ Yes ☐ No If yes comment _____
Wrist/ Hands	☐ Yes ☐ No	☐ Before I became pregnant ☐ First trimester ☐ Second trimester ☐ Third trimester	☐ Mild ☐ Moderate ☐ Severe	☐ Yes ☐ No If yes comment _____	☐ Yes ☐ No If yes comment _____
Low Back	☐ Yes ☐ No	☐ Before I became pregnant ☐ First trimester ☐ Second trimester ☐ Third trimester	☐ Mild ☐ Moderate ☐ Severe	☐ Yes ☐ No If yes comment _____	☐ Yes ☐ No If yes comment _____
Hips/ Thighs	☐ Yes ☐ No	☐ Before I became pregnant ☐ First trimester ☐ Second trimester ☐ Third trimester	☐ Mild ☐ Moderate ☐ Severe	☐ Yes ☐ No If yes comment _____	☐ Yes ☐ No If yes comment _____
Knees	☐ Yes ☐ No	☐ Before I became pregnant ☐ First trimester ☐ Second trimester ☐ Third trimester	☐ Mild ☐ Moderate ☐ Severe	☐ Yes ☐ No If yes comment _____	☐ Yes ☐ No If yes comment _____
Ankles/ Feet	☐ Yes ☐ No	☐ Before I became pregnant ☐ First trimester ☐ Second trimester ☐ Third trimester	☐ Mild ☐ Moderate ☐ Severe	☐ Yes ☐ No If yes comment _____	☐ Yes ☐ No If yes comment _____

	Only answer the following questions if you have indicated that you have experienced musculoskeletal pain **during this pregnancy**	
24.	Has the pain prevented you from spending time with your family and friends?	☐1 Yes ☐2 No
25.	Has the pain made you feel concerned or worried about your health?	☐1 Yes ☐2 No
26.	Has the pain made you feel sad or down?	☐1 Yes ☐2 No
27	Are you able to cope with the pain?	☐1 Yes ☐2 No
28.	How have you treated your pain?	☐ Medication: specify_____ ☐ no treatment ☐ other comment:

Thank you for participating.

Appendix E

19 June 2017

Carmen Hawker
Department of Chiropractic and Somatology
Faculty of Health Sciences
DUT

Re: Approval to use epidemiological and sociodemographic questionnaires from the MRC project

We acknowledge receipt of your notification regarding your completion of your research dissertation titled *"Back pain in pregnancy and its relationship to socio-demographic and psychosocial factors in a pregnant cohort in a primary health care clinic in the eThekwini municipality"* as part of the MRC project under the supervision of Dr. L. O'Connor.

We therefore support this effort and grant you permission to use the epidemiological and sociodemographic questionnaires from the MRC project to extract data to use for this project.

Yours sincerely,

[redacted]

Prof. MN Sibiya
Principal Investigator – MRC Project

Appendix F

Confidentiality Agreement:

I, Carmen Ashley Hawker, declare that I will maintain confidentiality throughout the study. I will not disclose any information about the participants that are involved in the research study.

Name: Carmen Ashley Hawker

Signature: 

Date: 28/11/2017