

A profile of patients presenting with spinal pain at Mahalapye and Shoshong World Spine Care clinics in Botswana

By

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I, Candice Armstrong, 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

This study is dedicated to my parents: Neill and Linda Armstrong, without you this would not have been possible. Thank you for your endless advice, love and support through the highs and lows during this journey. You are inspiring and I truly cherish you.

Mom, words cannot describe how grateful I am for your contribution to this study. Thank you for your perseverance and positivity through the long hours and freezing cold with me in Mahalapye and for the many memories we shared. Your enthusiasm and dedication was incredible. I cannot thank you enough.

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Abstract

Title: A profile of patients presenting with spinal pain at Mahalapye and Shoshong World Spine Care clinics in Botswana

Background: Spinal pain such as low back and neck pain, are common and can cause severe long term pain which results in a major burden on individuals and health care systems (Woolf and Pfledger, 2003; Hondras *et al.*, 2015a). Low-income countries often have few resources for adequately addressing musculoskeletal (MSK) pain (Louw *et al.*, 2007). Thus, World Spine Care (WSC), a non-governmental organization, opened two clinics in Botswana to help improve spinal health care by providing access to MSK specialists (Haldeman *et al.*, 2015). These clinics have been functional since 2012, and to date the profile of patients attending these clinics has not been investigated. Studies on patients attending chiropractic clinics have been carried out internationally (Hartvigsen *et al.*, 2002; Giles *et al.*, 2002; Coulter and Shekelle, 2005; Holt and Beck, 2005; Mootz *et al.*, 2005; Sorensen *et al.*, 2006; Garner *et al.*, 2007; Stevens, 2007; Rubinstein *et al.*, 2008; Martinez *et al.*, 2009; Ailliet *et al.*, 2010; Lischyna and Mior, 2012) and locally (Benjamin, 2007; Jaman, 2007; Mohamed, 2007; Venketsamy, 2007; Higgs, 2009; McDonald, 2012; Hitge, 2014), and yet very little information exists on the patients presenting to clinics in the public sector of Botswana. Demographic and disease profiles of patients vary by clinical setting, from country to country, and within regions of the same country (Hoy *et al.*, 2010a). Thus, this study aimed to determine the demographic and disease profile of spinal pain patients attending the WSC clinics in Mahalapye and Shoshong in Botswana.

Method: A retrospective, descriptive study design was used to extract data from the WSC patient files at the Mahalapye and Shoshong WSC clinics from 1 November 2012 to 31 March 2016. The research proposal was approved by the Institutional Research Ethics Committee (IREC); REC 53/16 (Appendix A), WSC (Appendix B) and Botswana MoH (Appendix C). Patient files included had provided consent for their files to be used for research purposes (Appendix F). Data recorded included demographic characteristics, factors related to spinal pain, the presenting complaint and the presence of co-morbid conditions. The data was analysed using Statistical Package for the Social Science (SPSS) version 24.0. Descriptive statistics in the form of graphs and cross tabulations were used to describe the demographic and disease profile of the spinal pain patients. Inferential statistics like chi-square, Fischer's exact test for categorical variables and Independent student's *t*

tests for numerical variables were used to determine differences between the two clinics. A p -value of less than 0.05 was used to indicate statistical significance (Singh, 2016).

Results: The sample size was 65% ($n=714$). There was a female preponderance (75.2%, $n=537$), a mean age of 50.6 years (\pm SD 16.13). Most patients were married (38%) and the most common occupations were either farmers (18.2%, $n=129$) or unemployed (16.3%, $n=115$). The majority of patients suffered from chronic (88%), idiopathic (59.5%), low back pain (69.9%), followed by upper/mid back (19.1%), with the least visits occurring for neck pain (8%). The most frequent diagnosis was joint dysfunction with associated soft tissue disorders. The patients reported mild disability with moderate pain intensity and most patients had not experienced previous spinal pain (60%). The patients did not report a secondary area of MSK pain (28.6%) and 73.9% of patients presented with at least one co-morbid condition.

Patients attending the rural clinic were older on average (52.7 years, \pm SD 16.92) than those at the urban clinic (48.9 years, \pm 15.29) ($p = 0.002$). There were more women attending the urban clinic when compared to the rural clinic ($p = 0.009$), with those attending the rural clinic most often reporting a primary school level of education in contrast to those in the urban clinic having most likely obtained a more than secondary school education ($p < 0.001$). More patients in the urban clinic had “other mechanical” e.g. joint dysfunction as an aetiology for their spinal pain when compared to the rural clinic ($p = 0.039$). In terms of pain duration, the rural clinic patients were more likely to present with acute and subacute pain than at the urban clinic ($p = 0.001$). The rural clinic patients also reported more previous episodes of spinal pain in contrast to those from the urban clinic ($p < 0.001$).

Conclusion: The spinal pain patients attending the WSC clinics had many similarities to spinal pain patients internationally and in SA, however unique differences were found specifically when the urban and rural clinic patients were compared. The findings of this study can assist WSC to provide more targeted healthcare at each clinic and within this region.

Key words: Spinal pain, demographic, disease, profile, prevalence, chiropractic, Botswana, WSC

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Definitions

Acute: Pain that has been present for less than or equal to four weeks (Costa-Black, Loisel, Anema and Pransky, 2010).

Chronic: Pain that is present for twelve weeks or more (Costa-Black *et al.*, 2010).

Co-morbidities: A concomitant but unrelated pathologic or disease process (Caughey, Vitry, Gilbert and Roughead, 2008).

Demographic profile: Study of statistical information that helps promote the understanding of patterns of population related characteristics within a certain geographical area (Stedman, 2005)

Descriptive: Refers to research that describes information regarding a certain topic such as demographics or diseases occurring in a population (Baumgartner, Strong and Hensley, 2002).

Disease profile: A disease profile is used to determine how risk factors predispose a particular population to a disease. The statistics collected from disease profiling is an important aspect of healthcare as the information can be used to identify the health gaps within the population that need to be addressed to improve the collective health status of that population (Rubinstein, Pfeifle, van Tulder and Assendelft, 2000; Polgar and Thomas, 2008; Van Zyl, van der Merwe, Walsh, van Rooyen, van Wyk and Groenewald, 2010).

Diagnosis: The identification of the nature of an illness or other problem by examination of the symptoms (Stedman, 2005).

Disability: In this study disability will be based on how the condition affects the individuals' activities of daily living, measured out of 32 (WSC Clinical User Guide, 2016).

Hypertension: Persisting high arterial blood pressure, that exceeds values of 140mmHg systolic or exceeding 90mmHg diastolic (Poulter, Prabhakaran and Caulfield, 2015).

Incidence: Incidence is defined as the percentage of new people affected by a certain disease over a recent period of time (Stedman, 2005).

Intensity: In this study intensity will be based on the individuals' feelings of the pain and how it is affecting them, measured by the numeric and Wong-Baker pain-rating scales (Hockenberry and Wilson, 2013).

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).

Prevalence: Prevalence is 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 (Stedman, 2005).

Spinal 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 (MacLean, Chambers and Clarke, 2009).

Tswana: Livingstone (2006) describes the language terms related to Botswana that is needed for this study:

Setswana – refers to the Bantu language and culture of the Tswana ethnicity

Motswana – is a single Tswana person

Batswana - multiple Tswana persons

Botswana – collective noun for all Tswana people hence the name for the nation

Recurrent pain: Pain recurring after a pain free interval and pain that presents on less than half the days in a 12 month period (Manchikanti, Singh, Datta, Cohen and Hirsch, 2009).

Sub-acute: Pain that is present for four to twelve weeks (Costa-Black *et al.*, 2010).

Abbreviations and Symbols

%	Percentage
<	refers to a figure “less than” the figure reported
>	refers to a figure “greater than” the figure reported
IREC	Institutional Research Ethics Committee
LBP	Low back pain
MSK	Musculoskeletal
M.Tech. Chiro	Masters in Technology of Chiropractic
MVA	Motor Vehicle Accident
N	Total sample size
<i>n</i>	Sub sample size
NGO	Non-governmental organisation
NP	Neck pain
<i>p</i>-value	probability value
RHDC	Research and Higher Degrees Committee
SA	South Africa
SD	Standard Deviation
<i>t</i>	<i>t</i> statistic
TSP	Thoracic spine pain
UK	United Kingdom
US	United States
USA	United States of America
WHO	World Health Organisation
WSC	World Spine Care

Chapter One

Introduction

1.1 Introduction

Musculoskeletal (MSK) disorders, especially those related to the spine such as low back (LBP) and neck pain (NP), are a common cause of severe long term pain and are a major burden on individuals and health care systems (Woolf, Vos, and March, 2010; Hondras, Myburgh, Hartvigsen, Haldeman and Johannessen, 2015a). Spinal pain arises from the spine and structures of the spinal column (e.g. muscles, ligaments and nerves), or from structures outside of the spine otherwise known as referred pain (MacLean *et al.*, 2010). The incidence and prevalence of MSK disorders is high in both developed and non-developed countries and is of increasing concern (Louw, Morris and Grimmer-Somers, 2007; Dagenais and Haldeman, 2012) with low-income countries having much need but few resources for delivering adequate care (Louw *et al.*, 2007).

Socioeconomic constraints in Africa predispose the population to a higher prevalence of many diseases and disabilities. In addition, MSK disorders caused from acute or repetitive traumatic injury are one of the primary causes of activity limitation and short-term disability, whilst simultaneously being the most prevalent cause of chronic conditions and long-term disability in Africa (Louw *et al.*, 2007). The health of Africans is of global concern, as it accounts for about 14% of the world's population, and it is the poorest continent, bearing about 40% of the global burden of disease (Lopez, Mathers, Ezzati, Jamison and Murray, 2001). Improvements in health outcomes observed in most Western countries over the past few decades have not been achieved in Africa (Lopez *et al.*, 2001; Hosseinpoor, Bergen, Kunst, Guthold, Rekve, t'Espaignet, Naidoo and Chatterji, 2012). This has been credited to the negative impact of infective and communicable diseases (most notably the human immunodeficiency virus (HIV) and acquired immunodeficiency syndrome (AIDS) epidemics), which has been reflected in both the focus and shift of health interventions and funding directions in health research (www.gov.za/about-sa/health#hiv, 2016).

Acknowledging the disabling effect of spinal pain and the lack of access to resources in developing countries a non-governmental (NGO), not for profit organization, called World Spine Care (WSC), was formed to benefit people with spinal disorders living in under-served communities throughout the world (Hondras *et al.*, 2015a). The WSC aimed to develop a low cost model of care, by recognizing the need to establish clinical programmes aimed at

easing the suffering and disability associated with spinal disorders in resource-poor communities and offering support for organizations devoted to reducing the global burden of disease caused by spinal disorders (Haldeman, Nordin, Outerbridge, Hurwitz, Hondras, Brady, Kopansky-Giles and Ford, 2015). This NGO aimed to do this by educating local healthcare workers/patients, establishing clinics and conducting research (Hondras *et al.*, 2015a). The clinical programmes, research projects, and education-based capacity-building initiatives are adapted to and integrated within each community in collaboration with local decision makers, existing health care workers and traditional healers. The cornerstone of WSC's emphasis is on long-term sustainability through education of community partners, Governments and local health professionals and by facilitating opportunities for training graduate students in a variety of health-related fields (Haldeman *et al.*, 2015).

In June 2011, WSC and the Government of the Republic of Botswana, represented by the Ministry of Health (MoH), signed the Memorandum of Understanding to establish the pilot WSC clinics in Botswana. The initial site was located in the Central District, in the village of Shoshong and the other clinic in the Mahalapye regional health district (www.worldspinecare.org, 2016). The WSC clinics have been operational since 2012, but to date there has been no formal investigation into the demographic or disease profile of spinal pain patients attending these clinics.

Demographic and disease profiling of population groups reflect the personal, health and economic details of a particular country or region (Rubinstein *et al.*, 2000; Van Zyl *et al.*, 2010). Demographic profiles provide information on the characteristics of a population, for example, age, gender, marital status, education, employment, whereas disease profiles outline disorders, conditions and diseases that affect a particular population. These types of profiles provide an accurate description of the patient population and the utilization of healthcare in that particular country (Polgar and Thomas, 2008; Van Zyl *et al.*, 2010). The information is then utilised by governments or organizations to identify and address the specific health concerns presented by their patients. This process supports and allows the development and implementation of community specific intervention programmes in order to address specific community health problems (Van Zyl *et al.*, 2010). Thus, this study aims to determine the profile of spinal pain patients attending the WSC clinics in Mahalapye and Shoshong.

1.2 Study aims and objectives

1.2.1 Problem statement

WSC operates two clinics in Botswana with the aim of improving health care in the region by offering free spinal health care to reduce the burden of spinal disorders (Haldeman *et al.*, 2015). These clinics were opened in 2012, and to date the profile of patients who attend these clinics has not yet been investigated. This study will provide quantifiable information that may enable WSC to identify specific health needs of their patients that might benefit from special attention or prioritization and thereby improve the collective health status of the community.

1.2.2 Aim of the study

The aim of this study was to determine the demographic and disease profile of spinal pain patients attending the WSC clinics in Mahalapye and Shoshong in Botswana from 1 November 2012 to 31 March 2016.

1.2.3 Objectives:

1. To determine the demographic profile of the spinal pain patients attending the WSC clinics in Mahalapye and Shoshong.
2. To compile a profile of the spinal complaints of the spinal pain patients attending the WSC clinics in Mahalapye and Shoshong.
3. To document the co-morbid conditions of the spinal pain patients attending the WSC Clinics in Mahalapye and Shoshong.
4. To determine the relationship between presenting complaint of the spinal pain patients attending the WSC clinics in Mahalapye and Shoshong and age, gender, education, dominant activity and co-morbid conditions.

1.3 Rationale

Spinal pain is a common problem afflicting all ages in urban and rural areas, with the burden increasing in developing countries (Manchikanti *et al.*, 2009). The impact of spinal conditions is not well understood in developing countries due to limited data on specific population groups, delays in diagnosis and the lack of adequate healthcare facilities to manage spinal disorders (Hondras *et al.*, 2015a). Research has shown that patients in Botswana are afflicted with untreated pain at high rates (Monteiro and Tlhabano, 2014). Yet medical advancement has been urban-biased with the rural economy lagging in its development. This may predispose rural communities to a greater prevalence of MSK disease and disability (Louw *et al.*, 2007). Observing the lack of adequate provision for MSK pain in developing countries, WSC developed an NGO that established clinics in developing countries around the world to help improve the quality of life of those patients suffering with MSK pain (Hondras *et al.*, 2015a).

In order to improve service delivery it is important to understand the patients seeking care at the WSC clinics. Each specific community possesses a unique combination of demographics, cultural practices and socioeconomic characteristics (Coulter and Shekelle, 2005). It has also been shown in studies in Ethekewini Durban, South Africa that demographic factors have a significant bearing on the conditions that a certain population may experience and with which they may present to a healthcare provider (Slabbert, 2010; Dyer, 2012). The results of this study can be utilised by the WSC to further understand the types of patients who are seeking care and their healthcare needs. Furthermore, WSC can then if necessary, change or implement new policies at the clinic, enhance marketing of the WSC clinic to the community and local healthcare practitioners and develop more targeted healthcare initiatives and educational programmes in Botswana.

1.4 Delimitations

When conducting descriptive research, as in this study, there are numerous variables that can be investigated. The study was designed to focus on the demographic and disease profile of the spinal pain patients attending the WSC clinics in Mahalapye and Shoshong, thus, the following variables were investigated: age, sex, marital status, education, occupation, aetiology, diagnosis, pain duration, pain intensity, pain disability, history of previous spinal pain, presenting complaint, secondary complaint and co-morbid conditions.

During the time period in this study, there were changes in the clinicians volunteering at the WSC clinics and some of the clinic paper work was changed. For example, some variables investigated, such as 'prior spinal pain', 'dominant activity' and 'other mechanical' as a mode of onset, were only included in the clinic paperwork at a later stage, resulting in missing data for some of the files. Similarly, the disability and intensity scoring systems utilized by WSC were inconsistent as the Wong-Baker scale was implemented to attempt to make it easier for the patients to understand. Thus it was necessary to convert the scoring into a percentage in order to standardize the rating, which may not have been the way the instruments were originally designed to capture disability and intensity. These changes were accounted for in Chapter Three to limit misinterpretation of the results.

1.5 Flow of dissertation

Chapter One highlights the background, rationale and aims and objectives of the study. Chapter Two will provide a review of relevant literature for this study. Chapter Three presents the methods utilised to obtain the data, while Chapter Four will present the results of the study. Chapter Five will discuss the results of the study in relation to the current literature, and Chapter Six will conclude the study ending with recommendations for future research.

Chapter Two

Literature Review

2.1 Introduction

The lifetime prevalence of spinal pain in America has been reported to range from 54%-80% in the adult population (Manchikanti *et al.*, 2009). Similar rates are seen across the globe (Louw *et al.*, 2007; Rubin, 2007; Woolf *et al.*, 2010; Videman and Battie, 2012). Back and neck pain are the most commonly reported complaints (Hoy *et al.*, 2010a; Hoy, Brooks, Blyth and Buchbinder, 2010b; Hoy, Protani, De and Buchbinder, 2010c). Sectors of society that suffer the greatest musculoskeletal (MSK) disability tend to be the lower income groups, especially those in developing countries (Louw *et al.*, 2007). Health facilities need to meet the needs of their patients and descriptive profiles can assist by providing necessary quantitative information (Van Zyl *et al.*, 2010).

This chapter will present a review of literature on the demographic characteristics of patients presenting with spinal pain internationally and locally. It will describe the causes, duration, diagnosis, disability, intensity and presentation of spinal pain. Co-morbid conditions will be discussed followed by information pertaining to World Spine Care (WSC) and its clinics in Mahalapye and Shoshong, Botswana.

The following search engines were used to source literature for this chapter: Google Scholar, Medline, ScienceDirect, DUT institutional repository, PubMed, SA ePublications, Summon, and EBSCOhost. The key terms used were: demographic, disease, spinal pain, Botswana, Chiropractic, cervical/thoracic/lumbar pain, incidence, prevalence, risk factors, aetiology, pain, duration, intensity, disability, co-morbidities, MSK pain, epidemiology and WSC.

2.2 Overview of the spine and its structures that may result in pain

The spine consists of five regions; cervical, thoracic, lumbar, sacral and coccygeal (MacLean *et al.*, 2010). The vertebrae and intervertebral discs (IVDs) collectively make up the vertebral column, and are referred to as the “spine” (Moore and Dalley, 2010). The spine protects the spinal cord and spinal nerves; it supports the weight of the body and plays an important role in posture and movement of the body (MacLean *et al.*, 2010; Sell and Longworth, 2010). It has four curves: the thoracic and sacral regions consist of primary curves that are concave anteriorly (kyphosis), whilst the cervical and lumbar regions have curves that are concave posteriorly (lordosis). These provide balance and shock absorption to the spine (Cramer and Darby, 2005; Moore and Dalley, 2010).

There are 33 vertebrae in the spine (Cramer and Darby, 2005; Moore and Dalley, 2010). The cervical vertebrae (C1-7) form the skeleton of the neck and bear less weight than the other spinal segments. The IVDs are thinner than in other regions but are relatively thick compared to the size of the vertebra therefore making the cervical region the most mobile with the greatest range of movement (Cramer and Darby, 2005; Moore and Dalley, 2010). Pain in this area is referred to as neck pain (Carroll, Hogg-Johnson, van der Velde, Haldeman, Holm, Carragee, Hurwitz, Cote, Nordin, Peloso, Guzman and Cassidy, 2008). The thoracic spine (T1-12) forms the upper back and has a reduced range of motion compared to the cervical and lumbar regions due to the attachments of the ribs (Moore and Dalley, 2010), pain in this area is referred to as thoracic spine pain. The lower back (L1-5) is made up of the largest vertebrae, and lies between the thorax and the sacrum, and is the region that bears the most weight (Moore and Dalley, 2010); pain in this area is called low back pain (Hoy *et al.*, 2010a).

According to Cramer and Darby (2005), vertebrae vary in size from one region to another but their basic structure is the same. Each vertebra and disc can move only a limited amount but the overall effect of several vertebrae moving together is to allow flexibility of the spine without reducing stability. The amount of movement in lateral flexion, flexion extension and rotation varies at the different levels of the spine (www.bjdonline.org/the-back/, 2016). A typical vertebra is illustrated in Figure 2.1.

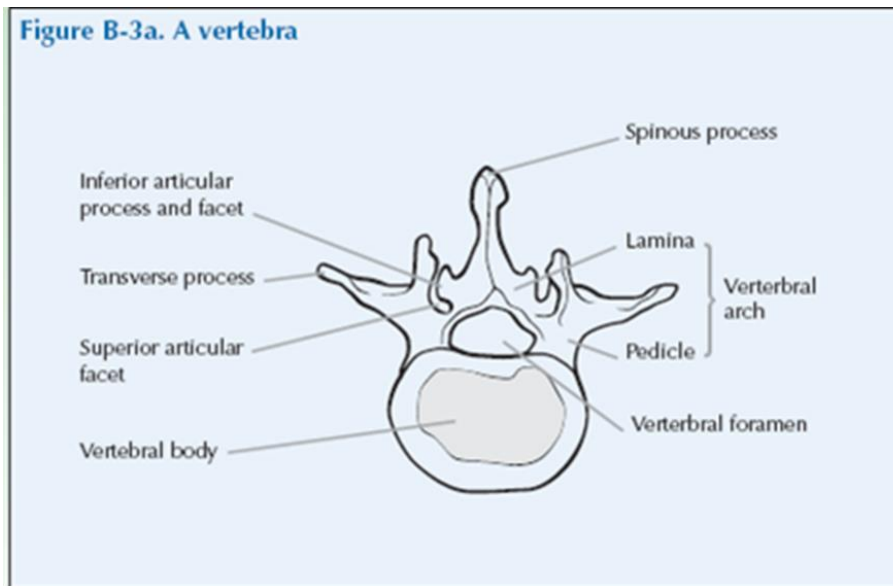


Figure 2.1: A typical vertebra (Global Alliance for MSK Health, www.bjdonline.org/the-back/, 2016).

The sacrum is wedge-shaped and provides strength and stability to the pelvis, transmitting weight from the body to the pelvis through the sacroiliac (SI) joints (Moore and Dalley, 2010). The sacrum and SI joints in some texts are described as part of the pelvis; for purposes of this study they are included as spine. The SI joints are found bilaterally between the sacrum and the ilia of the os coxae (Standring, 2008; Moore and Dalley, 2010). SI joints are highly stable, interlocking joints that show little movement and minor dysfunction in this area can lead to pain (Cramer and Darby, 2005; Standring, 2008; Moore and Dalley, 2010). The small triangular shaped coccyx is located at the tail end of the sacrum and provides attachments for the gluteus and coccygeus muscles (Moore and Dalley, 2010).

2.2.1 Originators of spinal pain

Pain has been defined as ‘an unpleasant sensory and emotional experience associated with actual or potential tissue damage’ (Hunter and Boon, 2004). Pain is common and complex as each patient’s experience and expression of pain is different (Briggs, 2010). The perception of pain is influenced not only by the painful stimulus but also other factors such as emotional, psychosocial and biological stressors (Moore and Dalley, 2010).

Spinal pain may be associated with a variety of clinical signs and symptoms (Haldeman, 2005), including: decreased range of motion (Bergmann and Peterson, 2011), muscle splinting, spasms, myofascial trigger points and/or dysfunction, oedema and/or scar formation, local (referred pain) or distal (radicular pain) symptoms and increased muscular or bony prominence tenderness (Morris, 2006). Failure to adequately address the causes of spinal pain may result in persistent pain and be responsible for its worldwide prevalence in the general population (Cramer and Darby, 2005; Morris, 2006; Hoy *et al.*, 2010a). All structures in the spine may cause pain as summarized in Table 2.1.

Table 2.1: Originators of pain in the spine (Cramer and Darby, 2005)

Anatomical part of the spine	Cause of the deviation from the normal posture	Resultant change in the normal anatomy	Causes for the development of pain
Intervertebral disc (IVDs)	Rotation / twisting and flexion movements with compression	Annulus tearing	Inflammation, long term disc protrusion or herniation’s
Facets	Rotation / twisting and extension movements	Capsular tears leading to posterior joint capsule synovitis and impaction of the facet joints limiting normal movement	Inflammation, joint movement restriction (subluxation). Degeneration or fibrosis may follow at a later stage
Bone	Benign/ metastatic tumours of bone, degeneration, fractures	Degeneration, bone spurs, abnormal bone growth or loss of bone, infection of bone	Inflammation, metastasis, ischemia, bone necrosis.
Muscles and Ligaments	Overuse, fatigue, inability to splint	Muscle spasm due to joint changes, restricted movement	Ischemia, metabolite build up, aggravation of pain and sustained hypertonic contraction.

The IVDs provide strong attachments between vertebral bodies and are thickest in the lumbar region. These discs are fibrocartilaginous and play a role in weight bearing, act as a shock absorbing cushions between vertebrae and a lesser role in movement (Cramer and Darby, 2005). They consist of two components: an external annulus fibrosis and an internal nucleus pulposus (Moore and Dalley, 2010). Different rotary forces can cause herniation or

protrusion of the nucleus pulposus into or through the weaker posterior annulus fibrosis, resulting in spinal pain (Cramer and Darby, 2005; Standring, 2008; Moore and Dalley, 2010). IVD disease can be a primary source of back pain but can also result in compression of exiting spinal nerves, which can lead to localised pain, inflammation and radicular symptoms and muscle weakness (Cramer and Darby, 2005).

Each pair of adjacent vertebrae is connected by facet joints (also called apophyseal joints), which stabilise the vertebral column and allow movement (Moore and Dalley, 2010). Facet joints have been implicated in causing chronic spinal pain in 15%-45% of patients (n=500) with spinal pain (Manchikanti, Boswell, Singh, Pampati, Damron and Beyer, 2004). Damage to the osseous and fibrous tissues of a facet joint can result in inflammation, degeneration and bone spur formation, which may result in spinal pain (Cramer and Darby, 2005; Moore and Dalley, 2010).

Clinically, bone pain is not well-characterized whereas a fracture will initially give rise to severe pain, often described as shooting or sharp (Frost, Hansen and Heegaard, 2016). Bone pain occurs in a diverse group of skeletal disorders and tends to increase with age due to lifestyle factors such as obesity and decrease in physical activity (Chartier, Thompson, Longo, Majuta and Mantyh, 2014). The pain may be caused by mechanical alteration, fractures, increased bone turnover, demineralized bone and/or a disturbed microenvironment (Frost *et al.*, 2016). Additionally, metastatic involvement of the bone is a frequent cause of pain, the most common cancer types, including breast, prostate and lung cancer, have a tendency to metastasize to bone (Lozana-Ondoua, Symons-Liguori and Vanderah, 2013). Cancer-induced bone pain can be described as dull in character, persistent, and increases over time, "spontaneous pain," without a triggering event or pain related to movement (Lozana-Ondoua *et al.*, 2013). Therefore, bone pain is a common and debilitating symptom of many malignant and non-malignant bone disorders (Frost *et al.*, 2016) and can cause spinal pain due to inflammation, degeneration, local destruction of the skeleton/spine, compression of the spinal cord and interference with peripheral nerves (Shaik, 2014).

The musculotendinous and ligamentous structures of the spine may suffer sprain, strain, or rupture, which may result in pain and inflammation and may be a stimulus for muscle spasm and instability (Cramer and Darby, 2005; Moore and Dalley, 2010). The spine is surrounded by some of the largest and most powerful muscles in the body (Appendix I). Local muscles are responsible for spinal stability while global muscles create movement, contraction of global muscles places shear loads on the joint surfaces and can lead to pain (Morris, 2006).

When muscle imbalances occur around the spine, faulty activation patterns incorrectly load the spine leading to MSK injury and spinal pain (Cramer and Darby, 2005; Moore and Dalley, 2010). Identifying the source of the spinal pain can assist treatment of the patient yet in many cases, due to the multifactorial presentation of spinal pain; the primary source is often not found (Machikanti *et al.*, 2004; Rubin, 2007).

2.3 Epidemiology of spinal pain

Epidemiological studies determine the distribution of disease in the population and provide an understanding of the natural history of the disease, which is relevant and essential for the planning of healthcare programmes (Briggs, Smith, Straker and Bragge, 2009). Furthermore, in terms of spinal pain, epidemiological studies highlight the link between the condition and factors either internal to the individual or external, which once determined can be controlled in order to minimize the condition (Machikanti *et al.*, 2004; Rubin, 2007).

2.3.1 Incidence and prevalence of neck pain (NP)

Neck pain (NP) is a clinical syndrome recognized by discomfort or pain around the cervical region with an associated reduction in cervical range of motion (ROM) (Hoy *et al.*, 2010c). The pain is usually around the middle to lower part of the back of the neck. The most common features associated with NP are headaches, paraesthesia and weakness in the upper limbs, dizziness and visual disturbances (Ndlovu, 2006; Carroll *et al.*, 2008). The prevalence and incidence of NP is reported to be increasing throughout the world (Hoy *et al.*, 2010c).

A population-based cohort study of NP in Canada (n=1133) found that the six-month prevalence of NP was 54% (Cote, Cassidy and Carroll, 2003), whereas in a Swedish study, the lifetime prevalence of NP was 43% (n=6000) (Guez, Hildingsson, Nilsson and Toolanen, 2002). It is estimated that 50% of the adult 'world population' suffers a mean lifetime prevalence of NP with a year prevalence of 37%, based on the 56 studies reviewed by Fejer, Kyvik and Hartvigsen, 2006. The global burden of disease study reported that the overall prevalence of NP in the general population ranges between 0.4% and 87% with the one year prevalence ranging from 5% to 80% (Hoy *et al.*, 2010c). In Durban, South Africa (SA) depending on the ethnic group being investigated, the prevalence varied from 36% to 50%, (Ndlovu, 2006; Slabbert, 2010; Muchna, 2011) which compares to Cote *et al.* (2003) where they recorded a high prevalence of neck pain compared with other studies; indicating that NP is a major problem affecting a large percentage of the local and global population.

NP is often reported to be the second most common complaint seen in clinical practice, second to LBP (Ferrari and Russell, 2003). However, studies in the USA (Coulter and Shekelle (2005), Manchikanti *et al.*, (2004) and South Africa Mahomed (2007)) differ and found that it was the number one complaint in clinical practice. Discrepancies seem to exist regarding the prevalence of NP between authors; this may be attributed to the various settings under which those studies took place, the sample size used and/or the methods utilized in obtaining the data (Guez *et al.*, 2002).

2.3.2 Incidence and prevalence of thoracic spine pain (TSP)

Thoracic spine pain (TSP) is pain experienced in the region of the thoracic spine, from T1-T12 and across the posterior aspect of the trunk (Briggs *et al.*, 2009). TSP is experienced across the lifespan of individuals, with the incidence being less than NP or LBP (Lishchyna and Mior, 2012). The lifetime prevalence of TSP in the USA was 7% (Lishchyna and Mior, 2012) compared to a systematic review of 33 international studies conducted by Australian authors, where it was reportedly higher than the USA (16 – 20%) (Briggs *et al.*, 2009); this may be due to the inclusion of children, adolescents and adults (Briggs *et al.*, 2009). In Durban, South Africa, of 7111 files analysed at a teaching Chiropractic clinic, only 3.5% of the patients consulted for thoracic spine pain (Benjamin, 2007), indicating a low prevalence of TSP in this setting. However there has been little investigation into the prevalence of TSP in developing countries, possibly due to it having less impact and significance when compared to that of NP and LBP (Sellers, 2002; Briggs *et al.*, 2009).

2.3.3 Incidence and prevalence of low back pain (LBP)

Low back pain (LBP) is defined as pain limited to the region between the lower margins of the twelfth rib and the gluteal folds (Galukande, Muwazi and Mugisa, 2005). The incidence and prevalence of LBP is high and of increasing international concern (Haldeman, 2005; Dagenais, Caro and Haldeman, 2008; Dagenais and Haldeman, 2012). LBP exists in epidemic proportions in the western world and is said to be on the increase and a major cause of disability in the developing world (Manchikanti *et al.*, 2004; Louw *et al.*, 2007; Woolf *et al.*, 2010 and Balague, Mannion, Pellise and Cedraschi, 2012).

In Europe, the lifetime prevalence of LBP is reported to be as high as 84% (Balague *et al.*, 2012), with it ranging between 65-80% in the USA (Woolf *et al.*, 2010). LBP lifetime prevalence in Uganda was reported to be 62% (Galukande *et al.*, 2005). Reviews of cross-sectional studies of LBP from developed countries report a point prevalence of 15–30%,

one-year prevalence as high as 50% and lifetime prevalence between 60% and 80% (Louw *et al.*, 2007; Driscoll, Jacklyn, Orchard, Passmore, Vos, Freedman, Lim and Punnett, 2010). It has been suggested that there is evidence indicating a lower lifetime LBP prevalence rate in Africa (Louw *et al.*, 2007). This, however, contradicts the premise that Africa has greater predisposing factors contributing to LBP (Woolf *et al.*, 2010).

LBP has been shown to be the most common MSK complaint in patients presenting to chiropractic clinics both internationally (Holt and Beck, 2005; Mootz, Cherkin, Odegard, Eisenberg, Barassi and Deyo, 2005; Sorensen, Stochkendahl, Hartvigsen and Grunnet-Nilsson, 2006; Garner, Aker, Balon, Nirmingham, Moher, Keenan and Manga, 2007; Stevens, 2007; Kopansky-Giles, Vernon, Steiman, Tibbles, Decina, Goldin and Kelly, 2007; Martinez, Rupert and Ndetan, 2009; Widanarko, Legg, Stevenson, Devereux, Eng, Mannetje, Cheng, Douwes, Ellison-Loschmann, McLean and Pearce, 2011) and locally (McDonald, 2012 and Hitge, 2014). Thus LBP is a major cause of disability, socioeconomic problems and loss of quality of life on a global scale (Hoy *et al.*, 2010a; Hoy *et al.*, 2010b), developing countries would financially benefit from a reduced prevalence of LBP due to costs involved, loss of work force and absenteeism in treating patients with LBP (Woolf *et al.*, 2010).

2.4 Factors affecting spinal pain

2.4.1 Age

Spinal pain has been found to be the number one cause of disability in people under 45 years of age and the third leading cause of disability in those older than 45 years (Balague *et al.*, 2012). The spine naturally degenerates over time and increasing age has been associated with spinal pain (McBeth and Jones, 2007; Hoy *et al.*, 2010a; Balague *et al.*, 2012). It has been found that a history of disabling spinal pain increases degeneration considerably (DePalma, Ketchum and Saullo, 2011), which also increases the likelihood of recurrent episodes. There is limited data on spinal pain in children and adolescents unless it is of a serious or life-threatening nature (Balague *et al.*, 2012; Taloyan and Lofvander, 2013). Those studies done on adolescents indicate that the prevalence of spinal pain, specifically LBP in teenagers, is similar to that of adults (Jeffries, Milanese and Grimmer-Somers, 2007; Briggs *et al.*, 2009).

NP has been documented to be more prevalent in middle-aged (30-50 years) populations with younger age groups having an increased likelihood of remission from NP compared with

older age groups (Carroll *et al.*, 2008). This may be due to the rising amount of desk work for students and young professionals (Fejer *et al.*, 2006; Rubin, 2007; Hoy *et al.*, 2010c). TSP has been found to more commonly affect adolescent populations reportedly due to backpack use (Briggs *et al.*, 2009). NP and LBP tend to begin in the third decade and incidence increases with age (Hoy *et al.*, 2010b; Balague *et al.*, 2012; Dagenais and Haldeman, 2012).

Patients seeking care for spinal pain at private chiropractic practices, both in SA and internationally, were mostly between the ages of 39 and 43 years of age, whereas at teaching chiropractic clinics, the patients was slightly younger with a mean age between 32 and 42 (Nyiendo *et al.*, 2001; Holt and Beck, 2005). This pattern was also evident in the age of the patients seeking care locally, at the DUT Chiropractic Teaching Clinic in SA; most probably due to clinic location, as it is located on the university's campus and convenient for students (Benjamin, 2007; Jaman, 2007; Venketsamy, 2007; Higgs, 2009; McDonald, 2012).

2.4.2 Gender

Many studies report a higher prevalence of MSK pain in women than in men (Wijnhoven, de Vet and Picavet, 2006), with women suffering more NP, TSP and LBP than men (Guez *et al.*, 2002; Fejer *et al.*, 2006; Wijnhoven *et al.*, 2006; Carroll *et al.*, 2008; Briggs *et al.*, 2009; Hoy *et al.*, 2010a; Hoy *et al.*, 2010b; Lishchyna and Mior, 2012). Risk factors that may contribute to an increased frequency of MSK disorders amongst females are menstruation, pregnancy, childbirth, anatomical differences (wider pelvis, increased valgus angulation of the knee and increased foot pronation), as well as physiological differences, such as hormone effects on connective tissue and reduced muscle bulk (Wijnhoven *et al.*, 2006; Tayolan and Lofvander. 2013).

It has been reported that healthcare use differs between the genders (Wijnhoven *et al.*, 2006). International and local studies in patients seeking private and public chiropractic care in the USA, Europe, New Zealand and SA found that the majority were female (Rubinstein *et al.*, 2000; Hartvigsen *et al.*, 2002; Coulter and Shekelle, 2005; Holt and Beck, 2005; Mootz *et al.*, 2005; Mahomed, 2007; Stevens, 2007; Lishchyna and Mior, 2012; Tatalias, 2006 and Nakao, Fricchione, Zuttermeister, Myers, Barsky and Benson, 2011), reported that females are more likely to use alternative medicines than their male counterparts, possibly explaining the trend observed.

Similarly, in Botswana (n=372), it was found that females over the age of 65 were more likely to seek care for MSK disorders than males; the sample consisted of more females (Clausen, Sandberg, Ingstad and Hjortdahl, 2000). In contrast, patients attending private chiropractic practices in Australia showed a slight male dominance (53.3%, n=1775) (Giles, Muller and Winter, 2002). This finding was at a public clinic and results were closely matched to the gender ratio of Australia. In adults the relationships between spinal pain and gender appear clear (McBeth and Jones, 2007) compared to adolescents, as spinal pain can be influenced by a variety of factors in adolescence: postural changes, puberty, backpack use, backpack weight, participation in specific sports and chair height (Briggs *et al.*, 2009).

2.4.3 Education

Under reporting or over reporting of pain has been associated with education and literacy levels (Dalstra, Kunst, Borrell, Breeze, Cambois, Costa, Geurts, Lahelma, Van Oyen, Rasmussen, Regidor, Spadea and Mackenbach, 2005; Bagwasi, 2006). 'Socioeconomic status' refers to differences in relative deprivation and is usually classified by factors such as levels of unemployment and education. In adults there is an inverse relationship between socioeconomic status and the prevalence of pain (McBeth and Jones, 2007).

In Canada (Nyiendo *et al.*, 2001), USA (Coulter and Shekelle, 2005) and SA (Mahomed, 2007) at least a third of the patients attending private chiropractic care were found to have obtained a tertiary education. Chiropractic care is primarily offered in the private sector, may or may not be covered by medical aid reimbursement depending on the country and is an out-of-pocket expense that then only becomes available to those who can afford to pay for this service (Haldeman, 2005). With an increased education level comes greater health awareness (Tatalias, 2006; Sorensen *et al.*, 2006) and tertiary education, thus allowing for better jobs with better income which is suggestive of middle and higher income levels being able to afford healthcare services in the private sector (Sorensen *et al.*, 2006).

In contrast, low educational status has been associated with an increased prevalence of spinal pain in France (Leclerc, Gourmelen, Chastang, Plouview, Niedhammer and Lanoe, 2008) and the USA (Hoy *et al.*, 2010a). Higgs (2009) reported the majority of patients attending a chiropractic clinic in a public hospital in Kimberley had no more than primary school level of education. This was a unique setting, as part of the public health sector in this region the services were rendered for the public; therefore lower income populations had access. Due to the costs of chiropractic services (Haldeman, 2005), it is expected that employed patients will attend private clinics whilst the unemployed have no choice but to

seek public health care. Limited research has been done to effectively compare low and high levels of education population groups within the same country.

2.4.4 Occupation

MSK disorders may develop from occupations that put muscles under unnecessary physical demand such as manual handling involving lifting, lowering, pushing, pulling, carrying and holding, and body movements with frequent bending, twisting and sudden movements have a significant potential for producing spinal pain (Roffey, Wai, Bishop and Dagenais, 2010; Wai, Roffey, Bishop, Kwon and Dagenais, 2010). The data on occupational risk for spinal pain in low income countries is relatively limited; it has been estimated that 80–90% of the population in these areas are involved in ‘heavy work,’ which suggests this may have a significant impact on the occurrence of spinal pain (Hoy *et al.*, 2010b).

Work postures, repetitive movements and high forces are risk factors to developing NP (Larsson, Bjork, Borsbo and Gerdle, 2012). Previous neck injury, trauma (whiplash) and poor posture significantly increases the biomechanical stresses on the cervical spine, and thus increases the prevalence of NP (Hoy *et al.*, 2010c). The vast majority of cases of TSP are due to muscular irritation or joint dysfunction and TSP is often precipitated by sedentary computer work (Sellers, 2002). NP and TSP have been associated with increased computer use; static and repetitive loads in awkward positions, duration of sitting, sedentary work postures, poor physical work environment (e.g. poor keyboard or mouse position), duration of twisting and bending the trunk in working postures (Sellers, 2002). Additionally, emotional problems and low job satisfaction can exacerbate work related MSK pain (Ferrari and Russell, 2003; McBeth and Jones, 2007; Briggs *et al.*, 2009; Hoy *et al.*, 2010a).

LBP arising from occupational ergonomic factors accounts for about one-third of all disability arising from the occupational risk factors included in the global burden of disease 2010 project (Driscoll *et al.*, 2010). The burden was considerable in all age groups and all regions (Driscoll *et al.*, 2010; Hoy *et al.*, 2010a). LBP is often associated with the work environment (Roffey *et al.*, 2010; Wai *et al.*, 2010). A history of LBP due to occupation is a risk factor for increased disability and future occurrences of LBP (Schneider, Lipinski and Schiltewolf, 2006). Several factors unique to the working environment such as job satisfaction, autonomy, supervisor empathy, task repetition (Wai *et al.*, 2010), exposure to heavy manual labour (Roffey *et al.*, 2010; Wai *et al.*, 2010) and occupational postures (Roffey *et al.*, 2010) have been identified as risk factors for LBP.

The majority of people in Botswana are unemployed and rely on the government to provide basic needs (Ntseane, 2004 and www.gov.bw, 2016). Many of the unemployed perform manual labour as their dominant activity, in the form of subsistence agriculture, using tools and processes devoid of ergonomics. Such traditional activities can expose potential workers to occupational risks before they start formal employment (Sealetsa and Moalosi, 2014). Thus the development of spinal pain may be from a combination of lifestyle factors exacerbated by poverty and the need for employment (Ntseane, 2004; Sealetsa and Moalosi, 2014). This is supported by Hondras, Hartvigsen, Myburgh and Johannessen, (2016) who studied the MSK burden in Botswana and found that physical labour, harsh living conditions, and caring for the very young and elderly by rural villagers who themselves were advancing in age, contributed to the everyday burden of MSK pain. In contrast, it has been suggested in low to middle income countries that physical labour might be protective for low-back pain (Hondras *et al.*, 2016).

In the international and local studies that investigated employment, occupation and spinal pain, a higher proportion of chiropractic patients attending private and public clinics were employed and it was noted that of those, there was a higher level of non-manual/sedentary work, as compared to manual occupations (Giles *et al.*, 2002; Benjamin, 2007; Jaman, 2007; Mahomed, 2007; Stevens, 2007; Venketsamy, 2007; Rubinstein *et al.*, 2008; Higgs, 2009; Martinez *et al.*, 2009; Ailliet, Rubinstein and de Vet, 2010; McDonald, 2012; Hitge, 2014). Of the six studies conducted at public clinics, only those in Canada (Giles *et al.*, 2002) and SA (Higgs, 2009) showed that there were higher levels of unemployment.

2.4.5 Marital status

Several studies (Coulter and Shekelle, 2005; Geisser, Cano and Leonard, 2005; Mohamed, 2007; Martinez *et al.*, 2009; Nakao *et al.*, 2011; Taloyan and Lofvander, 2013) have investigated marital status and its effect on spinal pain. It has been shown that being separated, divorced or widowed may result in a higher incidence of spinal pain compared to those who are married or single (Nakao *et al.*, 2011; Taloyan and Lofvander, 2013). Being married has beneficial effects on health, as marriage increases social support and patients reported significantly less stress about social, financial and living situations (Vereckei, Susanszky, Kopp, Ratko, Czimbalmos, Nagy, Palkonyai, Hodinka, Temesvari, Kiss, Tőro and Poor, 2011; Nakao *et al.*, 2011).

Nakao *et al.*, (2011) found that individuals who live alone or in social isolation are prone to develop and report MSK complaints. However, it has been reported that family issues can lead to psychological factors that can precipitate the development of spinal pain (Linton, 2000). Thus good family support structures help ease the burden of spinal pain (Linton, 2000; Nakao *et al.*, 2011; Taloyan and Lofvander, 2013). Only three studies were found to report marital status; the majority of patients were married irrespective of whether the study was done at a private practice (Coulter and Shekelle, 2005; Mahomed, 2007) or teaching clinic (Martinez *et al.*, 2009).

2.5 Profile of spinal pain

When profiling spinal pain, the type and severity of pain, the underlying causes, risk factors and co-morbidities associated with the pain should be thoroughly documented (Breivik, Eisenberg and O'Brien, 2013) as each specific community possesses a unique combination of demographic, cultural practices and socioeconomic characteristics (Coulter and Shekelle, 2005), that can influence the presentation of disease within that community.

2.5.1 Aetiology and diagnosis of spinal pain

Spinal pain is a very common and multifactorial complaint (Rubin, 2007, Manchikanti *et al.*, 2009; Hoy *et al.*, 2010a; DePalma *et al.*, 2011; Balague *et al.*, 2012). It is often difficult to isolate the causative agents effectively and efficiently (Dagenais and Haldeman, 2012), which may lead to delayed diagnoses and/or mismanagement of the patient (Morris, 2006; Dagenais and Haldeman, 2012). Serious pathology, which accounts for less than one percent of spinal pain (Sell and Longworth, 2010), needs to be identified and ruled out prior to continuing with conservative management. This typically includes an assessment of the patient looking for red flags, which are highlighted in Table 2.2. If red flags are found, the patient requires referral for further investigations which may include radiographic or advanced imaging, blood tests or referral to a specialist (Krismer, 2007; Sell and Longworth, 2010).

Table 2.2: Red flags indicating serious spinal pathology (Krismer, 2007; MacLean *et al.*, 2010).

Age	Presentation under 20 years	Onset over 55 years
History	Trauma	Past history of cancer Systemic steroids Drug abuse HIV or TB
Symptoms	Constant, persistent, progressive, non-mechanical pain	Neurological symptoms Systemically unwell Weight loss Night pain Thoracic pain

Spinal pain can be divided into mechanical or non-mechanical pain and depending on the diagnosis; the management of the condition may change (MacLean *et al.*, 2010). Non-mechanical pain refers to pain attributable to a recognisable, known specific pathology (e.g., infection, tumour, osteoporosis, fracture, structural deformity, inflammatory disorder, radicular syndrome, or cauda equina syndrome) (Balague *et al.*, 2012). Whereas mechanical spinal pain accounts for more than 90% of back pain and is defined as pain not attributable to a known specific pathology (Krismer, 2007; Balague *et al.*, 2012), that varies with physical activity and posture over time (Sell and Longworth, 2010).

Several aetiological classifications for spinal pain exist. This study will utilise the diagnostic triage model as utilised by the WSC. This classification system is utilized to allow for efficient and effective diagnosis and management of spinal pain patients at the WSC clinics. The diagnostic triage model is used to distinguish those patients with non-mechanical or serious spinal disorders from those with mechanical spinal pain, by means of history and examination, with particular emphasis on red flags.

2.5.1.1 Mechanical spinal pain

- **Degenerative/mechanical pain**

Mechanical spinal pain, also known as non-specific pain, is produced when strain is placed on the components of the spine, such as the vertebrae, facet joints and the surrounding musculature (Krismer, 2007; Balague *et al.*, 2012). One of the most common causes of mechanical spinal pain is from soft tissue disorders which include: muscular spasms, myofascial trigger points and muscular/ligamentous sprains and strains (Cramer and Darby, 2005). Muscle strain can occur from trauma, sudden injury or poor posture overtime (Sellers, 2002). This often occurs in conjunction with joint

dysfunction which may be associated with pain from the facet joints (WSC clinical user guide, 2016).

Pain generated by arthritic joints or soft tissue around the joint, may be directly linked to the presence of osteoarthritis (OA) e.g. disc degeneration, discogenic, joint dysfunction and soft tissue disorders (Timothy, Foley, Barron, Sloan and Shilliday, 2007). Discogenic pain is caused by damage of the outer annular fibres of disc without radicular symptoms and may occur with facet joint dysfunction (WSC Clinical User Guide, 2016). With increased age the spine degenerates resulting in a loss of spinal mobility, most notably occurring in the NP region (Hoy *et al.*, 2010a). Degeneration is defined as the loss of cartilage between the discs which results in inflammation, pain, stiffness, weakness, joint instability, and reduced range of motion (Caughey *et al.*, 2008). It is found more commonly in the elderly and is a major cause of pain and disability affecting over 135 million people worldwide and can be associated with discogenic pain; however, discogenic pain can occur in the absence of OA (Hunter and Boon, 2004).

- **Macro-trauma and micro-trauma**

Macro-trauma is pain as a result of a singular major traumatic event and is easily identified through the case history, e.g. childbirth, broken bones, motor vehicle accident (MVA) or traumatic fall resulting in muscle spasm, sprains/strains or fractures (Timothy *et al.*, 2007; WSC Clinical User Guide, 2016). Micro-trauma is a general term given to small, repetitive injuries to the body and if there is no clear major traumatic event or signs of pathology (Timothy *et al.*, 2007). Pain is due to an accumulation of damage, fibrosis or from abnormal neural drive in the muscles, ligaments, vertebrae and discs either singly or in combination which then results in a low level of inflammation, leading to vulnerability and eventually pain. Micro-trauma can also be due to chronic muscle contraction during static postures (WSC Clinical User Guide, 2016).

- **Other mechanical pain**

Other mechanical pain refers to spinal pain that occurs due to no clear repetitive strain/cumulative trauma or postural strain but involves mechanical factors which have contributed to the cause of the problem (WSC Clinical User Guide, 2016), e.g. occupation related pain combined with walking or farming as a dominant activity will cause other mechanical pain.

- **Idiopathic pain**

Idiopathic pain is pain occurring with an unknown pathogenesis or apparently spontaneous origin (WSC Clinical User Guide, 2016), it is often considered psychological in nature yet physiological processes can cause it (Helms and Barone, 2008). Physical, social and psychological factors play important roles in pain experiences and reporting (DePalma *et al.*, 2011; Videman and Battie, 2012); therefore, its management requires a holistic approach. According to Videman and Battie (2012) an idiopathic origin of back pain occurs in more than 80% of patients.

2.5.1.2 Non-mechanical spinal pain

- **Neoplastic pain**

Cancer is a significant global healthcare problem with an estimated worldwide incidence of ten million new cases per year, 54% of which occur in developing countries (Hunter and Boon, 2004). Primary bone cancer can arise in the spinal column, meninges, peripheral nerves or adjacent soft tissue; patients may experience night pain, weight loss, pallor and pathological fractures which can all contribute to spinal pain (Shaik, 2014). Malignant bone pain is often due to bone metastases, representing one of the first signs of widespread neoplastic disease (Lozana-Ondoua *et al.*, 2013). Not all the patients present with symptoms; however, two thirds of the patients with bone metastases experience severe pain, particularly those with advanced disease (Lozana-Ondoua *et al.*, 2013). In 80% of the cases, bone metastases occur in specific sites and can produce complications, like pathologic fracture, hypercalcemia (10% of cases), and spinal cord compression (5% of cases) (Frost *et al.*, 2016). Benign and malignant bone pain can be a cause of spinal pain and treatment should be personalized for patients and managed by means of a multidisciplinary approach.

- **Other serious non-mechanical causes of pain**

This includes other serious pathologies, which may have been identified by red flags found during the consultation (WSC Clinical User Guide, 2016) and include, but are not limited to:

Inflammatory joint disease: diseases such as rheumatoid arthritis (RA) and spondyloarthritis such as ankylosing spondylitis and psoriatic arthritis which result from chronic inflammation of joints (Hunter and Boon, 2004). The patient may present with fatigue, weight loss, fever, deformity of the joints and disability, thus, inhibiting motion and producing pain. Unlike mechanical spinal pain, which gets worse with physical activity and is usually more pronounced at the end of the day, inflammatory back pain is usually worse after periods of inactivity and in the early morning (Hunter and Boon, 2004; Moore and Dalley, 2010).

Neurogenic pain: This includes disorders that involve the nervous system (WSC Clinical User Guide, 2016). Common diagnoses were used as per the WSC User Guide:

- Discogenic radicular – disc protrusion produces pressure on nerve roots and causes radiculopathy, for example, sciatica is due to compression of the sciatic nerve that supplies the leg and causes pain down the back of the leg from buttock to ankle. Prolonged sciatica can lead to muscle weakness.
- Stenosis radicular – radicular symptoms are generated by degeneration and narrowing of the IVF which cause leg pain radiating beyond the knee, paraesthesia and nerve irritation.
- Peripheral nerve lesions – entrapment, trauma, infection or tumour causing irritation to peripheral nerves which causes loss in sensory distribution of nerves accompanied by swelling and impaired vibration and proprioception sensation.
- Central stenosis – narrowing of the spinal canal by a bony outgrowth, disc, tumour or any other space occupying lesion which causes discomfort in the legs is relieved by rest, bending forward or walking especially uphill.

Infections: infections can be local or systemic. Local infections may result in osteomyelitis, an infection of the bone which results in inflammation, an increase in osseous pressure and localised areas of osteonecrosis (bone death). Systemic infections such as tuberculosis (TB) may produce localized or systemic symptoms (Chaisson and Martinson, 2008) and presents with chronic spinal pain typically involving the thoracic and lumbar spine. The infection starts in the disc and spreads to the vertebral body, ligaments and musculature surrounding the spine. It results in bone destruction, abscess formation, kyphosis and can cause spinal instability or cord compression (Hunter and Boon, 2004; Moore and Dalley, 2010), resulting in severe neurological effects.

Spinal cord compression and cauda equina syndrome: Compression or inflammation of the nerve roots can cause symptoms of pain, altered reflexes, decreased strength, and decreased sensation (eMedicineHealth, 2016). Although these symptoms can become severe, and in some cases disabling, most are self-limiting and respond to conservative care. An extreme version of nerve compression or inflammation is cauda equina syndrome. Cauda equina syndrome is a serious condition caused by compression of the nerves in the lower portion of the spinal canal. Cauda equina syndrome is considered a surgical emergency because if left untreated it can lead to permanent loss of bowel and bladder control and paralysis of the legs. These can be caused by trauma or tumours and early diagnosis and treatment is vital (Driscoll *et al.*, 2010).

2.5.1.3 Reporting of aetiology of spinal pain

Studies investigating the aetiology of spinal pain in patients presenting to chiropractic clinics in SA, found that of those attending a public facility (n=157) the most common aetiologies were unknown (33.1%), non-traumatic (33.8 %) or traumatic (33.1%) (Higgs, 2009). More recently, Hitge (2014, n=117) found a higher percentage of unknown (63.2%) causes for spinal pain with fewer reports of traumatic (27.4%) and non-traumatic (9.4%) aetiologies; this study was conducted in a community clinic whereas Higgs (2009) was at a public hospital in Kimberley. Similar findings were in retrospective case reviews at the DUT Chiropractic Clinic for NP (Venketsamy, 2007, n=1342), TSP (Benjamin, 2007, n=249) and LBP (Jaman, 2007, n=7487). These studies highlighted that irrespective of clinic setting, idiopathic was the most common aetiology of spinal pain. In contrast, Martinez *et al.*, (2009) reported traumatic (47%) as the most common aetiology at a teaching clinic in Mexico. It was suggested by the authors that this was due to a higher number of young patients attending the clinic: younger patients are more likely to present with a traumatic conditions due to lifestyle and activity levels (Martinez *et al.*, 2009). Comparisons are challenging as aetiological classifications vary.

2.5.2 Pain duration and history of previous spinal pain

The period of time a patient suffers from spinal pain is relevant to the diagnosis and treatment of that condition (Hartvigsen *et al.*, 2002). The three commonly used duration periods are: acute - pain that has been present for less than or equal to four weeks; sub-acute - pain that has been present for four to twelve weeks, and chronic pain - pain that

exceeds twelve weeks (Costa-Black *et al.*, 2010). Acute and chronic pain have different physiological mechanisms, diverse manifestation and thus require different treatments (Helms and Barone, 2008; Campbell and Edwards, 2009).

Acute pain is usually confined to the affected area and is limited over time while chronic pain is prolonged pain, persisting beyond the expected normal healing time (Helms and Barone, 2008). Chronic pain is poorly understood and is more complex and difficult to manage than acute pain and often requires greater recovery time (Balague *et al.*, 2012; Breivik *et al.*, 2013). Practitioners would therefore use different strategies in the various stages to ensure optimal healing relative to the stage of tissue repair (Balague *et al.*, 2012).

Spinal pain has been found to have a recurrent nature with the rates of one-year recurrence reported to range from 25% to 80% (Evans, Mayer and Gatchel, 2001; Manchikanti *et al.*, 2009; Hayden, Dunn, van der Windt and Shaw, 2010; Hancock, Maher, Petocz, Lin, Steffens, Luque-Suarez and Magnussen, 2015). The majority of patients with acute spinal pain have at least one recurrent episode in the following year and most continue to have episodes of significant pain and disability (Nicholas, Linton, Watson and Main, 2011; Breivik *et al.*, 2013), leading to a chronic presentation (Balague *et al.*, 2012). This is contrary to a commonly held belief that spinal pain normally resolves spontaneously in most patients (Breivik *et al.*, 2013).

In 10–15% of patients, acute pain develops into chronic pain; this chronic state represents the greatest challenge because it tends not to improve with time and consumes most resources (Balague *et al.*, 2012). In adult populations, chronic pain ranges from 2% to 40%, with a median point prevalence of 15% (Breivik *et al.*, 2013). Studies from Spain (Fernández, Hernández-Barrera, Alonso-Blanco, Palacios-Ceña, Carrasco-Garrido, Jiménez-Sánchez and Jiménez-García, 2011), Portugal (Azevedo, Costa-Pereira, Dias and Castro-Lopes, 2011), Ireland (Raftery, Sarma, Murphy, De la Harpe, Normand and McGuire, 2011), Denmark (Kurita, Sjøgren, Juel, Højsted and Ekholm, 2012) and Iceland (Gunnarsdottir, Ward, and Serlin, 2010) reported chronic pain in 25–35% of the adults surveyed. Similar findings have been reported in South African populations (Higgs, 2009; McDonald, 2012; Hitge, 2014). These findings indicate that patients present with chronic pain in developed and developing countries but, the prevalence of chronic pain 41.1% (n=42249) was found to be higher in developing countries (Tsang, Von Korff, Lee, Alonso, Karam, Angermeyer, Borges, Bromet, de Girolamo, de Graaf, Gureje, Lepine, Haro, Levinson, Oakley-Brown, Posada-Villa, Seedat and Watanabe, 2008).

Risk factors influencing the prevalence of chronic pain are age, gender, and socioeconomic status. However, the precise nature of these relationships, and particularly the mechanisms of association, are unclear and require further investigation (McBeth and Jones, 2007). From the studies available, a higher prevalence of chronic pain conditions occur among females and older persons (peaking between 50–74 years of age) (Tsang *et al.*, 2008; Azevedo *et al.*, 2011; Raftery *et al.*, 2011; Kurita *et al.*, 2012; Breivik *et al.*, 2013;). Chronic pain is more common among manual workers and the unemployed, than among professional workers (Raftery *et al.*, 2011; Breivik *et al.*, 2013). Furthermore, being divorced, lower level of education and low level of income has been associated with the development of chronic pain (Tsang *et al.*, 2008; Raftery *et al.*, 2011; Breivik *et al.*, 2013). These findings strongly indicate that demographic factors influence the development of chronic spinal pain.

2.5.3 Disability and intensity

The experience of pain is unique for each person and the response to pain results from a complex interaction of biological, psychological, and social factors (Helms and Barone, 2008; Campbell and Edwards, 2009; Briggs, 2010; Tan, Smith, O'Sullivan, Chen, Burnett and Briggs, 2014). Research has demonstrated that pain-coping strategies influence perceived pain intensity and disability (Campbell and Edwards, 2009).

Pain can be rated as mild, moderate or severe (Helms and Barone, 2008; Briggs, 2010). Quantifying pain intensity is done clinically in order to objectively measure pain and monitor improvement. Additionally, the rating of pain is subjective and the perception of one's pain can be influenced by various factors including age and gender (Helms and Barone, 2008). Specific age groups may experience pain and/or communicate with healthcare practitioners differently, for example, children experience pain but may not be able to verbally express their pain experience and elderly patients often respond more slowly to pain (Helms and Barone 2008; Campbell and Edwards, 2009).

Females have been reported to have a higher prevalence of self-reported pain due to differences in physical activity, MSK maturity, posture, endocrine function and psychosocial characteristics than males (Wijnhoven *et al.*, 2006; Briggs *et al.*, 2009). It has been suggested that females report more symptoms, have an increased exposure to risk factors and an increased sensitivity to pain or lower pain threshold than men (Wijnhoven *et al.*, 2006). Once pain has been assessed, interventions directed toward pain relief must be implemented (Helms and Barone, 2008).

Disability can refer to inappropriate attitudes, altered pain behaviour (e.g. fear-avoidance behaviour and reduced activity levels of daily living), and work-related and emotional difficulties (Balague *et al.*, 2012). Systematic reviews of studies in the USA have shown that 23% of patients reporting LBP reported higher pain intensity with associated disability compared to only 15% of those with NP (Manchikanti *et al.*, 2009).

Similar results were found in the UK; where the one-month period prevalence of all reported spinal pain in the UK was 29% (n=5752), of which about half was described as intense, half was chronic in nature, 40% was disabling, and 20% was intense, disabling, and chronic (Webb, Brammah, Lunt, Urwin, Allison and Symmons, 2003), indicating the severity. Female gender and a history of previous back injury were positively associated with higher rates of pain disability (Balague *et al.*, 2012; Erick and Smith, 2014). Pain and disability is associated with lower levels of education, lower income bracket, unemployment and rising age (Webb *et al.*, 2003; Balague *et al.*, 2012; Erick and Smith, 2014).

Patients with significant pain and work disability account for most of the healthcare costs, disability and socioeconomic burden of spinal pain (Rubin 2007; Manchikanti *et al.*, 2009; Costa-Black *et al.*, 2010; MacLean *et al.*, 2010; Wai *et al.*, 2010). Spinal pain often interferes with everyday activities, such as work, family/home responsibilities, recreational activities, exercise and sleep (Evans *et al.*, 2001; Webb *et al.*, 2003; Rubin 2007; Manchikanti *et al.*, 2009; Breivik *et al.*, 2013). For people over the age of 45, spinal pain is a primary cause of disability, functional limitations and difficulty in performing activities of daily living (Webb *et al.*, 2003; Manchikanti *et al.*, 2009; Costa-Black *et al.*, 2010).

2.5.4 Co-morbidities and spinal pain

Chronic diseases of lifestyle, such as diabetes mellitus (DM) and coronary heart disease, account for millions of deaths each year globally (Van Zyl *et al.*, 2010). Thus patients with spinal pain may present with other health-related problems which may impact their pain (Caughey *et al.*, 2008; Manchikanti *et al.*, 2009). The study of multi-morbidity, (the presence of two or more chronic diseases/conditions and a growing endemic health problem) is relatively new worldwide (Fortin, Bravo, Hudon, Lapointe, Almirall, Dubois and Vanasse, 2006). The co-existence of multiple chronic diseases is frequently found in the older populations (Fortin *et al.*, 2006; Caughey *et al.*, 2008; Davis, Robinson, Le and Xie, 2011) but can occur at any age.

Osteoarthritis (OA) is common amongst the elderly and has a significant impact on quality of life and healthcare costs (Bae, Shin, Lee, Kim, Park, Cho and Ha, 2015). OA has been observed in over 90% of patients with diseases such as those affecting the cardiovascular, respiratory, gastrointestinal, urogenital, endocrine, metabolic, and neurological systems, as well as diseases of the ear, eye, throat, and larynx (Rijken, van Kerkhof, Dekker and Schellevis, 2005; Chopra and Abdul-Nasser, 2008; Verdecchia, Angeli, Mazzotta, Martire, Garofoli, Gentile and Reboldi, 2010). OA contributes to the development of spinal pain as it involves the joint tissue of the spine (Bae *et al.*, 2015).

The top co-morbidities found in spinal pain patients attending private chiropractic practices in Canada (Kopansky-Giles, 2007), Denmark (Hartvigsen *et al.*, 2002), and the Netherlands (Rubinstein *et al.*, 2000), were heart disease, cancer and cerebrovascular conditions which differs from the co-morbidities found in developing countries like Mexico (Martinez *et al.*, 2009) and SA (Hitge, 2014), where diabetes mellitus (DM), hypertension (HT) and the human immunodeficiency virus (HIV) were common. Challenges can be faced when investigating co-morbid conditions as it often relies on self-reports. Reporting a health problem not only depends on the actual presence of a clinical condition, but upon the patients' knowledge about the condition, their ability to recall it and their willingness to report it (Dalstra *et al.*, 2005; McBeth and Jones, 2007; Breivik *et al.*, 2013).

Developing countries have many health challenges, with diseases rising in the rural communities as a result of uneven access to healthcare services and insufficient quality of education (Van Zyl *et al.*, 2010). Patients from poor communities and lower socioeconomic classes are prone to an increased prevalence of co-morbid conditions such as HIV, HT and DM (Van Zyl *et al.*, 2010). Since HIV was first identified in 1981, the HIV/AIDS epidemic has continued to exceed all expectations in the severity and scale of its impact. An estimated 56 million people worldwide are currently living with HIV. The worst of the epidemic is in sub-Saharan Africa (Bertozzi, Martz and Piot, 2009).

Botswana currently has one of the highest recorded incidences of HIV infection in Africa (Clausen *et al.*, 2000; Gupta, Dandu, Packel, Rutherford, Leiter, Phaladze, Percy-de Kort, Lacopino and Weiser, 2010). In 2006, it had the second highest prevalence of HIV worldwide with 24% of adults infected between the ages of 15 – 49 (Gupta *et al.*, 2010). In this region, women are disproportionately affected, with women (15–24 years old) having more than three times the prevalence of HIV infection as men (UNAIDS Botswana, 2008 (www.unaids.org)). Botswana has been a leader in sub-Saharan Africa launching the first

national antiretroviral treatment programme in 2002; however, initial efforts to reduce HIV transmission have had limited success (Ntseane, 2004).

Co-morbid pain may influence a patient's prognosis (Carroll *et al.*, 2008) and contributes to the severity of pain experienced by the patient. It is therefore important that disease profiles be produced for specific communities so that further education and knowledge focused on that community can be developed (Van Zyl *et al.*, 2010). Therefore, a detailed understanding of the prevalence of common co-morbid conditions associated with disease may help to highlight complex issues surrounding management of patients (Caughey *et al.*, 2008).

2.6 Botswana and World Spine Care (WSC)

Botswana is a land-locked, Third World country roughly the size of France, situated in the southern part of the African continent bordered by SA to the south and southeast, Namibia to the west and north and Zimbabwe to the northeast (Chaisson and Martinson, 2008). The Kalahari Desert covers almost 70% of the land such that with a population of just over two million people, Botswana is one of the most sparsely populated countries in the world with most of the population living along the eastern border of the country with approximately 40% living in rural areas (www.statsbots.org.bw, 2011). Fifty-one percent of Botswana are female (www.gov.bw, 2016). The average life expectancy is 53 years for both men and women, although with the reduction in infant mortality rates and the Government's increased access to antiretroviral drugs, life spans are expected to increase in the near future (www.statsbots.org.bw, 2011; Hondras *et al.*, 2015a).

2.6.1 Healthcare in Botswana

The health systems of countries have relevance to the social determinants of health and play an important role in improving health status and addressing health inequalities (Van Zyl *et al.*, 2010). The Botswana healthcare system includes public (government), private for-profit, private non-profit and traditional medicine practice, with 98% of health facilities operating in the public sector (www.who.afro.int, 2016). The Ministry of Health (MoH) oversees health services in the country. There are 14 district hospitals in the country, more than 200 health clinics, at least 330 health posts, and almost 850 mobile posts. Most of the population lives within an eight kilometre radius of a health facility (www.gov.bw, 2016). At present, health systems principally provide care for acute episodic conditions and do not have the facilities to tend to chronic care needs, particularly for the rapidly growing aged population

(Hondras *et al.*, 2015a). During the past decade, there have been increased demands to refocus healthcare strategies that target MSK disorders, particularly in low- and middle-income countries (Louw *et al.*, 2007). Despite these efforts, healthcare imbalances and limited resources exist in Botswana for people with muscle, bone and joint disorders (Hondras *et al.*, 2015a).

Similar to many countries, the 'inverse care law' applies, which suggests that the availability of good quality health care is inversely related to the need for it in the population it serves (Van Zyl *et al.*, 2010). In SA, the distribution of health service utilisation and the benefits (measured in monetary terms) from using its services is in favour of the high-income classes for most public facilities, especially hospitals, and across all private sector services (Ataguba, Akazil and McIntyre, 2009). It is expected that Botswana is much the same.

2.6.2 WSC in Botswana

Since 2011, WSC has collaborated with the Botswana MoH to open two spine care clinics in Botswana offering spinal care and initiating research in Botswana (Haldeman *et al.*, 2015). To date, the clinics have seen approximately 1 300 patients (Outerbridge, 2016). Thus far, the care offered has been administered by chiropractors, and where necessary, referrals are made to the local hospital (www.worldspinecare.org, 2016).

The first clinic was set up in Shoshong, which is a rural village of about 10,000 people (www.statsbots.org.bw, 2011) in the Central District of Botswana, just north of the Tropic of Capricorn and approximately 250 km north of the country's capital, Gaborone (more than 230, 000 people) (www.statsbots.org.bw, 2011). The Shoshong WSC clinic serves as a primary clinic centre for the screening of serious pathology diagnosis and management of patients with spinal and MSK disorders. The second clinic was started at the Mahalapye District Hospital. The hospital was officially opened on August 2008, and serves a population of about 119 000. It is one of the four district hospitals that have recently been completed as part of government efforts to improve people's access to medical care as well as introduce specialist services closer to the community (www.gov.bw, 2016). The Mahalapye WSC clinic provides secondary diagnostics and management of those patients who have been identified at the primary clinic in Shoshong who require more advanced care (www.worldspinecare.org, 2016).

2.7 Conclusion

Little is known about spinal pain patients and their use of healthcare in Botswana. Therefore, the WSC clinics were started in response to a need within this community for MSK healthcare. Along with demographic factors and factors related to the presenting complaint, political differences between countries and their diverse cultures could result in the development of spinal pain and cause variations in the patient profiles. Thus, the need for demographic and descriptive information pertaining to spinal pain patients at the WSC clinics in Mahalapye and Shoshong is necessary to identify if disparity in patient profiles exists.

Chapter Three

Methodology

3.1 Introduction

This chapter will provide details of the research methodology used in this study to meet the study aims and objectives.

3.2 Study design and approval

This study was conducted using a quantitative paradigm and a retrospective, descriptive design. Descriptive designs allow populations to be described in terms of their characteristics such as age or gender (Baumgartner *et al.*, 2002). This type of design enables research to be done on a phenomenon, without influencing the phenomena, with the aim to have a better understanding of how the variables interact, in order to answer the research questions (Brink, 2007).

This research proposal was approved by the Institutional Research Ethics Committee (IREC) of the Durban University of Technology; REC 53/16 (Appendix A). This committee operates in accordance with the Declaration of Helsinki, 1975 (Johnson, 2005).

3.3 Permission to conduct the study

The researcher approached the WSC NGO for permission to conduct the study at the WSC clinics in Mahalapye and Shoshong. The WSC supported the investigation (Appendix B) and allowed the researcher access to the site and the patient files. In order to conduct research in Botswana, the Botswana MoH needed to give approval for the study to commence. Prior to the start of data collection the Ministry approved the study (Appendix C).

3.4 Study population

In this study, the population consisted of the patient files of all new patients that attended the WSC clinics in Mahalapye and Shoshong, between the periods of the 1 November 2012 to the 31 March 2016, with a primary complaint related to the spine. The patient files had to meet the following criteria:

3.4.1 Inclusion criteria:

1. The patient file had to belong to the WSC clinics in Mahalapye and Shoshong.
2. The patient had to have consulted the clinic between 01 November 2012 and 31 March 2016 with spinal pain as their main complaint.
3. The patient file had to have a completed Research Consent forms (Appendix F). The Research Consent form is given to all WSC patients at their initial visit informing the patient that their file may be utilised for future research purposes, the patient is free to decide whether they agree to have their information used for research purposes or not. Their choice does not affect their ability to receive treatment from the WSC clinics.

3.4.2 Exclusion criteria:

1. Patient files with more than 40% of missing data that was required for the relevant information.
2. Patient files used for pilot testing the data collection sheet (Appendix D (I)).

Prior to accessing the WSC clinics it was estimated that there were approximately n=1300 files from both the Mahalapye and Shoshong clinics. It was estimated that 80% would have had signed Consent forms and that approximately 70% of files would have been for patients seeking care for spine related problems, resulting in an estimated sample size of 910 files. All eligible files would be included in this study.

3.5 Data collection tool

The data collection sheet (Appendix D (I)) was designed by the researcher based on the information available in the patient files at the Mahalapye and Shoshong WSC Clinics. To ensure that all relevant information was obtained, the data collection sheet (Appendix D (I)) was cross checked against the data collection tools used in similar studies investigating demographic and disease profiles both in SA (Benjamin, 2007; Jaman, 2007; Venketsamy, 2007; Higgs, 2009; McDonald, 2012; Hitge, 2014) and internationally (Giles *et al.*, 2002; Kopansky-Giles *et al.*, 2007; Stevens, 2007).

The data collection sheet consisted of information pertaining to:

- Demographic factors (age, gender, education, occupation, dominant activity and marital status).
- Factors related to the main complaint (aetiology, diagnosis pain duration, history of previous spinal pain, pain disability and intensity, other MSK complaints, and presence of co-morbid conditions).

Pilot testing was performed in order to determine if the data collection sheet (Appendix D (I)) contained all the variables necessary for the research and allowed for simple collection of the most accurate data (Baumgartner *et al.*, 2002; Polgar and Thomas 2008). Pilot testing was done by randomly selecting three files, one for each year: 2013, 2014 and 2015. The data collection sheet (Appendix D (I)) was used to extract the relevant information from the patient files.

The following changes were made to the data collection tool post-pilot testing:

- Section A and B were added, along with numerical values with each heading to assist in the analysis.
- 'Missing' was added to each variable to allow for instances where the information was missing in the patients file.
- 'Other' was also added to each variable to account for options not being available on the data collection sheet.
- Ethnicity and Date of Birth (DOB) were removed as this data was not consistently collected by WSC.
- The choice of 'single' was added to marital status as it was not included prior to pilot test.
- 'Lying down' was added to dominant activity as it was not included prior to pilot test.
- 'Degenerative, idiopathic, macro and micro trauma' were added as options to aetiology.
- 'Prior spinal pain' was added.
- After examining the pilot patient files, 'pain disability and pain intensity' options were changed in order to be consistent with the data collected in the Mahalapye and Shoshong WSC clinic records as it was unknown prior to pilot testing.
- 'Degeneration' was added to diagnosis.
- 'Primary pain location otherwise known as presenting complaint' was changed to only include spinal pain options as this was the focus of this study.
- 'Secondary complaint' was amended to include all locations of the body.

- 'Degeneration, endocrine pathology, gastrointestinal pathology, inflammatory arthritides, tuberculosis, none, genitourinary pathology and integumentary pathology' were all added to section B9 'Co-morbidities'.
- 'Vascular' aetiology had not been utilized and WSC introduced a new aetiology in 2015 - 'Other mechanical', therefore vascular was reused as 'other mechanical' instead.
- The ordering throughout the data collection sheet was sorted alphabetically to make it easier for the researcher to locate the codes required to capture the data.

Once these changes were instituted the post-pilot data collection sheet (Appendix D (II)) was submitted to IREC for final approval before the study could begin.

3.6 Research procedure

On receiving permission to start data collection from IREC (REC 53/16, Appendix A), WSC (Appendix B) and the Botswana MoH (Appendix C), a research assistant was appointed to aid the researcher with capturing the research data from the data collection sheet (Appendix D (II)) into a Microsoft (MS) Excel spreadsheet. The research assistant did not access the WSC patient files and signed a confidentiality agreement (Appendix G) prior to engaging in data capturing.

The researcher and the research assistant visited the clinics in June 2016 to collect the research data. The research assistant's role was to capture the data from the data collection sheet into the MS Excel spread sheet. At the WSC clinics, the researcher went through each file, assessing its eligibility to be included in the study. When the file met the study inclusion criteria the necessary data was extracted by the researcher, recorded on the data collection sheet and then captured into an MS Excel spread sheet by the research assistant (Appendix D (II)). Data collection was conducted on site and no patient files were removed from the WSC Clinics' premises. The attending WSC clinician assisted the researcher and research assistant by allowing access to the premises and where clarification was required, the WSC clinician was consulted.

During data collection, a notice (Appendix H) was placed in the Mahalapye and Shoshong WSC Clinics stating that research was being conducted using the files of patients that had attended the WSC clinics from 1 November 2012 to 31 March 2016. The notice further advised that if anyone had queries related to the research or wished not to have their file

utilized in the research, that they were requested to contact the Mahalapye and Shoshong WSC Clinic coordinator. This was done in the interest of best practice principles (Gallan and Ogibene, 2012).

3.7 Data management and analysis

3.7.1 Data management

All data was coded and captured as per the data collection sheet (Appendix D (II)), into MS Excel spreadsheets. Three variables required synthesis:

1. Pain duration was further categorized as acute - pain that has been present for less than or equal to four weeks, sub-acute - pain has been present for four to twelve weeks, or chronic - pain exceeds twelve weeks (Costa-Black *et al.*, 2009), in order to compare with similar studies.
2. Pain disability was measured using a numerical score out of 32 adapted from the community-oriented programme for the control of rheumatic disease (COPCORD). Pain disability was based on eight questions of activities of daily living (ADLs), each question had five options (no difficulty, some difficulty, much difficulty, extreme difficulty and unable to do) the total score was out of 32, 0/32 being no disability experienced and 32/32 being most disability experienced.
3. Pain intensity was measured at the WSC in two ways. The numeric pain rating scale (Bournemouth) and the faces pain scale (Wong-Baker) were used. The numeric pain rating (Figure 3.1) scale ranges from 0 to 10, with 10 being the worst pain ever experienced and 0 being no pain sensation at all (WSC Clinical User Guide, 2016) and the second pain scale is the faces pain-rating scale (Figure 3.1) (Hockenberry and Wilson, 2013), which may be more useful in lower levels of education populations as it is easier to interpret (WSC Clinical User Guide, 2016). This scale includes six faces with indications of increasing pain intensity; the patient chooses the appropriate face to indicate their pain level. Pain intensity was changed from the numeric pain-rating scale and the faces pain-rating scale to a category of either mild, moderate or severe according to its numerical rating or face, 0 - 30 % (the first two faces) is considered mild, 40 – 60% (the middle two faces) moderate and 70% (the last two faces) and above is severe pain.

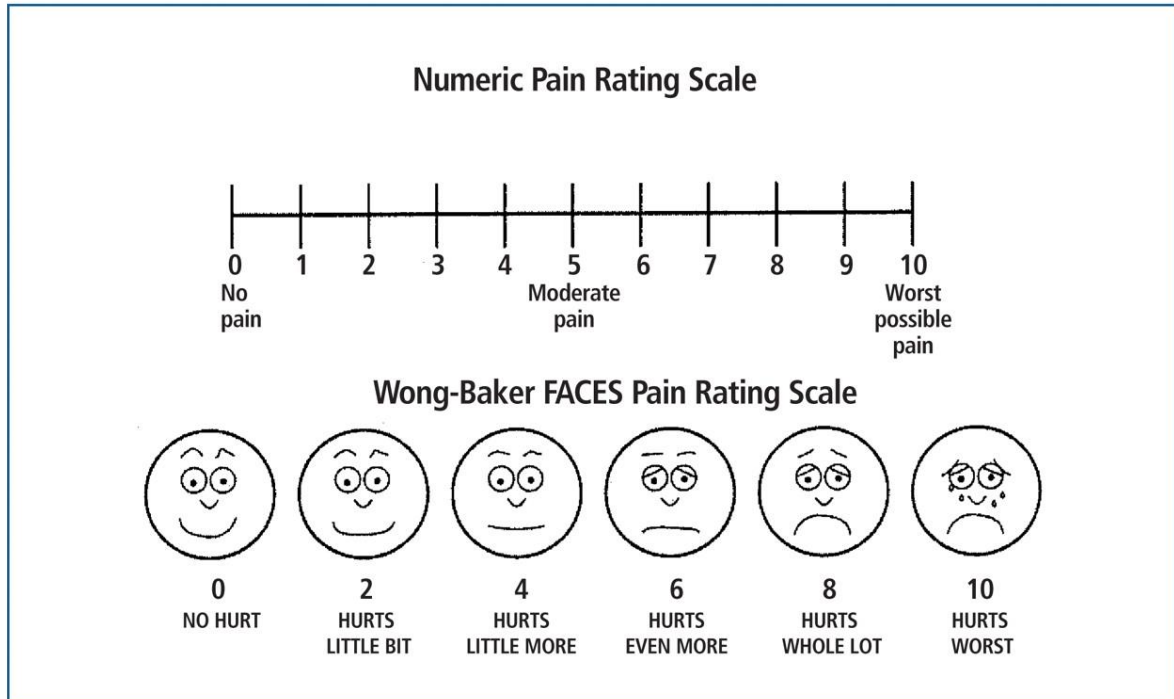


Figure 3.1: The numeric and Wong-Baker pain-rating scales (WSC Clinical User Guide, 2016).

3.7.2 Data analysis

The data was analysed by a qualified statistician using Statistical Package for the Social Science (SPSS) version 24.0. Descriptive statistics in the form of graphs and cross tabulations were used to describe the demographic and disease profiles of the patients who attended the WSC clinics in Mahalapye and Shoshong (Singh, 2016).

Inferential statistics like Chi-square and Fischer's exact test for categorical variables and Independent Student's *t*-tests for numerical variables were used to determine differences between the two clinics. A *p*-value of less than 0.05 was used to indicate statistical significance (Singh, 2016).

3.8 Ethical considerations

The ethical considerations for this study included the following:

1. **Autonomy and Justice:** Patient files were only used in this study if the patient had given consent for their information to be used for research purposes. A notice was placed at the clinics during data collection (Appendix H). Data collection was conducted in a professional manner ensuring confidentiality. All patient files were recorded by the file number; no patient names were recorded; the research assistant signed confidentiality statements.
2. **Non-maleficence and beneficence:** The welfare of the participants was protected in that only patient files were accessed. The files were checked for the appropriate patient consent before the information contained therein was collected for research purposes, as per Appendices E and F. Electronic copies were password protected for the duration of the study (access by researcher, research assistant and research supervisor only) all electronic copies will be stored for a minimum of five years once thesis is complete. All data extracted was coded; allowing no references to people's names or specific condition in any research output. Confidentiality was maintained throughout. Data collection was done on site; no patient files were removed from the WSC clinics in Mahalapye and Shoshong.

Chapter Four

Results

4.1 Introduction

This chapter presents the results obtained from the data collected in this study and it will be presented under the study objectives. The results in each section will be given for the clinics together and for each clinic individually. The Mahalapye clinic will be identified as the urban clinic and Shoshong as the rural clinic.

4.2 Sample size

It was estimated that there would be approximately 910 clinic files that would meet the study criteria for inclusion. On conducting the study there was a total of 1104 available for data collection of which 714 met the study inclusion criteria, as seen in Figure 4.1. There were a greater proportion of files meeting the study inclusion criteria from the urban clinic.

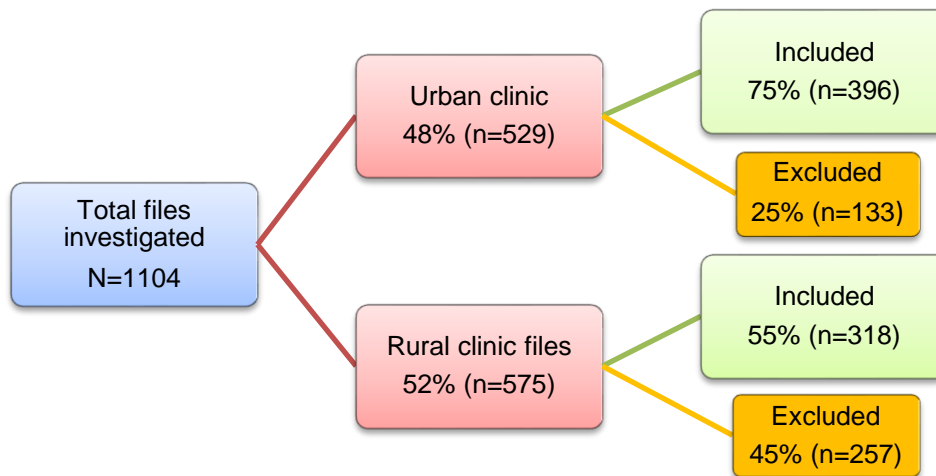


Figure 4.1: Number of files available at each clinic for data collection

Files were excluded for the following reasons:

- Missing Consent form (n=71)
- The main complaint was for an extremity condition or a non-spinal complaint (n=319)
- The files that were utilized in the pilot testing (n=3)

4.3 Objective 1: To determine the demographic profile of the spinal pain patients attending the WSC clinics in Mahalapye and Shoshong.

4.3.1 Age

The mean age of the spinal pain patients attending the WSC clinics was 50.57 (n=714), with a range from 5 to 96 years. Spinal pain patients attending the rural clinic were statistically older (52.64 years, \pm SD 16.92) than those attending the urban clinic (48.91 years, \pm SD 15.29) ($p = 0.002$, Independent samples t -test).

When divided into age categories there were fourteen patients below 19 and thirty-one patients over 80 years of age at both clinics, with the majority of patients falling within the working population age range as seen in Table 4.1.

Table 4.1: Age range (years) of spinal pain patients attending the WSC clinics

Age range	Urban n (%)	Rural n (%)	Total N (%)
1 - 9	1 (0.3)	0 (0.0)	1 (0.1)
10 - 19	6 (1.5)	7 (2.2)	13 (1.8)
20 - 29	37 (9.3)	18 (5.7)	55 (7.7)
30 - 39	75 (18.9)	57 (17.9)	132 (18.5)
40 - 49	87 (22.0)	51 (16.0)	138 (19.3)
50 - 59	82 (20.7)	74 (23.3)	156 (21.8)
60 - 69	73 (18.4)	61 (19.2)	134 (18.8)
70 - 79	24 (6.1)	30 (9.4)	54 (7.6)
80 - 89	9 (2.3)	16 (5.0)	25 (3.5)
90 - 99	2 (0.5)	4 (1.3)	6 (0.8)
Total	396 (100.0)	318 (100.0)	714 (100.0)

(Chi squared test invalid due to low cell counts)

4.3.2 Gender

Women consulted the WSC clinics more than males, as seen in Table 4.2., with a significantly higher number of women consulting the urban clinic compared to the rural clinic ($p = 0.009$, Fisher's Exact Test).

Table 4.2: Gender of spinal pain patients attending the WSC clinics

Gender	Urban n (%)	Rural n (%)	Total N (%)
Female	313 (79.0)	224 (70.4)	537 (75.2)
Male	83 (21.0)	94 (29.6)	177 (24.8)
Total	396 (100.0)	318 (100.0)	714 (100.0)

4.3.3 Education

The patients attending the WSC clinics were most likely to have either a primary school (33%) or a post high school (29.5%) level of education. A primary school education was most often reported in the rural setting in contrast to those in the urban setting where patients reported a more than secondary schooling education ($p < 0.001$, Chi-squared test), as seen in Figure 4.2.

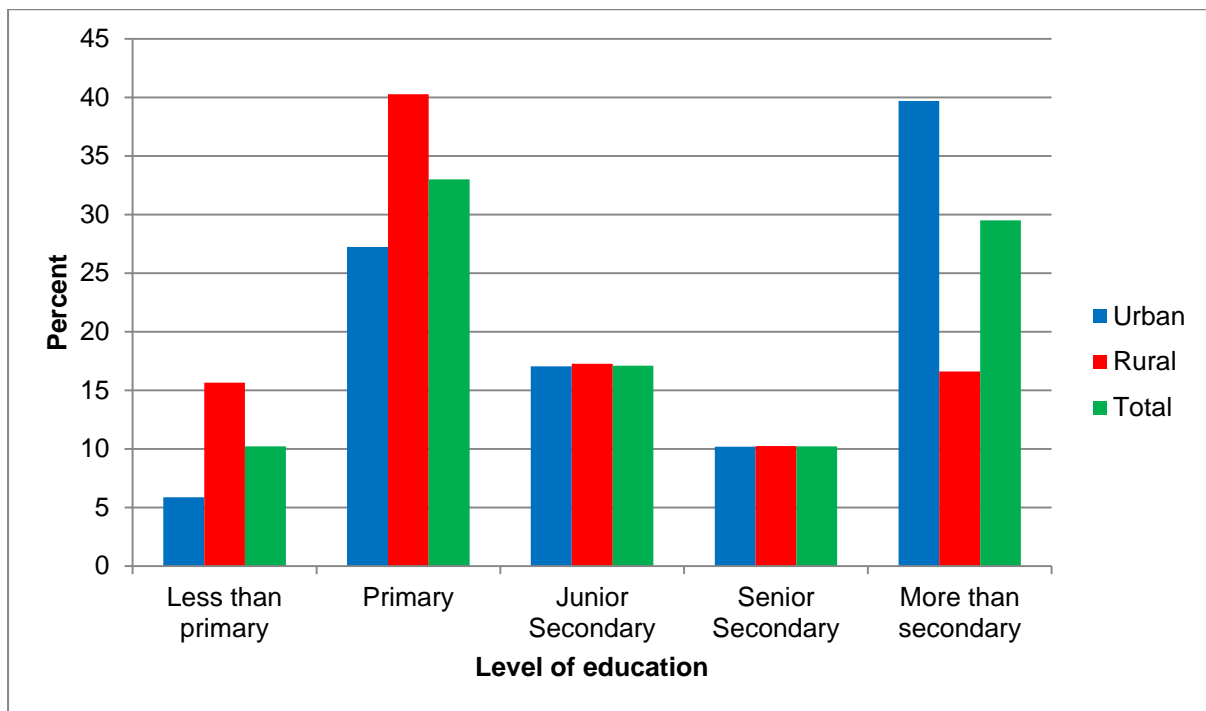


Figure 4.2: Level of education of spinal pain patients attending the urban (n=393) and rural (n=313) WSC clinics

4.3.4 Dominant activity and occupation

The most common dominant activities reported by the WSC spinal patients was manual labour, sitting and walking as seen in Table 4.3. When the individual clinics were compared a significant difference ($p < 0.001$, Chi-squared test) was found with those in the rural setting reporting manual labour as their dominant activity, in contrast to those at the urban clinic where sitting was the dominant activity. The urban patients stood more, whereas the rural patients tended to walk and partake in more housework, indicating that the rural patients were more involved in activities requiring physical activity.

Table 4.3: Dominant activity of spinal pain patients attending the WSC clinics

Dominant Activity	Urban n (%)	Rural n (%)	Total N (%)
Manual labour	76 (20.0)	106 (35.8)	182 (26.9)
Sitting	116 (30.5)	38 (12.8)	154 (22.8)
Walking	77 (20.3)	71 (24.0)	148 (21.9)
Housework	46 (12.1)	44 (14.9)	90 (13.3)
Standing	53 (13.9)	25 (8.4)	78 (11.5)
Driving	9 (2.4)	8 (2.7)	17 (2.5)
Lying down	2 (0.5)	3 (1.0)	5 (0.7)
Other	1 (0.3)	1 (0.3)	2 (0.3)
Total	380 (100.0)	296 (100.0)	676 (100.0)

Of those who were employed, the most prevalent occupation reported was farming followed by office work, as seen in Table 4.4. Irrespective of clinic setting, being unemployed was the second most common response.

Table 4.4: Occupation of spinal pain patients attending the WSC clinics

Occupation	Urban n (%)	Rural n (%)	Total N (%)
Farmer	42 (10.7)	87 (27.7)	129 (18.2)
Unemployed	60 (15.3)	55 (17.5)	115 (16.3)
Office work	65 (16.5)	14 (4.5)	79 (11.2)
Retired	52 (13.2)	24 (7.6)	76 (10.7)
Housework	30 (7.6)	42 (13.4)	72 (10.2)
Health Care	45 (11.5)	15 (4.8)	60 (8.5)
Service (e.g. Waiter, salesperson, mechanic, gardener)	25 (6.4)	9 (2.9)	34 (4.8)
Teacher	21 (5.3)	13 (4.1)	34 (4.8)
Military	8 (2.0)	24 (7.6)	32 (4.5)
Other	12 (3.1)	6 (1.9)	18 (2.5)
Student	10 (2.5)	7 (2.2)	17 (2.4)
Labourer	8 (2.0)	6 (1.9)	14 (2.0)
Not working due to pain	7 (1.8)	2 (0.6)	9 (1.3)
Police	4 (1.0)	5 (1.6)	9 (1.3)
Driver	4 (1.0)	4 (1.3)	8 (1.1)
Other professional (e.g. co-ordinator, craft improver, road foreman, seamstress/tailor)	0 (0.0)	1 (0.3)	1 (0.1)
Total	393 (100.0)	314 (100.0)	707 (100.0)

When dominant activity was compared to occupation (Appendix J) a significant difference was found between the rural and urban setting ($p < 0.001$, Chi-squared test). In the rural clinic (n=314) the predominant occupation found was farming (27.7%) with manual labour and walking as the dominant activities, whereas in the urban clinic (n=393), office work (16.5%) was the predominant occupation with sitting as the dominant activity. Additionally, the majority of the domestic workers and unemployed patients reported housework as their dominant activity.

4.3.5 Marital status

Of the spinal pain patients attending the WSC clinics 38% (n=702) were married, followed by 27% who were never married and 13% who reported being single. No significant difference was found between clinic location and marital status ($p = 0.249$, Chi-squared test), as seen in Figure 4.3.

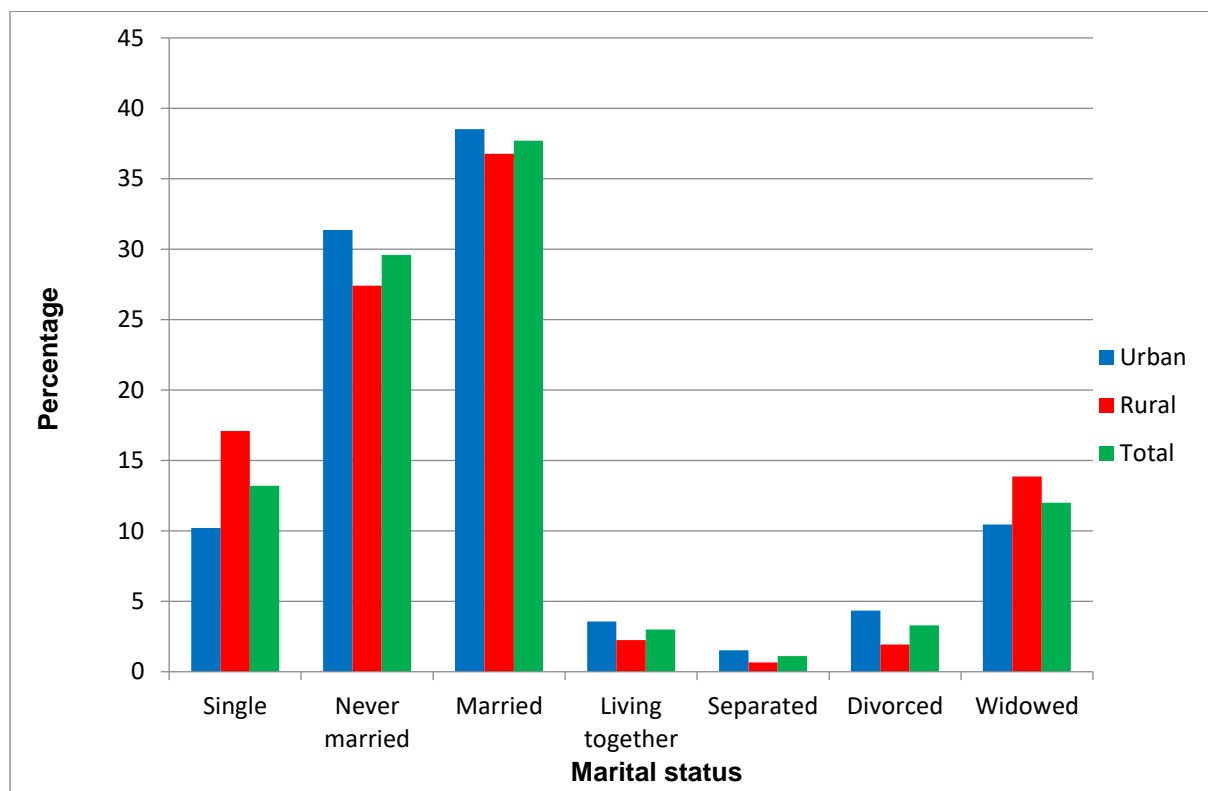


Figure 4.3: Marital status of spinal pain patients attending the urban (n=392) and rural (n=310) WSC clinics

4.4 Objective 2: To compile a profile of spinal complaints of the spinal pain patients attending the WSC clinics in Mahalapye and Shoshong

4.4.1 Presenting complaint

Low back pain was the main reason for patients consulting the urban and rural WSC clinics, followed by upper/mid back and then neck pain, as seen in Figure 4.4 (n=712). No significance was found between the clinic location and presenting complaint of the WSC patients. Irrespective of clinic location, LBP was the most common reason for patients seeking care for spinal pain.

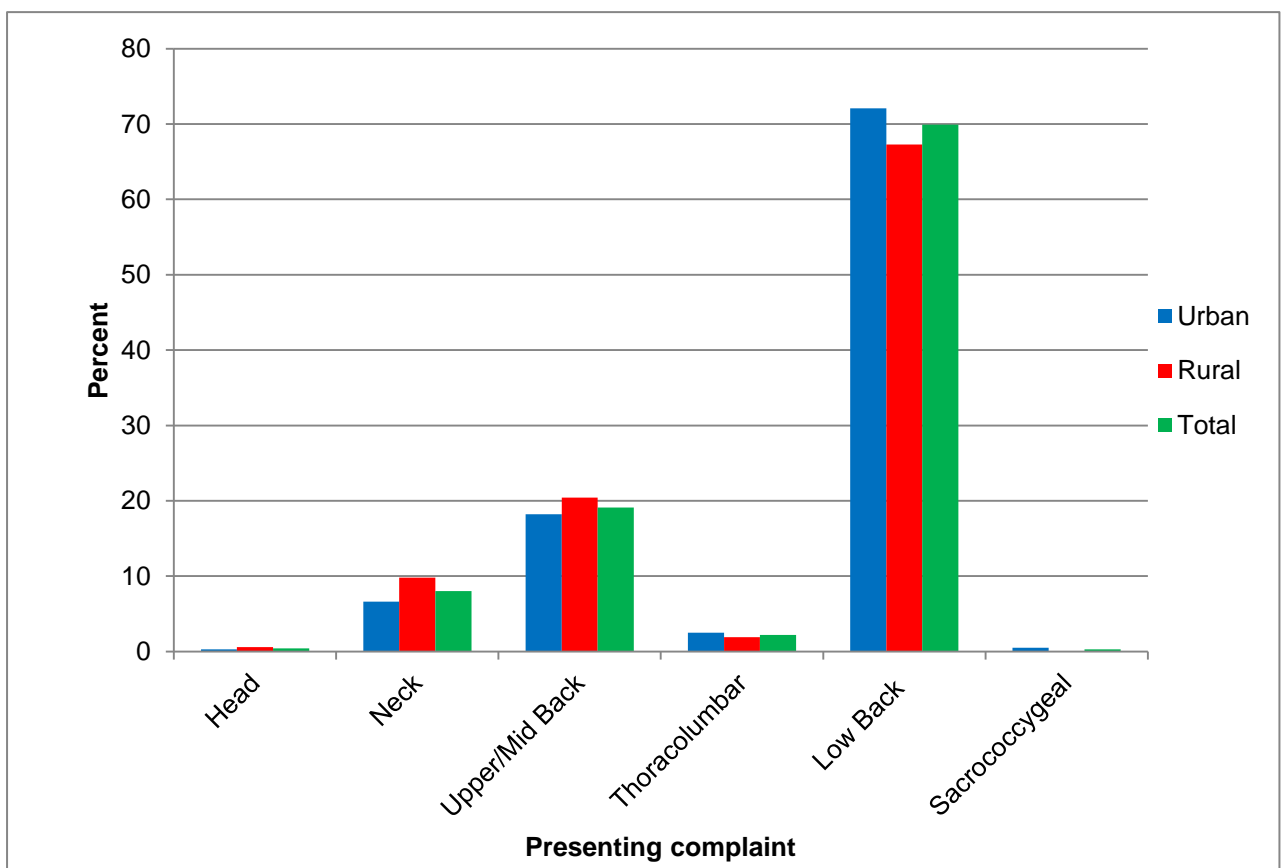


Figure 4.4: Presenting complaint of spinal pain patients attending the urban (n=394) and rural (n=318) WSC clinics

4.4.2 Aetiology

The aetiology of the spinal pain was mostly mechanical in origin, with an idiopathic aetiology being the most common reason for seeking treatment for spinal pain, as seen in Table 4.5. A significantly higher number of the urban spinal patients had the aetiology “other mechanical” e.g. joint dysfunction ($p = 0.039$, Chi-squared test) when compared to the rural clinic patients.

Table 4.5: Aetiology of spinal pain patients attending the WSC clinics

Aetiology	Urban n (%)	Rural n (%)	Total N (%)
Idiopathic	221 (56.5)	197 (63.3)	418 (59.5)
Other mechanical	53 (13.6)	17 (5.5)	70 (10.0)
Macrotrauma	39 (10.0)	26 (8.4)	65 (9.3)
Degenerative	31 (7.9)	27 (8.7)	58 (8.3)
Microtrauma	26 (6.6)	30 (9.6)	56 (8.0)
Other e.g.	18 (4.6)	13 (4.2)	31 (4.4)
Neoplastic	2 (0.5)	1 (0.3)	3 (0.4)
Non-traumatic	1 (0.3)	0 (0.0)	1 (0.1)
Vascular	0 (0.0)	0 (0.0)	0 (0.0)
Total	391 (100.0)	311 (100.0)	702 (100.0)

4.4.3 Diagnosis

In many cases the WSC clinicians gave more than two diagnoses, this led to several categories of diagnoses being formed. Due to the many different combinations of diagnoses made they were broken down into 13 categories based on the most common diagnosis found in the patient files, as seen in Table 4.6. Appendix K provides the actual individual diagnoses that make up each category. Irrespective of clinic site, the majority of patients were diagnosed with joint dysfunction which was normally associated with soft tissue disorders.

Table 4.6: Diagnosis of spinal pain patients attending the WSC clinics

Diagnosis	Urban n (%)	Rural n (%)	Total N (%)
Soft tissue disorder	63 (16.1)	65 (21.1)	128 (18.4)
Joint dysfunction	220 (56.4)	176 (57.1)	396 (56.7)
Discogenic	37 (9.5)	33 (10.6)	70 (10.0)
Discogenic radicular	19 (5.0)	8 (2.5)	27 (3.8)
Degenerative	23 (5.9)	16 (5.0)	39 (5.5)
Stenosis radicular	16 (4.3)	1 (0.3)	17 (2.3)
Rheumatological	1 (0.3)	1 (0.3)	2 (0.3)
Spinal cord compression, degenerative and discogenic radicular	0 (0.0)	2 (0.6)	2 (0.2)
Fracture	7 (1.9)	2 (0.6)	9 (1.2)
Infection	1 (0.3)	1 (0.3)	2 (0.2)
Peripheral nerve lesion	2 (0.6)	1 (0.3)	3 (0.3)
Other e.g. Bell's palsy	0 (0.0)	1 (0.3)	1 (0.1)
Cauda equina	1 (0.3)	1 (0.3)	2 (0.2)
Total	390 (100.0)	308 (100.0)	698 (100.0)

4.4.4 Pain duration

The number of patients attending the WSC clinics with chronic pain was high (88%, n = 712). A significant difference was found between the clinic location and pain duration ($p = 0.001$, Chi-squared test), with greater numbers of acute and subacute patients presenting to the rural clinic than the urban clinic.

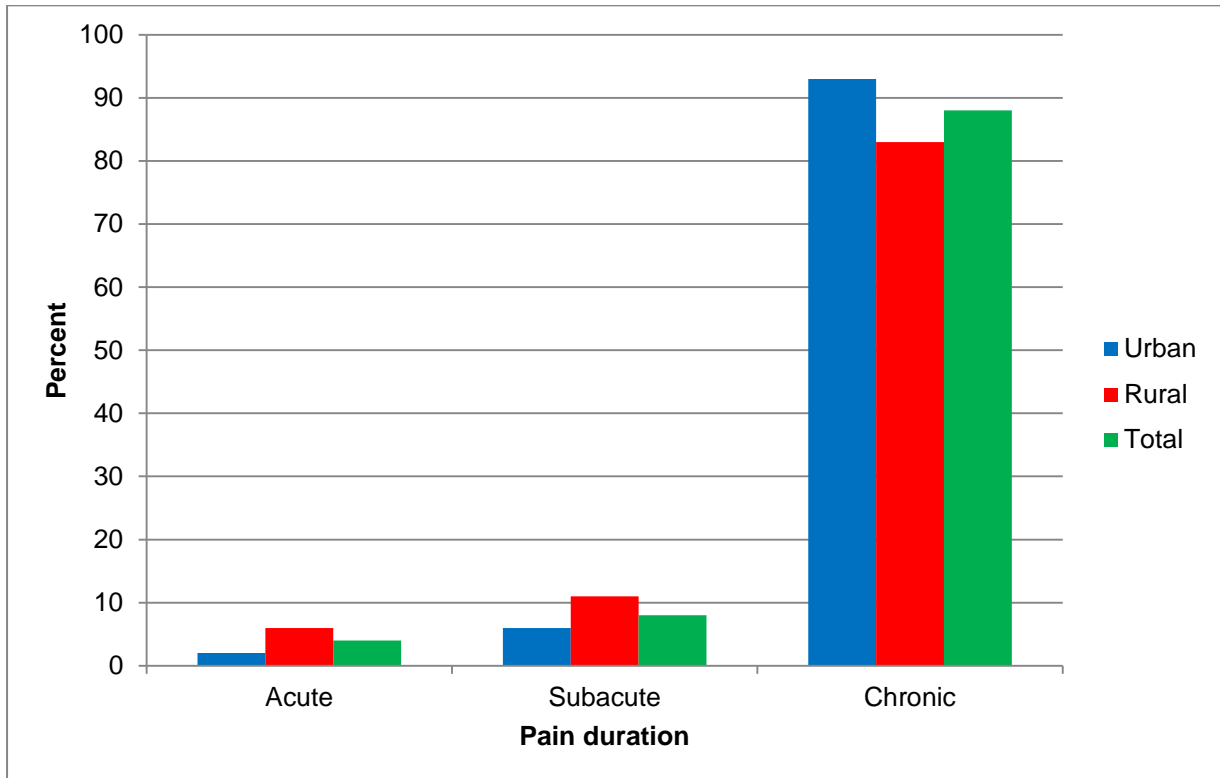


Figure 4.5: Pain duration of spinal pain patients attending the WSC urban (n=395) and rural (n=317) clinics

4.4.5 History of previous spinal pain

From the total population of spinal pain patients attending the WSC clinics (n=686), 60% did not report previous spinal pain. A significantly higher number of patients in the rural clinic reported previous spinal pain ($p < 0.001$, Chi-squared test), when compared to the urban clinic patients, as seen in Figure 4.6. Prior spinal pain was not always investigated over the time period at WSC Clinics. Yet of the 714 patient files included in this study, 686 files had history of previous spinal pain in the paperwork.

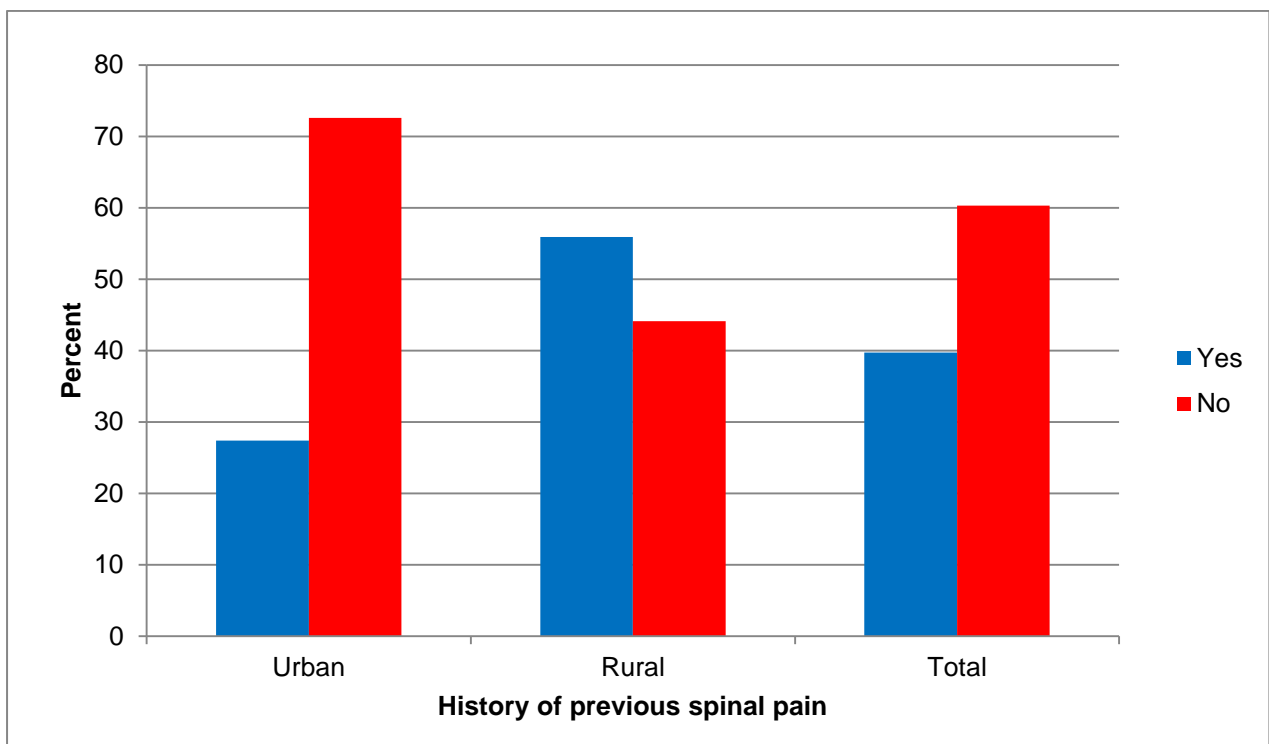


Figure 4.6: Previous history of spinal pain of spinal pain patients attending the WSC urban (n=391) and rural (n=295) clinics

4.4.6 Pain disability

The mean pain disability score for patients at the WCS clinics was 9/32 (n=435) which is low, indicating that patients experienced mild disability as a result of their pain. No significant difference was found between clinic location and pain disability ($p = 0.310$, t -test). The mean disability score of the rural and urban clinics are shown in Table 4.7.

Table 4.7: Pain disability (score out of 32) of spinal pain patients attending the WCS clinics

Location	N (%)	Mean	±SD	Maximum	Minimum
Urban	285 (63)	8.7	4.5	26.0	0.0
Rural	168 (37)	9.1	4.1	24.0	0.0
Total	453 (100)	8.8	4.4	26.0	0.0

4.4.7 Pain Intensity

The majority of patients attending the WCS Clinics reported moderate pain, with no significant difference ($p = > 0.05$, chi squared test) found between clinic locations, as seen in Table 4.8 (n=701).

Table 4.8: Pain intensity of spinal pain patients attending the WCS clinics

Pain intensity	Urban n (%)	Rural n (%)	Total N (%)
Mild	31 (7.9)	17 (5.5)	48 (6.8)
Moderate	258 (65.6)	200 (64.9)	458 (65.3)
Severe	104 (26.5)	91 (29.5)	195 (27.8)
Total	393 (100.0)	308 (100.0)	701 (100.0)

4.4.8 Secondary MSK complaint

Two thirds of the WCS clinic spinal pain patients reported concomitant pain in another area of their MSK system, with the upper/mid back followed by neck, knee and low back being the most commonly affected areas, as seen in Table 4.9 (n=710). No significance difference was found between and the rural and urban clinics.

Table 4.9: Secondary complaints of spinal pain patients attending the WSC clinics

Secondary complaint	Urban n (%)	Rural n (%)	Total N (%)
No Secondary complaint	115 (29.3)	88 (27.7)	203 (28.6)
Upper/mid back	73 (18.6)	48 (15.1)	121 (17.1)
Neck	54 (13.8)	39 (12.3)	93 (13.1)
Knee	47 (12.0)	36 (11.3)	83 (11.7)
Lower back	42 (10.7)	32 (10.1)	74 (10.4)
Shoulder	16 (4.1)	20 (6.3)	36 (5.1)
Hip	10 (2.6)	8 (2.5)	18 (2.5)
Ankle/Foot	9 (2.3)	8 (2.5)	17 (2.4)
Lower leg	2 (0.5)	12 (3.8)	14 (2.0)
Chest/Costal	1 (0.3)	8 (2.5)	9 (1.3)
Head	5 (1.3)	4 (1.3)	9 (1.3)
Thoracolumbar	5 (1.3)	1 (0.3)	6 (0.8)
Thigh	2 (0.5)	3 (0.9)	5 (0.7)
Upper arm	1 (0.3)	4 (1.3)	5 (0.7)
Other	4 (1.0)	1 (0.3)	5 (0.7)
Elbow	2 (0.5)	2 (0.6)	4 (0.6)
Hand/Wrist	3 (0.8)	1 (0.3)	4 (0.6)
Abdomen	1 (0.3)	1 (0.3)	2 (0.3)
Face/Jaw	0 (0.0)	1 (0.3)	1 (0.1)
Forearm	0 (0.0)	1 (0.3)	1 (0.1)
Total	392 (100.0)	318 (100.0)	710 (100.0)

4.5 Objective 3: To document the co-morbid conditions of the spinal pain patients attending the WSC clinics in Mahalapye and Shoshong.

4.5.1 Co-morbidities

Irrespective of clinic setting, over 95% of patients attending the WSC Clinics suffered from at least one co-morbid condition with up to five conditions being reported. Most patients (73.9%) only reported one co-morbidity, with very few reporting more than three, as seen in Table 4.10.

Table 4.10: Number of co-morbidities of spinal pain patients attending the WSC clinics

Number of co-morbidities	Urban n (%)	Rural n (%)	Total N (%)
None	14 (3.5)	13 (4.1)	27 (3.8)
One	297 (75.0)	231 (72.6)	528 (73.9)
Two	68 (17.2)	62 (19.5)	130 (18.2)
Three	14 (3.5)	10 (3.1)	24 (3.4)
Four	2 (0.5)	2 (0.6)	4 (0.6)
Five	1 (0.3)	0 (0.0)	1 (0.1)
Total	396 (100.0)	318 (100.0)	714 (100.0)

Figure 4.7 shows the common co-morbid conditions reported. Hypertension (32.8%), followed by HIV (16.1%), degenerative joint disease (9.1%) and diabetes (7.4%) were most commonly reported.

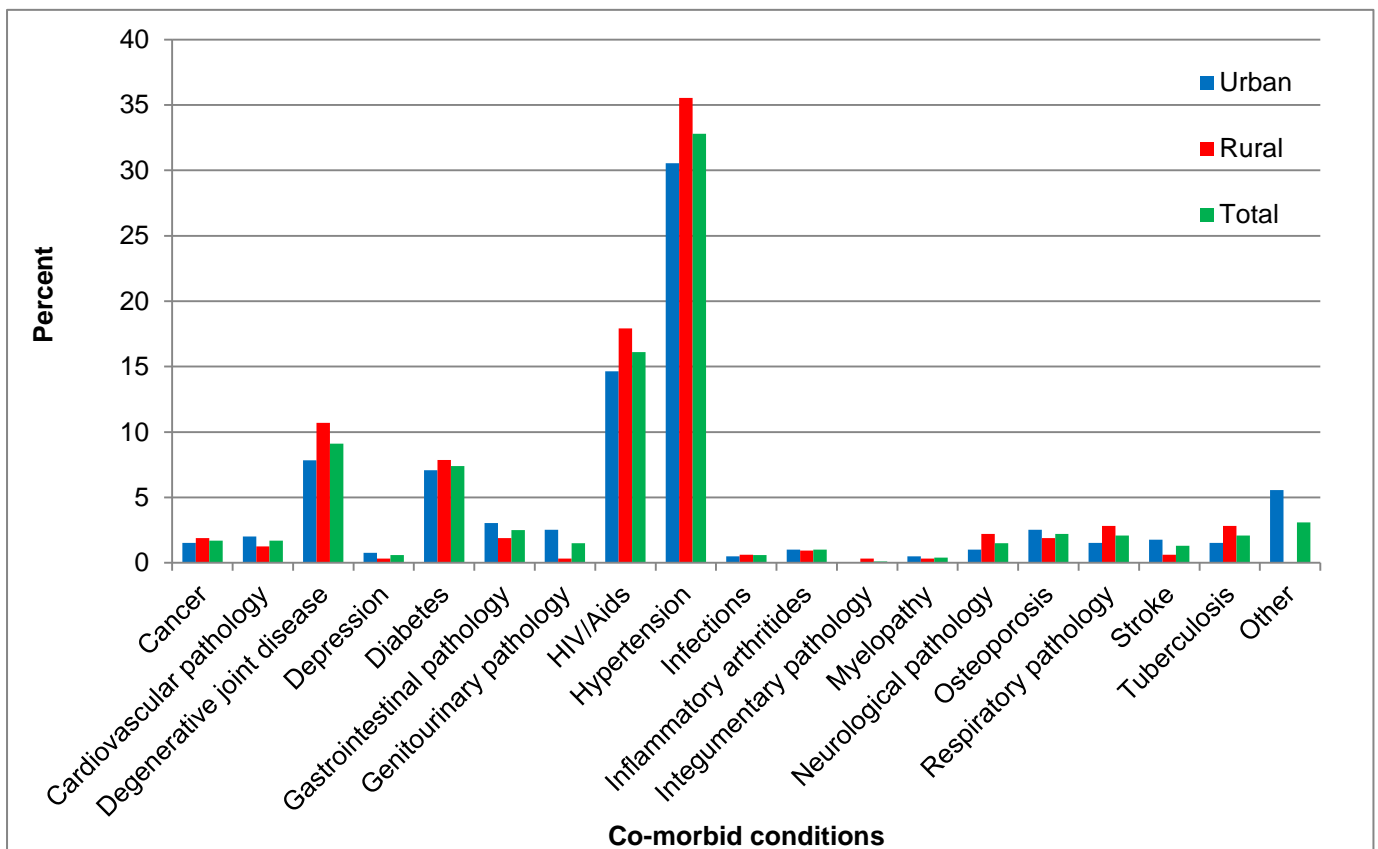


Figure 4.7: Presence of co-morbidities of spinal pain patients attending the WSC urban (n=396) and rural (n=318) clinics

4.6 Objective 4: To determine the relationship between presenting complaint of the spinal pain patients attending the WSC clinics in Mahalapye and Shoshong and age, gender, education, dominant activity and co-morbid conditions.

4.6.1 Presenting complaint compared to age

Appendix L shows that with increasing age the number of patients with spinal pain irrespective of area increased, then decreased after 70 years of age. Trends suggest that LBP occurred over a greater spectrum of age categories when compared to other spinal complaints. NP occurred between the ages of 40 – 70, TSP between the ages of 30 – 60 and LBP between the ages of 50 – 70. Overall the age group most affected by spinal pain was 30 – 70 years.

4.6.2 Presenting complaint compared to gender

Overall females (n=535) experienced more spinal pain than males (n=177) ($p = 0.009$, Fisher's Exact Test). Trends suggest that females were more likely to report LBP, head and sacrococcygeal pain than males, while males suffered more from neck and upper/mid back pain, as seen in Figure 4.8.

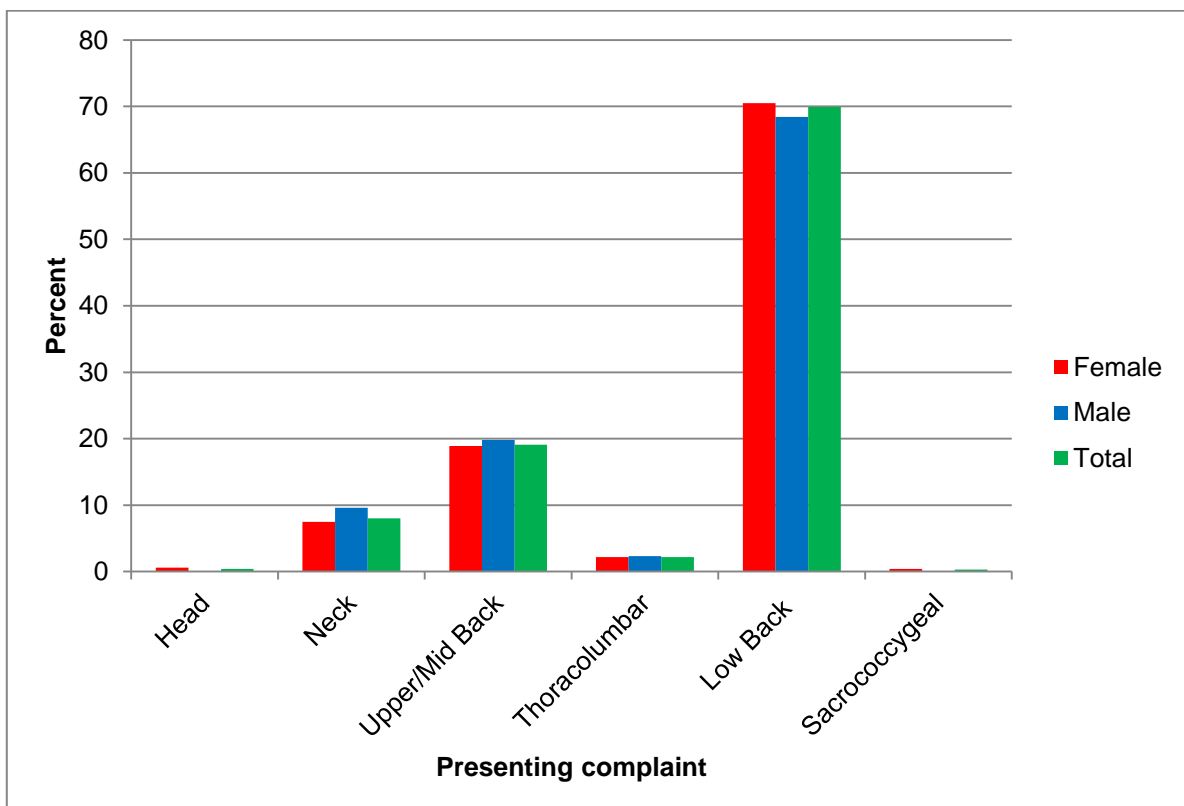


Figure 4.8: Presenting complaint compared to gender of spinal pain patients at the WSC clinics (n=712)

4.6.3 Presenting complaint compared to level of education

Trends suggest LBP and NP were related to a 'primary school level of education' compared to TSP which was more frequently reported with 'more than secondary level of education' as seen in Table 4.12 (Appendix M).

4.6.4 Presenting complaint compared to dominant activity

Trends suggest that manual labour activities were more likely to be associated with LBP and NP, whereas sitting correlated with upper/mid back and thoracolumbar pain. Walking was associated with pain in all spinal areas followed by standing as seen in Figure 4.9 (n=674).

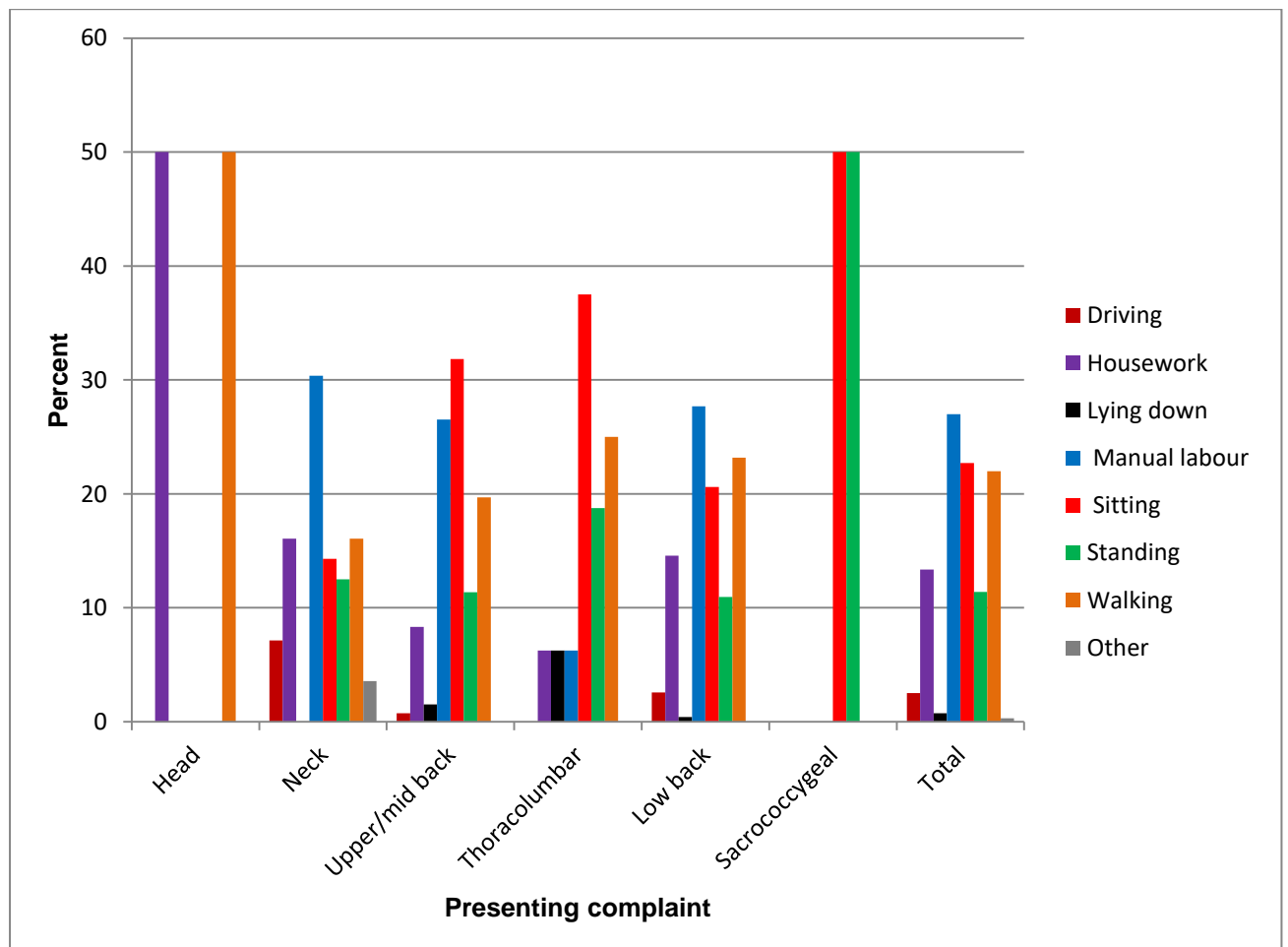


Figure 4.9: Presenting complaint compared to dominant activity of spinal pain patients at the WSC clinics (n=674)

4.6.5 Presenting complaint compared to the number of co-morbid conditions

Trends suggest that the number of co-morbid pathologies present in the patients were not associated with a specific spinal regional complaint in the patients attending the WSC clinics, as seen in Figure 4.10 (n=712). Irrespective of spinal region, the presence of one co-morbid condition was most commonly reported.

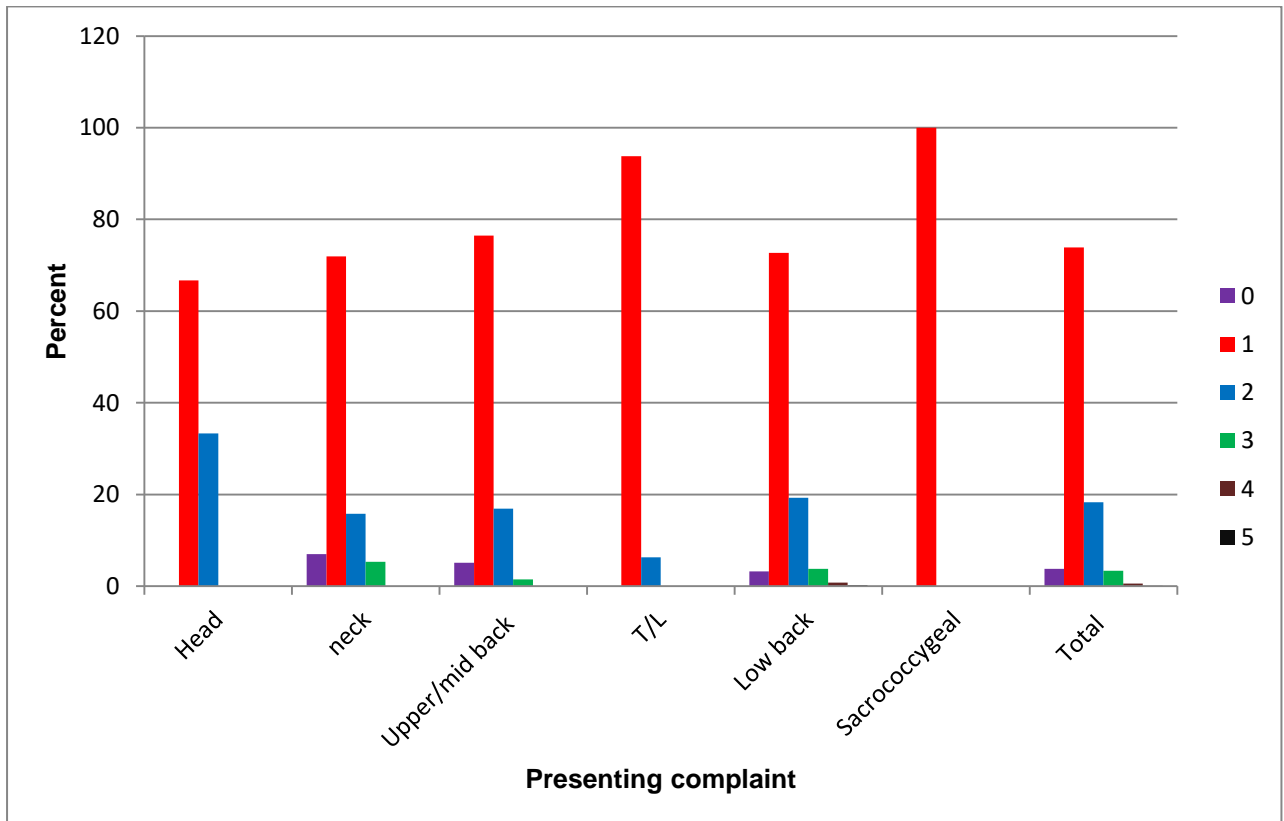


Figure 4.10: Presenting complaint compared to number of co-morbidities of spinal pain patients at the WSC clinics (n=712)

Chapter Five

Discussion

5.1 Introduction

This chapter will discuss the results in light of the aims and objectives of this study and in context of the available literature. It will start with a discussion of the number of files that could be included in the study followed by contextualisation of the results under each objective.

5.2 Sample size

The sample of patient files eligible for inclusion was 65% (n=714) of the total number of files at the Mahalapye and Shoshong clinics found between 1 November 2012 to 31 March 2016. The sample size used determines how well results can be generalised to the population as a whole (Levin, 2006). Lishchyna and Mior (2012) and Hitge (2014) conducted a clinical audit of chiropractic clinics which was similar to this study and had sample sizes of 89% (n=580) and 90% (n=117) respectively. The larger the sample the more accurate the results, as it ensures that the study is representative of the population. A sample size of more than 60% is considered good when conducting a patient file review according to Fincham, (2008). A sample of 65% obtained in this study can allow for extrapolations to be made for the broader population of patients seeking spinal care at the WSC Clinics in Mahalapye and Shoshong.

5.3 Objective 1: To determine the demographic profile of the spinal pain patients attending the WSC clinics in Mahalapye and Shoshong.

5.3.1 Age

Spinal pain is experienced across the life span of individuals (Lishchyna and Mior, 2012) and afflicts all ages, from adolescents to the elderly (Brooks, 2006; Rubin, 2007; Balague *et al.*, 2012). This was seen in this study where the youngest patient was five and the oldest, 96 years of age. Similar trends have been observed in studies on other chiropractic populations both internationally (Hartvigsen *et al.*, 2002; Giles *et al.*, 2002; Coulter and Shekelle 2005; Holt and Beck 2005; Mootz *et al.*, 2005; Sorensen *et al.*, 2006; Garner *et al.*, 2007; Stevens, 2007; Rubinstein *et al.*, 2008; Martinez *et al.*, 2009; Ailliet *et al.*, 2010; Lishchyna and Mior, 2012) and locally (Benjamin, 2007; Jaman, 2007; Mohamed, 2007; Venketsamy, 2007; Higgs, 2009; McDonald, 2012; Hitge, 2014). A curvilinear relationship related to age and spinal pain has been found, peaking between the ages of 40 and 60 then declining after the

age of 65 (Thomas, 2005; McBeth and Jones, 2007; Hoy *et al.*, 2010a; Balague *et al.*, 2012). This was supported by Carroll *et al.*, (2008) and Briggs *et al.*, (2009) where they found that people in the middle age groups suffered more from spinal pain. Similar trends were found in this study with the majority of patients, irrespective of the urban or rural WSC clinic setting was between the ages of 30 to 70 years. This age group is also the most economically productive, and may result in absenteeism and economic burden (Driscoll *et al.*, 2010).

The WSC clinics are accessible to pediatric/adolescent patients but very few pediatric/adolescent patients were in this study, which was similar to other studies in patients seeking care for spinal pain (McBeth and Jones, 2007; Carroll *et al.*, 2008). There has been under-reporting of spinal pain in adolescents (McBeth and Jones, 2007), and it has been found that younger people have a better recovery from pain compared with those aged 30 to 44 and 60 to 75 being twice as likely to seek spinal care and report continued spinal pain compared to the younger populations (Carroll *et al.*, 2008; Briggs *et al.*, 2009; Hoy *et al.*, 2010a). Back pain in childhood has been found to be a strong predictor of back pain in later life (Briggs *et al.*, 2009). WSC may want to explore why so few children were seen in the clinics and congenital causes of spinal pain in this age group. Additionally aim to improve education of the benefits of addressing spinal pain in children through initiating campaigns like "Straighten up Botswana" (www.straightenupamerica.org) or school presentations.

It has been reported that older patients (50+) have greater difficulties with living expenses, experience pain of longer durations, more frequently and of more complexity and had more health problems (Mathew, Chopra, Thekkemuriyil, George, Goyal and Nair, 2011). Increasing age is also associated with the loss of bone strength, muscle elasticity and tone; IVDs lose fluid and flexibility which decreases their ability to cushion the vertebrae, therefore leading to injury and pain (Cramer and Darby, 2005). In contrast, younger patients have been reported to experience more severe pain, be more financially strained and more often unemployed (Mathew *et al.*, 2011). Irrespective of age, the socioeconomic impact of pain affects both the individual and healthcare systems (Mathew *et al.*, 2011). Thus, ensuring that spinal pain patients receive adequate early treatment can prevent long term disability and the associated high costs (Brooks, 2006; Rubin, 2007). It is therefore necessary that clinicians working at healthcare settings like the WSC clinics in Botswana, need to be proficient in managing spinal pain in all age groups.

A study conducted by Clausen *et al.*, 2000 in Botswana, found that 71% (n=419) of Motswana over the age of 65 years did not seek assistance for their pain. Yet in this study, 31% of the patients were older than 60 years of age. Most societies have developed traditional cultural approaches to conceptualizing and handling pain (Monteiro and Tlhabano,

2014). In Shoshong, Botswana, most villagers (n=34) responded to questions related to their MSK pain as if no one had ever asked them and there was no evidence that they sought diagnostic meaning of their symptoms as MSK pain is attributed to the hard work associated with their everyday lives (Hondras *et al.*, 2016). Additionally, MSK disorders affected their independence to perform socially accepted traditional duties, such as fetching water and firewood, sweeping their yards, weeding, harvesting crops and building dwellings in the villages. Labour-intensive lifestyles exacerbate the consequences of physical ailments, making it important to understand the sociocultural value of hard work and traditional beliefs of a community in order to prevent and manage MSK pain (Hondras *et al.*, 2015b; Hondras *et al.*, 2016). Findings in this setting, although rooted in a specific cultural context, are likely transferrable to rural settings in other lower income countries such as India and Ghana where WSC have established similar clinics.

The average age of the patients at the WSC clinics was 51 years. This is similar to the average life expectancy for men and women in Botswana, which is 53 years (www.statsbots.org.bw, 2011). The average age of the patients consulting the WSC clinics was higher than that found in international (Hartvigsen *et al.*, 2002; Giles *et al.*, 2002; Coulter and Shekelle 2005; Holt and Beck, 2005; Mootz *et al.*, 2005; Sorensen *et al.*, 2006; Stevens, 2007; Martinez *et al.*, 2009; Ailliet *et al.*, 2010; Lishchyna and Mior, 2012) and local (Benjamin, 2007; Jaman, 2007; Mohamed, 2007; Venketsamy, 2007; Higgs, 2009; McDonald, 2012) studies investigating chiropractic patients. This may be due to the elderly population in Shoshong, as it is traditional in Tswana life for the elderly (over 60) to move back to the villages (Macdonald, 1996; Clausen *et al.*, 2000). The exception was Hitge (2014) who found the average age of patients to be 53 years of age, similar to this study. Hitge's (2014) study profiled patients seeking care at a free chiropractic community clinic in Ugu district Kwa-Zulu Natal, SA. This area is rural with the majority of patients being from a low socioeconomic bracket similar to the context within which the WSC clinics are situated. Additionally, other similarities between this study and Hitge (2014) were found; the patients were mostly married, females presenting with LBP, unemployed, with hypertension as the most commonly reported co-morbidity.

5.3.2 Gender

Spinal pain affects both genders yet most studies display a female preponderance similar to what was found in this setting (Wijnhoven *et al.*, 2006; Fejer *et al.*, 2006; Carroll *et al.*, 2008; Briggs *et al.*, 2009; Hoy *et al.*, 2010a; Lishchyna and Mior, 2012). Females have been found to be more willing to report illness, use alternative medicines and seek spinal care and thus use health services more often than males (Tatalias, 2006; Nakao *et al.*, 2011). A higher prevalence of self-reported pain among females may be due to differences in physical activity, MSK maturity, posture, endocrine and psychosocial characteristics as well as different physiological mechanisms for pain perception between genders (Briggs *et al.*, 2009).

When comparing the urban and rural clinics and gender, there were slightly more females visiting the rural clinic than males, yet there was an overwhelming majority of female visits irrespective of clinic site. The Botswana census (www.stasbots.org.bw, 2011) found that the ratio between females and males is roughly equal but females made up the majority of the elderly population of 55+ (Botswana Demographics Profile, 2016). Historically migration in Botswana, which is a normative and endemic feature of Tswana life (Macdonald, 1996; Ntseane, 2004; Hondras *et al.*, 2015a), has resulted in young men seeking work away from home, often in mines or the cities where employment opportunities were greater (Macdonald, 1996; Ntseane, 2004), leaving females to be at home with the children and the elderly. Many females who are unemployed in Botswana rely on manual labour and subsistence farming to survive (Sealetsa and Moalosi, 2014; www.gov.bw, 2016). It was found that approximately 25% of the adult male population was absent from their home villages at any one time in Botswana (Macdonald, 1996; Monteiro and Tlhabano, 2014).

Hondras *et al.*, (2015a) noted that in Botswana, some patients, mostly women and the young freely expressed their pain, in contrast to men and the elderly who were less vocal about their pain. This was similar to Clausen *et al.*, (2000) and would be supported by this study with the high number of female patients seeking care. In this study majority of patients (75.2%) were females between the ages of 40 to 60 years old and reported manual labour as either their occupation or dominant activity therefore they are at higher risk of MSK pain due to degeneration due to hormonal change and increasing age; hence, strategies focused on the male working populations to increase spinal health awareness will be beneficial for individuals, health systems and economic costs in Botswana.

5.3.3 Education

Level of education as a risk factor for spinal pain remains inconclusive; high and low levels of education have been associated with the presentation of spinal pain (Nyiendo *et al.*, 2001; Sorensen *et al.*, 2006; Coulter and Shekelle, 2005; Mahomed, 2007; Leclerc *et al.*, 2008, Hoy *et al.*, 2010a; Breivik *et al.*, 2013). A European survey conducted by Cimmino *et al.*, (2011), identified a low level of education as a risk factor for spinal pain whereas Wijnhoven *et al.*, (2006), in a general population of Dutch people, found that level of education was not associated with spinal pain. It has been reported that, patients with higher education levels seek care for spinal pain and tend to report more pain while lower educated groups report less; this may be due to a greater awareness of disease and access to health care amongst the higher educated populations (Dalstra *et al.*, 2005; Tatalias, 2006; Sorensen *et al.*, 2006) but yet in this study both groups were affected by spinal pain.

Botswana has a large low income population who lack access to resources and adequate services in hospitals and rural clinics (Ntseane, 2004). Most of the population lives in rural areas (40%) and in poverty (Sealetsa and Moalosi, 2014; Hondras *et al.*, 2015a). The WSC rural clinic patients generally had a primary school level of education or less in contrast to the urban clinic where the majority had secondary level of education or greater. According to the Botswana Demographic profile (2016), the average school life expectancy is 13 years. Currently, there are eighteen schools located in Mahalapye and six in Shoshong with only one secondary school, but forty years ago even less schools were established in these areas (Mahalapye Education Department, 2016). The patient-clinician encounters in cross-cultural settings increase the level of complexity related to healthcare communication (Hondras *et al.*, 2015b), especially in rural areas like Shoshong. In an attempt to bridge this gap, WSC has employed two Setswana and English speaking health care assistants to assist with the history taking of patients and to be available during the examination to reduce communication loss due to language barriers that may occur while using medical terminology that the patients may or may not be familiar with.

5.3.4 Occupation and dominant activity

Forty-seven percent of households in Botswana live below the poverty datum line (BIDPA), while the unemployment rate is at 23%. Poverty in rural areas pushes young people to move to urban areas to seek employment (Ntseane, 2004). Unemployment in the WSC patients was high irrespective of clinic location, similar to other studies done on patients attending public clinics with spinal pain, both internationally (Giles *et al.*, 2002) and in SA (Higgs, 2009).

Being unemployed, and thus having limited access to money, limits availability of access to a variety of good quality foods (Rubin, 2007). Poor nutrition may also exacerbate spinal pain as the body would not have access to the right nutrients to deal with inflammation and provide healing (Driscoll *et al.*, 2010). In this study a quarter of the patients reported manual labour as their dominant activity with approximately a fifth indicating that they were farmers. Certain occupations (Driscoll *et al.*, 2010) and dominant activities of an individual can affect their risk for developing spinal pain. Those exposed to 'heavy work' (Hoy *et al.*, 2010a) and repetitive motions are predisposed to developing spinal pain (Sellers, 2002; Hoy *et al.*, 2010a; Balague *et al.*, 2012).

The location of the WSC clinic influenced the occupation and dominant activities of the patients. Sedentary work like office work can lead to poor posture, NP and TSP (Hoy *et al.*, 2010c). More patients attending the urban clinic worked in offices (17%) and they appeared to sit and stand more compared to only 5% in the rural setting. The spinal pain patients attending the rural clinic reported farming (28%) as the most common occupation and manual labor/housework as dominant activities, indicating that the rural patients were more involved in activities requiring physical activity. In a study of the burden of MSK disorders in Shoshong (n=34), Hondras *et al.*, (2016) found that walking is the primary mode of transport and many participants reported walking as an aggravating factor for their MSK pain. A total of 22% of patients attending the WSC clinics reported walking as their dominant activity. The role of physical activity is difficult to quantify as under activity can lead to pain and too much activity can also result in pain (Driscoll *et al.*, 2010). Walking and/or cost of transportation could play a role in the number of patients attending the WSC clinics due to the amount of pain experienced or financial strain in relation to the distance needed to travel to the WSC clinics.

The results of the employed patients at the urban clinic were similar to results from studies of chiropractic patients in private practice settings where there was a higher level of non-manual/sedentary jobs (Giles *et al.*, 2002; Benjamin, 2007; Jaman, 2007; Mahomed, 2007;

Stevens, 2007; Venketsamy, 2007; Rubinstein *et al.*, 2008; Higgs, 2009; Martinez *et al.*, 2009; Ailliet *et al.*, 2010; McDonald, 2012; Hitge, 2014).

Desk jobs of a sedentary nature are linked to higher education and the development of NP and TSP (Fejer *et al.*, 2006; Rubin, 2007; Hoy *et al.*, 2010c) whereas jobs requiring manual labor, especially involving lifting, have been found to be associated with lower education and LBP (Hoy *et al.*, 2010b; Roffey *et al.*, 2010; Wai *et al.*, 2010). Interestingly in this study NP and LBP correlate with manual labour as the dominant activity. However, in most studies NP was associated with sitting (Sellers, 2002; Ferrari and Russell, 2003; Larsson *et al.*, 2007; Hoy *et al.*, 2010c). In this setting, manual labour may be associated with carrying firewood and water on their heads which contribute to the cause of NP (Sealetsa and Moalosi, 2014) and farming, which could lead to strain in the neck and upper extremity region.

In this study upper/mid back and thoracolumbar spinal pain were associated with a dominant activity of sitting. Prolonged poor posture, which can occur from sitting incorrectly and an incorrect ergonomic environment, increases the mechanical stressors on the spine and can lead to muscular irritation/joint dysfunction resulting in spinal pain (Sellers, 2002; Hoy *et al.*, 2010c). Prevention and education programmes surrounding work postures and correct ergonomic environment in rural areas should include psychosocial as well as ergonomic measures to improve the working conditions of those in manual labour and sedentary occupations in these communities.

5.3.5 Marital status

The role of marriage is a social support and married patients report significantly less stress related to finance and family situations whereas individuals who live alone or in social isolation are more likely to develop pain (Nakao *et al.*, 2011). Most of the spinal pain patients attending the WSC clinics were married (38%) which is similar to the findings of Coulter and Shekelle (2005) and Mahomed, (2007) although their studies were conducted in chiropractic private practice.

Twenty-seven percent of patients reported to be 'never married'. This may be due to the age of these patients or to cultural differences in Botswana such as the bride price or *bogadi*; married women are subject to their husband's authority concerning finance, land and housing, for example married women cannot have a personal bank account or a business without their husband's permission. Some Motswana may therefore avoid marriage (Macdonald, 1996). Additionally, in Botswana, it is deemed culturally acceptable for married men to have a concubine, thus women who have never been married or who have passed the suitable age for marriage may be living in these circumstances (Macdonald, 1996).

5.4 Objective 2: To compile a profile of spinal complaints of the spinal pain patients attending the WSC clinics in Mahalapye and Shoshong.

5.4.1 Presenting complaint and other areas of MSK complaint

LBP was the main reason for patients consulting the WSC clinics, irrespective of location, with similar findings being reported in both international (Hartvigsen *et al.*, 2002; Holt and Beck, 2005; Mootz *et al.*, 2005; Sorensen *et al.*, 2006; Garner *et al.*, 2007; Stevens, 2007; Martinez *et al.*, 2009; Ailliet *et al.*, 2010; Lishchyna and Mior, 2012) and local private and public chiropractic practices (Jaman, 2007; Higgs, 2009; McDonald, 2012; Hitge, 2014). LBP is a common problem that the majority of people will experience at some point in their life time (Hoy *et al.*, 2010b). It is a multifactorial disorder (Balague *et al.*, 2012); with its incidence being highest in the third decade, with the prevalence increasing until 60–65 years of age and then gradually decreasing (Krismer, 2007; Dagenais, Caro and Haldeman, 2008; Driscoll *et al.*, 2010; Hoy *et al.*, 2010b; DePalma *et al.*, 2011). This pattern was observed in the population investigated in this study.

Interestingly in this study the second most common site for reporting pain and having concomitant pain was the thoracic region. This is in contrast to all other studies reviewed where NP was the second most common site of complaint (Hartvigsen *et al.*, 2002; Holt and Beck, 2005; Mootz *et al.*, 2005; Sorensen *et al.*, 2006; Jaman, 2007; Garner *et al.*, 2007; Stevens, 2007; Higgs, 2009; Martinez *et al.*, 2009; Ailliet *et al.*, 2010; Lishchyna and Mior, 2012; McDonald, 2012; Hitge, 2014). TSP is often found as a result of postural strain or referred pain (Briggs *et al.*, 2009). There is a high level of obesity in Botswana (Harding, 2007) which can lead to altered posture and increased strain on the spinal structures. Unfortunately weight, height and body mass index could not be recorded as the data was not documented in most of the patient's files.

Low levels of literacy of the patients attending the WSC clinics, particularly at the Shoshong clinic, together with language barriers, and a lack of understanding of anatomical regions of the back and pain referral patterns may have resulted in the patients NP being recorded as upper back pain. Often, particularly with vague symptom presentation in combination with language barriers, discrepancies exist in translation between subjective expressions used by patients and the clinical terminology (Cohen, Luther and Hart, 2013; Swartz, Kilian, Twesigye and Chiliza, 2014).

Patients presenting with spinal pain often have concomitant MSK pain in other areas (Davis *et al.*, 2011), for example, osteoarthritis has been found to coexist with other conditions in

over 90% of patients (Bae *et al.*, 2015). This can lead to the individual being more susceptible to pain in other areas (Verdecchia *et al.*, 2010; Davis *et al.*, 2011; Bae *et al.*, 2015). When assessing concomitant MSK pain, there were more extremity patients at the rural clinic compared to the urban clinic which is consistent with findings from international studies (Rubinstein *et al.*, 2000; Hartvigsen *et al.*, 2002; Mootz *et al.* 2005; Holt and Beck 2005; Martinez *et al.*, 2009). The average age of patients at the Shoshong clinic (53 years) was slightly older than at the Mahalapye clinic (48 years). Older patients are more likely to suffer from osteoarthritis (Tsang *et al.*, 2008) as a co-morbid condition which would result in extremity pain, particularly of the weight-bearing joints such as the knees. Knee pain could also be exacerbated by manual labour (Chopra and Abdul-Nasser, 2008) which was a more prevalent dominant activity in the rural setting.

5.4.2 Aetiology and diagnosis

Spinal pain is an important clinical, social, economic and public health problem with many possible aetiologies (Manchikanti *et al.*, 2009). The majority of patients at the WSC Clinics presented with pain of idiopathic, mechanical origin. Which was supported by Hondras *et al.*, (2016b) who found that villagers in Shoshong (n=34) typically described MSK pain to be of idiopathic onset as opposed to any single event. The majority of cases ($\pm 90\%$) of spinal pain are idiopathic and non-specific in nature, which is defined as pain with no known underlying pathology or specific cause (Krismer, 2007; DePalma *et al.*, 2011). This is a common aetiology as any spinal structure can serve as the source of pain and is susceptible to disease and injury (DePalma *et al.*, 2011; Videman and Battie, 2012). Despite the high prevalence of spinal pain, it has been suggested that a specific aetiology of spinal pain can only be diagnosed in 10-15% of patients based on clinical examination (Manchikanti *et al.*, 2004).

Non-specific pain is characterised by pain, muscle tension or stiffness and will result in functional limitations (Krismer, 2007). Soft tissue disorders and joint dysfunction were the most common diagnoses, these findings were similar to Lishchyna and Mior, (2012) who reported common sprain and strains (92%) as the most common diagnosis at a public clinic in the USA and Hitge (2014) who reported general myofascitis as the second most common diagnosis after sacroiliac syndrome at a public clinic in SA.

Soft tissue disorders and joint dysfunctions often occur as a result of mechanical cumulative trauma and can affect the bones, muscles and their attachments, as well as nerves and blood supply (Cramer and Darby, 2005; Krismer, 2007; Balague *et al.*, 2012; Erick and Smith

2014). This can be caused by degeneration and arthritic joints which are a direct cause of pain around the joint or surrounding soft tissue (Timothy *et al.*, 2007). Facet joints may cause NP, TSP and LBP in 15 to 67% of patients (Manchikanti *et al.*, 2004). Joint dysfunction in the spine can occur with damage to the IVDs which can be caused by repetitive manual labour, obesity and posture resulting in discogenic pain (Hunter and Boon, 2004). Additionally, postural dysfunction or occupational factors may cause prolonged muscle contractions resulting in ischemia and pain (Hunter and Boon, 2004).

In this study, non-mechanical pain was in the minority. Less than 5% of the spinal pain patients consulting the WSC presented with non-mechanical/specific spinal pain relating to serious pathology. The volunteer clinicians at the WSC clinics thus far have been chiropractic practitioners. Chiropractors are trained as primary care practitioners and are well trained in the diagnosis and treatment of mechanical and non-mechanical spinal pain (www.worldspinecare.org). The rural clinic located in Shoshong, is a primary care centre for diagnosis, treatment and screening of spinal pain and other mechanical, non-mechanical pain or serious pathology; if a patient is identified as requiring more advanced care, they are referred to the secondary care centre at the urban clinic in Mahalapye, which has access to primary medical and surgical specialists. A further link to tertiary care has been created by WSC and the Botswana Ministry of Health; patients who require surgery are referred and transferred to the major teaching hospital in Gaborone, Princess Marina Hospital (www.worldspinecare.org/clinics/Botswana).

5.4.3 Pain duration and history of previous spinal pain

The majority of patients attending the WSC clinics suffered chronic pain (88%, n = 712). This is in contrast to many studies in developed countries like Denmark (Hartvigsen *et al.*, 2002; Sorensen *et al.*, 2006), Canada and the USA (Coulter and Shekelle, 2005) where the patients' presented in the acute phase. These studies were conducted at private practices where the average age of the patients was 40 years of age.

Chronic pain and its under-treatment place a substantial burden on individuals, employers, healthcare systems and society (Tsang *et al.*, 2008; Breivik *et al.*, 2013). Chronic pain decreases an individual's quality of life, interferes with ADLs and work while the economic costs include: loss of productivity and absenteeism (Breivik *et al.*, 2013), therefore it is a condition requiring specialized management. Chronic pain has been associated with increasing age, females, unemployment and manual labour (Tsang *et al.*, 2008; Raftery *et al.*, 2011; Breivik *et al.*, 2013). All these characteristics were a common finding in this study.

It has been reported that in developing countries, like Botswana, and lower socioeconomic settings that patients are more likely to present in the chronic phase of illness as they are unable to seek treatment earlier (Nicholas *et al.*, 2011; Balague *et al.*, 2012; Breivik *et al.*, 2013). Barriers to seeking early treatment may include lack of awareness and finances to pay for health care services or to be able to pay for transport to public clinics/hospitals (Ntseane, 2004; Bagwasi, 2006; Hondras *et al.*, 2016). Living in poverty would present more pressing needs that must be addressed such as communicable diseases (Caughey *et al.*, 2008) or the HIV/AIDS epidemics (www.gov.za/about-sa/health#HIV, 2016) which may make prioritising mechanical spinal pain a non-necessity.

Spinal pain, although originally thought to resolve on its own, has been found to have a recurrent, episodic nature which makes it difficult to study as large proportions of patients may report symptoms that resolve, only to experience them again in the future (McBeth and Jones, 2007). The rate of 1-year recurrence of spinal pain has been reported to range from 25% to 80% (Manchikanti *et al.*, 2009; Hancock *et al.*, 2015). The number of previous episodes has been shown to be a risk factor for recurrence and contributes to the chronicity of the condition (Nicholas *et al.*, 2011). Although some episodes recover within a few weeks, recurrences are common in the elderly and individuals with chronic spinal pain (Hayden *et al.*, 2010).

In Botswana, Erick and Smith, (2014) revealed that previous spinal pain was independently and significantly associated with LBP among teachers and was positively associated with pain and disability; teachers who reported prior injury were found to be two times more likely to report LBP in comparison to those who did not report prior injury. This may be attributed to the lack of health care in developing countries or rural areas compared to developed urban areas (Louw *et al.*, 2007). From this study, it was found that 60% of the WSC clinic spinal patients had not experienced previous spinal pain. This was unexpected due to the chronic nature and average age of the spinal pain patients attending the WSC Clinics. This may be due to an inconsistency in the paper work of including the question in the patients' history and a discrepancy in the definition of previous spinal pain.

5.4.4 Disability and intensity

Pain beliefs are known to be affected by factors such as culture, education, and health literacy, place of work, personal experience of pain and consequences of pain such as disability, and influenced by attitudes associated with the experience of pain (Helms and Barone, 2008; Campbell and Edwards, 2009; Briggs, 2010; Tan *et al.*, 2014). In addition, negative beliefs are associated with higher levels of pain and disability (Hems and Barone, 2008; Campbell and Edwards, 2009; Briggs, 2010). Disability of WSC spinal pain patients ranged from no disability to extreme disability experienced, therefore, the experience of pain and how it affects one's activities of daily living are different for each individual (Helms and Barone, 2008; Campbell and Edwards, 2009).

As reported by Manchikanti *et al.*, (2009) and Balague *et al.*, (2012), the relationship between pain and disability is not clear as some patients in this study had severe pain and no disability or no pain with severe disability. Thus, there is a need to understand complex cultural and psychosocial outcomes to effectively assess and manage spinal pain patients (Monteiro and Tlhabano, 2014; Hondras *et al.*, 2015a). In Botswana, teachers who reported LBP had mostly mild to moderate disability, with very few suffering severe disability (0.7-4.3%, n=1732) (Erick and Smith, 2014). In this study, patients reported mild disability levels indicating that they were still able to perform activities of daily living. Quantifying disability allows for clinicians to use this measure to determine patient improvements separately to pain.

The majority of patients (65%), whether at the urban or rural clinics, reported moderate pain intensity. Moderate to high levels of pain may result in fear-avoidance behaviour which suggests that individuals become fearful of pain and avoid any movement and activity that may provoke pain (Balague *et al.*, 2012). This may add to the socioeconomic burden of communities in this setting. Acknowledging and understanding pain intensity is important as pain is a substantial cause of impaired physical function (Mathew *et al.*, 2011). The physical, social, psychological and cultural influences and outcomes related to pain in Botswana are not well understood (Hondras *et al.*, 2015a). Understanding current health care use in Botswana, as well as the expectations about future care for MSK disorders will be important to develop and sustain health education and service models. The burden of MSK disorders in Shoshong has been found to be attributed to financial strain, family structure, physical labour and the loss of independence and social identity to fulfil significant traditional roles (Hondras *et al.*, 2016). WSC has emphasized a holistic approach to care for spinal disorders

in this underserved community in order to improve healthcare and address lifestyle issues in patient management.

5.5 Objective 3: To document the co-morbid conditions of the spinal pain patients attending the WSC Clinics in Mahalapye and Shoshong

Co-morbidities including psychological and physical conditions are common in spinal pain and add significant complexities to the physician's clinical task when addressing the patients' pain (Manchikanti *et al.*, 2004; Davis *et al.*, 2011). The people of Botswana, like other countries internationally and locally, suffer from the presence of multiple chronic diseases that have been associated with a decline in health outcomes, such as quality of life, mobility, functional ability and increase in hospitalisations, psychological distress, mortality and the use of health care resources (Fortin *et al.*, 2006; Woolf *et al.*, 2010).

Although much research has been done on the impact of chronic illness on quality of life, still relatively little is known about the role of co-morbidity (Caughey *et al.*, 2008). With a concomitant rise in the number of people living with multiple chronic diseases, especially the elderly, more information is needed on the effects of specific disease combinations for preventive purposes (Rijken *et al.*, 2005; Caughey *et al.*, 2008). Chronic diseases are the leading cause of illness and disability in those aged 65 years and older (Caughey *et al.*, 2008), as the number of concurrent medications increase, the risk of adverse drug events increases significantly. It has been estimated that the likelihood of an older person having an adverse drug reaction increases from 10% if one medication is taken, to 75% if five or more medications are used (Fortin *et al.*, 2006). When placed in this context, the need for a greater awareness from both the physician and patient of the importance of managing a patients' overall health status within the context of multiple diseases, rather than a single disease, needs to be stressed.

The majority of the spinal pain patients at the WSC clinics only reported the presence of one co-morbid condition. It is possible that co-morbid conditions were undiagnosed as the information is based on self-reports, and these patients may not have reported concurrent conditions (Dalstra *et al.*, 2005; McBeth and Jones, 2007; Breivik *et al.*, 2013). In this study, the most prevalent co-morbidities were hypertension (32.8%), followed by HIV (16.1%), and then degenerative joint disease (DJD) (9.1%). These findings were dissimilar to those reported in public clinics in the USA (Stevens, 2007) and SA (Jaman, 2007; Venketsamy, 2007; Higgs, 2009; Hitge, 2014) where HIV was not included in the top list of co-morbidities.

Raised blood pressure is the biggest single contributor to the global burden of disease and to global mortality (Poulter *et al.*, 2015). The development of hypertension has been associated with aging as blood pressure rises with age, excess intake of salt, increased calories intake, lack of physical exercise and alcohol consumption which are prevalent in Botswana as meat is preserved in salt due to lack of electricity and alcohol is consumed daily in most of the population (Macdonald, 1996; Clausen *et al.*, 2000). Preventive strategies are therefore needed in less developed countries as the prevalence of hypertension has increased especially in patients younger than expected (below 50) (Poulter *et al.*, 2015).

HIV/AIDS exacerbates and prolongs pain, increases healthcare usage/expenditures and the percentage of those living in poverty (UNAIDS, Botswana, 2008 (www.unaids.org)). Currently, 16% of the population in Botswana are living with HIV/AIDS, with prevalence in adults of 22%, with 78% of these adults on free antiretroviral (ARVs) treatment (Botswana Demographic Profile, 2016). In Botswana, HIV/AIDS has a significant impact on the economic productivity of the country by affecting the most productive age groups (MacDonald, 1996) causing loss of income for individuals and the overall loss of economic output (Gupta *et al.*, 2010). In this setting, agriculture is the largest sector accounting for a large portion of production and a majority of employment and many households rely on production from subsistence agriculture. HIV/AIDS and ARVs can cause several symptoms and side effects that may result in the development of spinal pain. Therefore, maintaining a healthy population is an important goal and is crucial to the development of a productive workforce essential for economic development.

Osteoarthritis (OA), although common in the elderly and in patients with physically demanding lifestyles (Rijken *et al.*, 2005; Verdecchia *et al.*, 2010; Bae *et al.*, 2015) and the growing burden of obesity in Botswana, was an unexpectedly low incidence in this study. This may be related to the aging process and under-reporting of OA as it is assumed normal with age (Hoy *et al.*, 2010a; Hondras *et al.*, 2016). Under or over-reporting of co-morbid conditions could potentially affect the results of this study as diagnoses and co-morbid conditions may overlap. Additionally, the prevalence and impact of combined MSK disorders are likely to vary between different ethnic communities, and, although disease patterns may be similar, several ill-defined aches and pains and soft-tissue disorders may be due to factors of occupational overuse, strenuous lifestyles, poor nutrition and the presence of co-morbid illnesses; these are potentially amenable to effective management (Chopra and Abdul-Nasser, 2008).

5.6 Conclusion

This study found that patients seeking spinal care at the WSC clinics in Mahalapye and Shoshong have many similarities and a few differences when compared to patient profiles both locally (Benjamin, 2007; Jaman, 2007; Mohamed, 2007; Venketsamy, 2007; Higgs, 2009; McDonald, 2012; Hitge, 2014) and internationally (Hartvigsen *et al.*, 2002; Giles *et al.*, 2002; Coulter and Shekelle, 2005; Holt and Beck, 2005; Mootz *et al.*, 2005; Sorensen *et al.*, 2006; Stevens, 2007; Martinez *et al.*, 2009; Ailliet *et al.*, 2010; Lishchyna and Mior, 2012). These results have been able to provide WSC with quantitative information that can aid further engagement with the community in Botswana and improve service delivery.

Chapter Six

Conclusion

6.1 Conclusion

Many of the patients attending the WSC clinics did so for spinal pain, indicating that like other countries, people of Botswana also suffer high levels of spinal pain. The patients were mostly married females over the age of 50 with chronic, idiopathic, mechanical LBP of moderate disability and intensity. The upper/mid back area was the second most reported area of spinal pain. The most common co-morbidity was hypertension. The diagnosis of joint dysfunction with soft tissue disorders of the spine was most often made, with the majority of the patients (60%) presenting with no history of previous spinal pain. The level of education, occupation and dominant activity of the patients was dependent on the clinic location.

The findings of this study had many similarities to those reported in chiropractic patients both globally (Hartvigsen *et al.*, 2002; Garner *et al.*, 2007; Stevens, 2007; Lischyna and Mior, 2012) and locally (Higgs, 2009; Hitge, 2014). Interesting differences were a higher average age of the patients attending the WSC clinics and that the TSP was the second most common complaint after LBP which is in contrast to most studies that report NP as the most prevalent secondary complaint. This study also showed that NP was associated with manual labour whereas other studies link NP to sedentary office work, both of which require further investigation.

Differences between the urban and rural clinic included age where the rural clinic patients were significantly older than those at the urban clinic. There was also a higher number of women attending the urban clinic compared to the rural clinic ($p = 0.009$). In the urban clinic the patients predominately had either a secondary level of schooling or higher, with office work being the main form of employment with sitting as the dominant activity. In the rural clinic, the patients mostly reported a primary school level education with farming being the main occupation and manual labour being the predominant activity. Dominant activity; was not researched in other chiropractic studies and is an important characteristic to include in order to understand the community and to create tailored preventative strategies to improve MSK health. A significantly higher number of the urban spinal patients had the aetiology "other mechanical" e.g. joint dysfunction ($p = 0.039$) when compared to the rural clinic. There was a significant difference in pain duration between the two clinics; acute and subacute patients presented to the rural clinic more than the urban clinic. Patients in the rural clinic experienced significantly more previous spinal pain than the urban clinic.

This was a descriptive study to investigate the demographic and disease profile of spinal pain patients attending the WSC clinics in Mahalapye and Shoshong, Botswana. This study was able to provide an understanding and add to a body of knowledge in terms of the characteristics of the patients that presented to these two public clinics in a developing country. This study highlighted that the most economically productive people were affected by spinal pain and that a large percentage had physically demanding lifestyles. The impact of spinal pain was worsened by advancing age, gender, education, dominant activity, and the presence of co-morbidities. Demographic and disease profiles of patients vary by clinical setting, from country to country, and within regions of the same country (Hoy *et al.*, 2010a). It is evident that the WSC clinics have assisted the local populace to access spinal health care which previously was not available, thus enhancing the health and wellbeing of these communities. The information from this study can assist WSC together with the government of Botswana to further facilitate health initiatives focused on education of spinal pain and health programmes.

6.2 Recommendations from this study

6.2.1 Recommendations for WSC

Obtaining additional information from the patients – the clinic forms could include a section related to assets, income brackets, dwelling type for a better understanding of the patient's socio-economic status which would allow for a more detail of the context in which these patients exist. Although there was an option for weight and height in the clinic paperwork it was not always collected and as a result was not included in this study.

The WSC should consider running educational programmes targeted at managing and preventing health disorders specifically targeting the common comorbidities identified in this study. Additionally, the initiation of educational programmes targeted at scholars and adults, about spinal pain to increase awareness and provide mechanisms to reduce the burden of spinal pain in the region. Campaigns like 'Straighten up SA' can be adapted to suit the Tswana people.

A substantial number of patients presented with chronic pain. WSC clinics could implement forms for disability grants in their paper work and specialized management programmes to assist patients with improving loss of productivity, work, ADLs and quality of life.

Using the information gained in this study about occupation and dominant activity can aid the WSC to develop more specific intervention strategies and educational programmes for

preventative management, with emphasis on ergonomic education, in order to decrease the economic burden and to improve the collective health status of the community in Mahalapye and Shoshong.

6.2.2 Recommendations for future research

1. Epidemiological studies into spinal pain and the common co-morbidities identified in this study may provide unique factors that would further aid management of these conditions in this setting.
2. The WSC paperwork is extensive and there were many other aspects of spinal care that could be investigated. Examples include assessing the management strategies utilised at the clinics and their effect on spinal pain, the relationship between the presentation of 'yellow flags' and prognosis of treatment.
3. Qualitative studies assessing the patient's perceptions of the WSC and the treatment that they received would further assist the WSC to determine their impact in the local community.
4. Investigations into the knowledge, perception and utilisation of the WSC by the local population and 'buy-in' from local health practitioners would further facilitate the role of WSC in providing care to Tswana people.

6.3 Limitations

This study was conducted retrospectively, where the patient files at the WSC clinics in Mahalapye and Shoshong were used to extract data relevant to this study. The validity of the data relied on the accuracy of the clinical information from the patients being recorded appropriately at the time of their consultation (Baumgartner *et al.*, 2002; Polgar and Thomas 2008).

The clinicians working at the WSC clinics undergo training prior to starting work and thus far have all been chiropractic healthcare professionals. It is possible that language barriers between patients and clinicians and social and cultural concepts of spinal pain could have been lost in translation. Recall bias and self-reporting of pain, may also decrease the validity of the data as it is unclear if patients understood and remembered information pertaining to their pain experienced.

References

- Ailliet, L., Rubinstein, S.M., and Henrica, C. 2010. Characteristics of Chiropractors and their patients in Belgium. *Journal of Manipulative and Physiological Therapeutics*, volume 33, (issue 8): pages 618-625.
- Ataguba, J.E., Akazili, J., and McIntyre, D. 2011. Socio-economic-related health inequality in South Africa: evidence from General Household Surveys. *International Journal for Equity in Health* 2011, 10:48.
- Azevedo, L.F., Costa-Pereira, A., Mendonça, L., Dias, C.C., and Castro-Lopes, J.M. 2012. Epidemiology of chronic Pain: a population-based nationwide study on its prevalence, characteristics and associated disability in Portugal. *Journal of Pain* 13:773–783
- Bae, Y.H., Shin, J.S., Lee, J., Kim, M., Park, K.B., Cho, J.H., and Ha, I.H. 2015. Association between Hypertension and the Prevalence of Low back Pain and Osteoarthritis in Koreans: A Cross-Sectional Study. *PLOS ONE*. DOI:10.1371/journal.pone.0138790.
- Bagwasi, M. 2006. The role of language in adult education and poverty reduction in Botswana. *Review of education (2006)* 52.333-341.
- Balague, F., Mannion, A.F., Pellise, F., and Cedraschi, C. 2012. Non-specific low back pain. *Lancet* 2012; 379: 482-91.
- Baumgartner, T.A., Strong, C.H., and Hensley, L.D. 2002. *Conducting and reading research in health and human performance*. 3rd ed. New York: McGraw-Hill.
- Benjamin, R.L. 2007. A retrospective cross sectional survey of thoracic cases on record at Durban University of technology Chiropractic day clinic. MTech: Chiropractic, Durban University of Technology, South Africa.
- Bergmann, T.F., and Peterson, D.H. 2011. *Chiropractic Technique – Principles and Procedures*. 3rd ed. USA: Mosby-Elsevier.
- Bertozzi, M., Tyler, E., and Piot, P. 2009. The Evolving HIV/AIDS Response and the Urgent Tasks Ahead. *Health affairs. ProQuest Central* 28, 6; pg. 1578.
- Breivik, H., Eisenberg, E., and O'Brien, T. 2013. The individual and societal burden of chronic pain in Europe: the case for strategic prioritisation and action to improve knowledge and availability of appropriate care. *BMC Public Health*, 13: 1229.
- Brink, H. *Fundamentals of research methodology for health care practitioners*. 2007. 2nd edition. Junta and Co. Cape Town.

- Briggs, A.M., Smith, A.J., Straker, L.M., and Bragge, P. 2009. Thoracic spine pain in the general population: Prevalence, incidence and associated factors in children, adolescents and adults. *BMC musculoskeletal disorders*, 10:77.
- Briggs, E. 2010. Assessment and expansion of pain. Nursing standard. *Art and Science*, 10:25 Page 35.
- Brooks, M. 2006. The burden of musculoskeletal disease – a global perspective. *Clinical rheumatology*, Volume 25, Issue 6, pp 778-781.
- Campbell, C.M., and Edwards, R.R. 2009. Mind-body interactions in pain: the neurophysiology of anxious and catastrophic pain-related thoughts. *American college of Rheumatology*. 1931-5244.
- Carroll, L.J., Hogg-Johnson, S., van der Velde, G., Haldeman, S., Holm, L.W., Carragee, E.J., Hurwitz, E.L., Côté, P., Nordin, M., Peloso, P.M., Guzman, J., and Cassidy J.D. 2008. Course and prognostic factors for neck pain in the general population. *European spine journal*, 17: S75-S82
- Caughey, G.E., Vitry, A.I., Gilbert, A.L., and Roughead, E.E. 2008. Prevalence of comorbidity of chronic diseases in Australia. *BMC Public Health*, 8:221
- Chaisson, R.E., and Martinson, N.A. 2008. Tuberculosis in Africa – combating an HIV driven crisis. *N Engl J Med*; 358:1089-1092.
- Chartier, S.R, Thompson, M.L, Longo, G, Fealk, M.N, Majuta, L.A, Mantyh, P.W. 2014. Exuberant sprouting of sensory and sympathetic nerve fibers in nonhealed bone fractures and the generation and maintenance of chronic skeletal pain. *Pain 2014*, 155: 2323-2336.
- Chopra, A., and Abdul-Nasser, A. 2008. Epidemiology of rheumatic musculoskeletal disorders in the developing world. *Best practice and research clinical rheumatology*. Vol. 22, No. 4, pp. 583-604, 2008.
- Cimmino, M.A., Ferrone, C., and Cutolo, M. 2011. Generalised musculoskeletal problems. *Best practice and research clinical rheumatology*. Volume 25, Issue 2, Pages 173-183.
- Clausen, F., Sandberg, E., Ingstad, B., and Hjortdahl, P. 2000. Morbidity and health care utilisation among elderly people in Mmankgodi village, Botswana. *J Epidemiology Community Health* 2000; 54:58–63.
- Cohen, H.K.S, Luther, A and Hart, C.A. 2013. Confusing medical terms: disease that may or may not exist. *QJM 2013*; 106: 617_21.
- Costa-Black, K.M., Loisel, P., Anema, J.R., and Pransky, G. 2010. Back pain and work. *Best Practice & Research Clinical Rheumatology*, 24 (2010) 227–240.

Cote, P., Cassidy, D.J., and Carroll, L. 2003. The epidemiology of neck pain: what we have learned from our population-based studies. *J Can Chiropractic Association* 2003; 47.4.

Coulter, I.D. and Shekelle, P.G. 2005. Chiropractic in North America: A descriptive analysis. *Journal of Manipulative and physiological therapeutics*, 28(2): 83-89.

Cramer, G.D. and Darby, S.A. 2005. *Basic and Clinical Anatomy of the Spine, Spinal Cord and ANS*. Mosby. ISBN: 0801664675.

Dagenais, S., Caro, J., and Haldeman, S. 2008. A systematic review of low back pain cost of illness studies in the United States and internationally. *The spine journal* 8 (2008) 8-20.

Dagenais S and Haldeman S, 2012. *Evidence-Based Management of Low Back Pain*. 1st ed. Elsevier Mosby, USA.

Dalstra, J.A.A., Kunst, A.E., Borrell, C., Breeze, E., Cambols, E., Costa, G., Geurts, J.J.M., Lahelma, E., Van Oyen, H., Rasmussen, K.K., Regidor, E., Spadea, T., and Mackenback, J.P. 2005. Socioeconomic differences in the prevalence of common chronic diseases: an overview of eight European countries. *International Journal of Epidemiology* 2005; 34:316–326.

Davis, J.A., Robinson, R.L., Le, T.K., and Xie, J. 2011. Incidence and impact of pain conditions and comorbid illnesses. *Journal of pain research*. 2011:4 331-345.

DePalma, M.J., Ketchum, J.M., and Saullo, T. 2011. What is the source of chronic low back pain and does age play a role? *Pain medicine* 2011; 12:224-233.

Driscoll, T., Jacklyn, G., Orchard, J., Passmore, E., Vos, t., Freedman, G., Lim, S., and Punnett, L. 2010. The global burden of occupationally related low back pain: estimates from the Global Burden of Disease 2010 study. *Ann Rheum Dis* 2014; 73:975–981.

Dyer, B. 2012. An epidemiological investigation of low back pain in the white population of the greater eThekweni metropolitan area. MTech: Chiropractic. Durban University of Technology. South Africa.

Erick, P.N., and Smith, D.R. 2014. Low back pain among school teachers in Botswana, prevalence and risk factors. *BMC musculoskeletal disorders* 2014, 15:359.

Fejer, R., Kyvik, K.O., and Hartvigsen, J. 2006. The prevalence of neck pain in the world population: a systematic critical review of the literature. *European Spine Journal*. June 2006, Volume 15, Issue 6, pp 834-848.

Fernández-de-las-Peñas C, Hernández-Barrera V, Alonso-Blanco C, Palacios-Ceña D, Carrasco-Garrido P, Jiménez-Sánchez S, Jiménez-García R (2011) Prevalence of neck and low back pain in community-dwelling adults in Spain: a population-based national study. *Spine* 36:E213–E219

Ferrari, R., and Russell, A.S. 2003. Neck pain. *Best Practice & Research Clinical Rheumatology* Vol. 17, No. 1, pp. 57–70, 2003 doi:10.1053/yberh.2003.269.

Fincham, J.E. 2008. Response rates and responsiveness for surveys, standards and the journal. *American Journal of Pharmaceutical Education*, 2008; 72 (2) Article 43.

Fortin, M., Bravo, G., Hudon, C., Lapointe, L., Almirall, J., Dubois, M.F., and Vanasse, A. 2006. Relationship between multimorbidity and health-related quality of life of patients in primary care. *Quality of life research*. February 2006, Volume 15, Issue 1, pp 83-91. Springerlink.

Frost, C.O., Hanse, R.R., and Heegaard, A.M. 2016. Bone pain: current and future treatments. *Elsevier Ltd*. <http://dx.doi.org/10.1016/j.coph.2016.02.007> 1471-4892/#.

Gallan, J.L. and Ognibene, F.P. 2012. *Principles and practice of clinical research*. 3rd ed. Elsevier San Diego, California.

Galukande M, Muwazi S, Mugisa D. 2005. Aetiology of low back pain: Mulago Hospital, Uganda. *African Health Sciences* 2005, 5(2):164-167.

Garner, M.J., Aker, P., Balon, J., Moher, D., Keenan, D., and Manga, P. 2007. Chiropractic care of musculoskeletal disorders in a unique population within Canadian community health centres. DOI: <http://dx.doi.org/10.1016/j.jmpt.2007.01.009>

Geisser, M.E., Cano, A., and Leonard, M.T. 2005. Factors associated with marital satisfaction and mood among spouses with chronic back pain. *The Journal of Pain*, Vol 6, No 8 (August), 2005: pp 518-525.

Giles, L.G.F., Muller, R. and Winter, G.J. 2002. Patient satisfaction, characteristics, radiology, and complications associated with attending a specialized government-funded multidisciplinary spinal pain unit. *Journal of Manipulative and Physiological Therapeutics*. 26(5):293-299.

Guez, M.; Hildingsson, C.; Nilsson, M. and Toolanen, G. 2002. The prevalence of neck pain: a population based study of Northern Sweden. *Acta orthop Scand*, 73(4):455-9.

Gupta, R., Dandu, M., Packel, L., Rutherford, G., Leiter, K., Phaladze, N., Percy-de Korte, F., Iacopino, V., and Weiser, S.D. 2010. Depression and HIV in Botswana: A population-Based study on Gender specific socioeconomic and behavioural correlates. *PLoS One*. Dec 2010, Volume 5, Issue 12, e14252.

Gunnarsdottir S, Ward SE, Serlin RC (2010) A population based study of the prevalence of pain in Iceland. *Scandinavian Journal of Pain* 1:151–157

Haldeman, S. 2005. *Principles and Practice of Chiropractic* (3rd ed). USA:McGraw-Hill.

Haldeman, S., Nordin, M., Outerbridge, G., Hurwitz, E.L., Hondras, M., Brady, O., Kopansky-Giles, D., and Ford, T. 2015. Creating a sustainable model of spine care in underserved communities: The World Spine Care (WSC) charity. *The Spine Journal: Official Journal of the North American Spine Society* (2015). DOI: 10.1016/j.spinee.2015.06.046

Hancock, M.J., Maher, C.M., Petocz, P., Lin, C.W.C., Steffens, D., Luque-Suarez, A., and Magnussen, J.S. 2015. Risk factors for the recurrence of low back pain. *Elsevier. The Spine Journal* 12 (2015) 2360-2368.

Harding, G. 2007. Back, chest and abdominal pain. *Musculoskeletal medicine. Australian family physician* Vol. 36. No. 6.

Hartvigsen, J., Sorenson, L.P., Graesborg, K., and Grunnet-Nilsson, N. 2002. Chiropractic patients in Denmark: A short description of basic characteristics. *Journal of manipulative and Physiological Therapeutics*, Volume 25, Issue 3, March-April 2002, pages 162-167.

Hayden, J.A., Dunn, K.M., van der Windt, D.A., and Shaw, W.S. 2010. What is the prognosis of back pain? *Elsevier. Best practice and research clinical rheumatology* 24 (2010) 167-179.

Helms, J.E., and Barone, C.P. 2008. Physiology and treatment of pain. *Continuing Education. Critical care nurse* Vol 28, No.6, and December 2008. <http://ccn.aacnjournals.org>

Higgs, M. 2009. A demographic and descriptive survey of chiropractic patients at the chiropractic clinic at Kimberly public hospital complex. MTech: Chiropractic, Durban University of Technology. South Africa.

Hitge, C. 2014. Patients at Marburg Haven Clinic: A demographic and disease profile. MTech: Chiropractic, Durban University of Technology. South Africa.

Hockenberry, M.J and Wilson, D. 2013. *Wong's essentials of pediatric nursing*. 9th edition. St. Louis, MO: Elsevier Mosby.

Holt, K., and Beck, R. 2005. Chiropractic patients presenting to the New Zealand College of Chiropractic Teaching Clinic: A short description of patients and patients' complaints. *Chiropractic journal of Australia*. Volume 35, Issue 4 (Dec 2005).

- Hondras, M., Myburgh, C., Hartvigsen, J., Haldeman, S., and Johannessen, H. 2015a. How can we assess the burden of muscle, bone and joint conditions in rural Botswana: context and methods for the MuBoJo focused ethnography. *Chiropractic and manual therapies* (2015) 23:11. BioMed Central.
- Hondras, M., Myburgh, C., Hartvigsen, J. and Johannessen, H. 2015b. *Botlhoko, botlhoko!* How people talk about their musculoskeletal complaints in rural Botswana: a focused ethnography. *Global Health Action*, 8: 29010.
- Hondras, M., Hartvigsen, J., Myburgh, C. and Johannessen, H. 2016. Everyday burden of musculoskeletal conditions among villagers in rural Botswana: A focused ethnography. *Journal of rehabilitative medicine* 2016; 48: 449-455.
- Hosseinpour, A.R., Bergen, N., Kunst, A., Harper, S., Guthold, R., Rekve, D., d'Espaignet, E.T., Naidoo, N., and Chatterji, S. 2012. Socioeconomic inequalities in risk factors for non-communicable diseases in low-income and middle-income countries: results from the World Health Survey. *BMC Public health*. 2012, 12:912. BioMed central.
- Hoy, D.G., Protani, M., De, R., and Buchbinder, R. 2010c. The epidemiology of neck pain. *Best practice and research clinical rheumatology* 24 (2010) 783-792. Elsevier 6.
- Hoy, D.G., March, L., Brooks, P., Woolf, A., Blyth, F., Vos, T., and Buchbinder, R. 2010a. Measuring the global burden of low back pain. *Best practice and research clinical rheumatology* 24 (2010) 155-165. Elsevier 1.
- Hoy, D.G., Brooks, P., Blyth, F., and Buchbinder, R. 2010b. The epidemiology of low back pain. *Best practice and research clinical rheumatology* 24 (2010) 769-781. Elsevier 5.
- Hunter, J.A.A. and Boon, N.A., 2004. *Davidsons Principals and Practice of Medicine*. 18th ed. Churchill Livingstone. UK,
- Jaman, R. 2007. A retrospective cross-sectional survey of lumbo-sacral cases recorded at the DUT chiropractic day clinic (1995-2005). MTech: Chiropractic, Durban university of Technology. South Africa.
- Jeffries, L.J, Milanese, S.F, Grimmer-Somers, K.A. 2007. Epidemiology of adolescent spinal pain: a systematic overview of the research literature. *Spine* 2007 Nov 1;32(23):2630–7.
- Johnson, C. 2005. On the subject of human subjects. *Journal of manipulative therapeutics*, 28: 79-80.
- Kopansky-Giles, D., Vernon, H., Steiman, I., Tibbles, A., Decina, P., Goldin, J., and Kelly, M. 2007. Collaborative community-based teaching clinics at the Canadian memorial Chiropractic College: Addressing the needs of local poor communities. *Journal of manipulative and Physiological Therapeutics*. Volume 30, Number 8.

- Krismer, M., and van Tulder, M. 2007. Low back pain (non-specific). *Best practice and research clinical rheumatology*. Vol. 21, No. 1, pp 77-91, 2007. Elsevier 5.
- Kurita GP, Sjögren P, Juel K, Højsted J, Ekholm O. 2012. The burden of chronic pain: a cross-sectional survey focussing on diseases, immigration, and opioid use. *Pain* 153:2332–2338.
- Larsson, B., Björk, J., Börsbo, B., and Gerdle, B. 2012. A systematic review of risk factors associated with transitioning from regional musculoskeletal pain to chronic widespread pain. *European pain journal* 16 (2012) 1084–1093.
- Leclerc, A., Gourmelen, J., Chastang, J.F., Plouvier, S., Niedhammer, I., and Lanoë, J.L. 2008. Level of education and back pain in France: the role of demographic, lifestyle and physical work factors. *Int Arch Occup Environ Health* (2009) 82:643–652.
- Levin, K.A. 2006. Study design III: Cross-sectional studies. *Evidence based dentistry (2006)*, 7, 24-25.
- Lishchyna, N., and Mior, S. 2012. Demographic and clinical characteristics of new patients presenting to a community teaching clinic. *The journal of Chiropractic education*. Vol. 26. No. 2, 2012.
- Livingstone, J. 2006. Insights from African history of disability. *Radical history review* 2006; 94: 111-26.
- Lopez, A.D., Mathers, C.D., Ezzati, M., Jamison, D.T., and Murray, C.J.L. 2001. Global and regional burden of disease and risk factors, 2001: systematic analysis of population health data. *Lancet* 2006: vol. 367: 1747-57.
- Louw, Q.A., Morris, L.D., and Grimmer-Somers, K. 2007. The prevalence of low back pain in Africa: a systematic review. *BMC musculoskeletal disorders* 2007, 8:105.
- Lozana-Ondoua, A.N., Symons-Liguori, A.M. and Vanderah, T.W. 2013. Cancer-induced bone pain: Mechanisms and Models. Elsevier: Neuroscience letters.
- MacLean, S., Chambers, C., and Clarke, A. 2010. Back Pain. *ABC of Spinal disorders*. Chapter 5, Back pain, pages 19-21.
- Macdonald, D.S. 1996. Notes on the socio-economic and cultural factors influencing the transmission of HIV in Botswana. *Soc Sci. Med.* Vol. 42, No.9, pp. 1325-1333.
- Mahalapye Education Department, 2016. Personal Communication with Candice Armstrong.
- Mahomed, F. 2007. Chiropractic patients in South Africa: A demographic and descriptive profile. M.Tech: Chiropractic, Durban University of Technology. South Africa.

- Manchikanti, L., Boswell, M.V., Singh, V., Pampati, V., Damron, K.S., and Beyer, C.D. 2004. Prevalence of facet joint pain in chronic spinal pain of cervical, thoracic and lumbar regions. *BMC musculoskeletal disorders*. 2004, 5;15.
- Manchikanti, L., Singh, V., Datta, S., Cohe, S.P., and Hirsch, J.A. 2009. Comprehensive review of epidemiology, scope, and impact of spinal pain. *Pain physician* 2009, 12 (4): E35-70.
- Martinez, D.A., Rupert, R.L., and Ndetan, H.T. 2009. A demographic and epidemiological study of a Mexican chiropractic college public clinic. *Chiropractic and Osteopathy* 2009, 17:4. BioMed central.
- Mathew, A.J., Chopra, A., Thekkemuriyil, D.V., George, E., Goyal, V., and Nair, J.B. 2011. Impact of musculoskeletal pain on physical dysfunction and health-related quality of life in a rural community in south India: A WHO-ILAR-COPCORD-BJD India Study. *Clinical rheumatology* (2011) 30:1491-1497.
- McBeth, J., and Jones, K. 2007. Epidemiology of chronic musculoskeletal pain. *Best practice and research clinical rheumatology*. Vol. 21, No. 3, pp. 403-425, 2007. Elsevier 2.
- McDonald, M.L. 2012. Demographic characteristics of patients attending DUT Chiropractic day Clinic: A comparison of trends between 1994 and 2011. M.Tech: Chiropractic, Durban University of Technology. South Africa.
- Monteiro, N., and Tlhabano, K. 2014. Treating pain in Botswana: Exploring Doctors' perspectives on patient experiences. University of Botswana.
- Moore, K.L. and Dalley, A.F. 2010. *Clinically orientated anatomy*. 4th ed. Lippincott Williams and Wilkins, Baltimore, Maryland, USA.
- Mootz, R.D., Cherkin, D.C., Odegard, C.E., Eisenberg, D.M., Barassi, J.P., and Deyo, R.A. 2005. Characteristics of chiropractic practitioners, patients, and encounters in Massachusetts and Arizona. *Journal of Manipulative and Physiological Therapeutics*, 28: 645-653.
- Morris CE, 2006. *Low Back Syndromes: Integrated Clinical Management*. U.S.A. The McGraw - Hill Companies, Inc.
- Muchna, J.M. 2011. An epidemiological investigation into the risk factors associated with neck pain in the Indian population in the greater Durban area. M.Tech: Chiropractic, Durban University of Technology.
- Nakao, M., Fricchione, G., Zuttermeister, P.C., Myers, p., Barsky, .J., and Benson, H. 2011. Effects of gender and marital status on somatic symptoms of patients attending a mind/body medicine clinic. *ProQuest Central Volume* 26, 4, pg. 159.
- Nicholas, M.K., Linton, S.J., Watson, P.J., Main, C.J and the "Decade of the Flags" Working Group. 2011. Early identification and management of psychological risk factors ("yellow flags") in patients with low back pain: A reappraisal. *Physical therapy journal*, Volume 91, Number 5.

Ndlovu, P.Z. 2006. A case-control study investigating factors associated with neck pain in the indigenous African population in the greater Durban area. M:Tech: Chiropractic, Durban Institute of Technology, South Africa.

Ntseane, P.G. 2004. Addressing poverty, unemployment and gender inequality in Southern Africa: An alternative strategy for HIV/AIDS prevention with sex workers in Botswana. *ProQuest Central* 37, 4; pg.9.

Nyiendo, J., Haas, M., Goldberg, B. and Sexton, G. 2001. Pain, disability, and satisfaction outcomes and predictors of outcomes: A practice-based study of chronic low back pain patients attending primary care and Chiropractic physicians. *Journal of manipulative and physiological therapeutics*, 24(7): 433-439.

Outerbridge, G. 2016. World Spine Care. Personal Communication with Candice Armstrong.

Polgar, S. and Thomas, S.A. 2008. *Introduction to research in the health sciences*. 5th ed. UK: Churchill Livingstone

Poulter, N.R., Prabhakaran, D., and Caulfield, M. 2015. Hypertension. *Lancet* 2015; 386: 801-812.

Rafferty, M.N, Sarma, K., Murphy, A.W, De la Harpe, D., Normand, C., McGuire, B.E. 2011. Chronic pain in the Republic of Ireland – community prevalence, psychosocial profile and predictors of pain-related disability: results from the Prevalence, Impact and Cost of Chronic Pain (PRIME) study, part 1. *Pain* 152:1096–1103.

Rijken, M., van Kerkhof, M., Dekker, J., and Schellevis, F.G. 2005. Comorbidity of chronic diseases. *Quality of life research*. 2005. Volume 14, Issue 1, pp 45-55.

Roffey, D.M., Wai, E.K., Bishop, P., and Dagenais, S. 2010. Causal assessment of occupational sitting and low back pain: results of a systematic review. *Spine journal*. 2010; 10(3):252-261.

Rubin, D.I. 2007. Neck and back pain: epidemiology and risk factors for spine pain. *Neurologic clinics* 2007; Volume 25, Issue 2, pages 353-371. Elsevier.

Rubinstein, S., Pfeifle, C.E., van Tulder, M.W. and Assendelft, W.J.J. 2000. Chiropractic Patients in the Netherlands: A descriptive Study. *Journal of Manipulative and Physiological Therapeutics*, 23(8): 557-563.

Rubinstein, S., Leboeuf-Yde, C. And Pfeifle, C. 2008. Predictors of a favourable outcome in Patients treated by Chiropractors for neck pain. *Spine*, 33(13): 1451-1458.

- Schneider, S., Lipinski, S., and Schiltewolf, M. 2006. Occupations associated with high risk of self-reported back pain: representative outcomes of back pain prevalence study in the Federal Republic of Germany. *European Spine Journal*, 15:821-833.
- Sealetsa, O.J., and Moalosi, R. 2014. A survey of musculoskeletal disorder prevalence in the Kiln Brick Moulding Industry in Botswana. University of Botswana. *Ergonomics journal 2014*, S4:010.
- Sell, P., and Longworth, S. 2010. Clinical assessment of the patient with back pain. *ABC of spinal disorders*. Chapter one. Pages 1-2. BMJ Books.
- Sellers, J.M. 2002. *Governing from below: Urban regions and the global economy*. Cambridge University Press. U.K.
- Shaik, J. 2014. Clinical Chiropractic IV. Pathological and arthritic diseases of the bone and spine. Chiropractic, Durban University of Technology, South Africa.
- Singh, D. 2016. Durban University of Technology. Personal Communication with Candice Armstrong.
- Slabbert, W.N. 2010. An epidemiological investigation of neck pain in the white population in the greater Durban area. M: Tech Chiropractic, Durban University of Technology, South Africa.
- Sorensen, L.P., Stochkendahl, M.J., Hartvigsen, J., and Grunnet-Nilsson, N. 2006. Chiropractic patients in Denmark 2002: An expanded description and comparison with 1999 survey. *Journal of manipulative and Physiological therapeutics*. Volume 29, issue 6, 2006, pages 419-424.
- Stedman's *Medical Dictionary for the Health Professions and Nursing*, 2005. 5th edition. Baltimore: Williams and Wilkins.
- Stevens, G.L. 2007. Demographic and referral analysis of a free chiropractic clinic servicing ethnic minorities in the Buffalo, NY area. *Journal of manipulative and physiological therapeutics*. Volume 30, Issue 8, 2007, pages 573-577.
- Standring, S. 2008. *Gray's Anatomy: the anatomical basis for clinical practice*. 4 ed. Churchill Livingstone / Elsevier, Edinburgh, Scotland.
- Swartz L, Kilian S, Twesigye J, Attah D, Chiliza B. 2014. Language, culture, and task shifting - an emerging challenge for global mental health. *Glob Health Action 2014*; 7: 23433.
- Tan, B.K., Smith, A.J., O'Sullivan, P.B., Chen, G., Burnett, A.F., and Briggs, A.M. 2014. Low back pain beliefs are associated to age, location of work, education and pain-related disability in Chinese healthcare professionals working in China: a cross sectional survey. *BMC musculoskeletal disorders 2014*, 15:255.

Taloyan, M., and Lofvander, M. 2013. Depression and gender differences among younger immigrant patients on sick leave due to chronic back pain: a primary care study. *Primary health care research and development* 2014, 15: 5-14.

Tatalias, J.A. 2006. A prospective, epidemiological pilot study to investigate the level of knowledge of homeopathy and its contextualization in health shops in the Gauteng area. MTech: Homeopathy, Durban University of Technology, South Africa.

Thomas, S. 2005. Zygapophyseal Joints and Low Back Pain. www.spineuniverse.com/article1898. Accessed December 2015.

Timothy, J., Foley, E., Comer, C., Barron, D., Sloan, J., and Shilliday, H. 2007. Soft tissue injuries: 3. Paraspinal. Soft tissue series. *Emergency medicine journal* 2008; 25:514-521.

Tsang, A., Von Korff, M., Lee, S., Alonso, J., Karam, E., Angermeyer, M.C., Borges, G.L.G., Bromet, E.J., de Girolamo, G., de Graaf, R., Gureje, O., Lepine, J.P., Haro, J.M., Levinson, D., Oakley Brown, M.A., Posada-Villa, J., Seedat, S., and Watanabe, M. 2008. Common chronic pain conditions in developed and developing countries: Gender and age differences and comorbidity with depression-anxiety disorders. *The journal of Pain*. DOI: <http://dx.doi.org/10.1016/j.jpain.2008.05.005>

Van Zyl, S., van der Merwe, L.J., Walsh, C.M., van Rooyen, F.C., van Wyk, H.J., and Groenewald, A.J. 2010. A risk-factor profile for chronic lifestyle diseases in three rural Free State towns. South African family practice. 2078-6204 Journal homepage: <http://www.tandfonline.com/loi/ojfp20>

Venketsamy, Y. 2007. A retrospective cross-sectional survey of cervical cases recorded at the Durban University of Technology Chiropractic day clinic (1995-2005). M: Tech chiropractic, Durban University of Technology, South Africa.

Verdecchia, P., Angeli, F., Mazzota, G., Martire, P., Garofoli, M., Gentile, G., and Reboldi, G. 2010. Treatment strategies for osteoarthritis patients with pain and hypertension. *Therapeutic advances in musculoskeletal disease* 2010; 2(4) 229-240.

Vereckei, E., Susanszky, E., Kopp, M., Ratko, I., Czimbalmos, A., Nagy, Z., Palkonyai, E., Hodinka, L., Temesvari, P.I., Kiss, E., Toro, K., and Poor, G. 2011. Psychosocial, educational, and somatic factors in chronic nonspecific low back pain. *Rheumatology international* (2013) 33:587-592.

Videman, T., and Battie, M.C. 2012. Back pain epidemiology – the challenge of case definition and developing new ideas. *The spine journal* 12 (2012) 71-72. Elsevier.

Wai, E.K., Roffey, D.M., Bishop, p., Kwon, B.K., and Dagenais, S. 2010. Causal assessment of occupational lifting and low back pain: results of a systematic review. *Spine journal*, 2010 June; 10(6):554-566. Elsevier.

Webb, R., Brammah, T., Lunt, M., Urwin, M., Allison, T., and Symmons, D. 2003. Prevalence and predictors of intense, chronic and disabling neck and back pain in the UK general population. *Spine journal* 2003. Volume 28, Issue 11, pp 1195-1202.

Widanarko, B., Legg, S., Stevenson, M., Devereux, J., Eng, A., Mannetje, A., Cheng, S., Douwes, J., Ellison-Loschmann, L., McLean, D., and Pearce, N. 2011. Prevalence of musculoskeletal symptoms in relation to gender, age and occupational/industrial group. *International journal of industrial ergonomics* 41 (2011) 561-572. Elsevier.

Wijnhoven, h., de Vet, H.C., Picavet, H., and Susan, J. 2006. Prevalence of musculoskeletal disorders is systemically higher in women than in men. *Clinical journal of pain*, 2006. Volume 22, issue 8, pp 717-724.

Woolf, A.D., Vos, T., and March, L. 2010. How to measure the impact of musculoskeletal conditions. *Best practice and research clinical rheumatology* 24 (2010) 723-732. Elsevier 1.

World Spine Care. 2016. World Spine Care Clinical User Guide (unpublished guide).

World Wide Web pages:

www.who.afro.int (Accessed October, 2016)

www.aidsinfo.nih.gov/education-materials (Accessed November, 2016)

www.bjdonline.org/the-back/ (Accessed August, 2016)

www.emedicinehealth.com/medical-dictionary-definitions (Accessed October, 2016).

www.gov.bw (Accessed September, 2016)

www.gov.za/about-sa/health#hiv (Accessed November, 2016)

www.indexmundi.com/botswana/demographics_profile.html (Accessed August, 2016)

www.library.dut.ac.za (Accessed September, 2016).

www.straightenupamerica.org (Accessed January, 2017).

www.unaids.org/en/regionscountries.botswana UNAIDS, Botswana, 2008 (Accessed January, 2017).

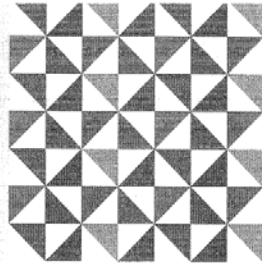
www.unicef.org/infobycountry/botswana_statistics. (Accessed August, 2016)

www.webmd.com/hypertension-high-blood-pressure/guide (Accessed November, 2016).

www.statsbots.org.bw (Accessed August, 2016)

www.worldspinecare.org/clinics/Botswana (Accessed December, 2016)

Appendix A - Institutional Research Ethics Committee (IREC) full approval of proposal



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

13 June 2016

IREC Reference Number: **REC 53/16**

Ms C Armstrong
42 Inverness
49 South Ridge Road
Berea
Durban
4001

Dear Ms Armstrong

A profile of patients presenting with spinal pain at Mahalapye and Shoshong World Spine Care clinics in Botswana

The Institutional Research Ethics Committee acknowledges receipt of your final data collection tool for review.

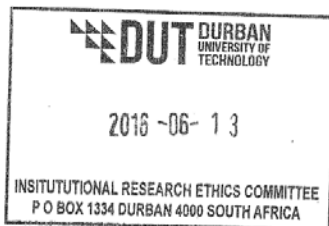
We are pleased to inform you that the questionnaire has been APPROVED; you may now proceed with data collection on the proposed project.

Kindly ensure that participants used for the pilot study are not part of the main study.

Yours Sincerely



Professor J K Adam
Chairperson: IREC



Appendix B - World Spine Care (WSC) approval



To: Candice Armstrong

42 4th floor, Inverness, 49 South Ridge Road, Berea Durban

4001 South Africa

From: Margareta Nordin Dr. Med. Sci. World Spine Care (WSC)

Reference: Research Project (WSC)

Date: September 8, 2015

Dear Candice,

Thank you for a very nice presentation on August 25 2015 for the World Spine Care Research Committee. The Committee voted unanimously to approve your project:

"A profile of patients presenting with spinal pain at Mahalapye and Shoshong World Spine Care clinics in Botswana."

The committee needs the following from you:

- 1) A written proposal in the format requested from your university/school; and
- 2) Prior to commencing the research, a copy of the approval from your university/school institutional review board or research ethics committee.

Eric Hurwitz and Margareta Nordin are assigned to your project from the committee. We would expect you to participate in a question and answer session at a subsequent research committee meeting after you have submitted the proposal to us. Please submit proposal by e-mail to me.

Please contact Eric Hurwitz (ehurwitz@hawaii.edu) or me with any questions by e-mail.

Sincerely,

Margareta Nordin Dr. Med. Sci.



Co-Chair World Spine Care Research Committee

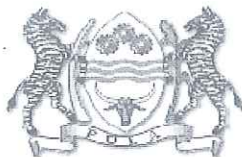
Mail: margareta.nordin@nyu.edu

Skype: margareta.nordin111

Cc. E. Hurwitz, O. Brady, S. Haldeman, G. Outerbridge

Appendix C - Botswana Ministry of Health (MoH) approval

TELEPHONE: 363 2766
FAX: 391 0647
TELEGRAMS: RABONGAKA
TELEX: 2818 CARE BD



MINISTRY OF HEALTH
PRIVATE BAG 0038
GABORONE

Republic of Botswana

REFERENCE NO: HPDME 13/18/1 X (580)

17 June 2016

Health Research and Development Division

Notification of IRB Review: **New application**

Ms. Candice Armstrong
Flat 42, Inverness
49 South Ridge Road
Berea, Durban
KZN

Protocol Title:

**A PROFILE OF PATIENTS PRESENTING WITH
SPINAL PAIN AT MAHALAPYE AND SHOSHONG
WORLD SPINE CARE CLINICS IN BOTSWANA
(AS PART OF; WORLD SPINE CARE – CONSENT FOR
ONGOING DATA COLLECTION IN BOTSWANA
CLINICS)**

HRU Approval Date: 17 June 2016
HRU Expiration Date: 16 June 2017
HRU Review Type: HRU reviewed
HRU Review Determination: Approved
Risk Determination: Minimal risk

Dear Ms. Armstrong

Thank you for submitting new application for the above referenced protocol. The permission is granted to conduct the study.

This permit does not however give you authority to collect data from the selected sites without prior approval from the management. Consent from the identified individuals should be obtained at all times.

The research should be conducted as outlined in the approved proposal. Any changes to the approved proposal must be submitted to the Health Research and Development Division in the Ministry of Health for consideration and approval.

Furthermore, you are requested to submit at least one hardcopy and an electronic copy of the report to the Health Research, Ministry of Health within 3 months of completion of the study. Approval is for academic fulfillment only. Copies should also be submitted to all other relevant authorities.

Continuing Review

In order to continue work on this study (including data analysis) beyond the expiry date, submit a Continuing Review Form for Approval at least three (3) months prior to the protocol's expiration date. The Continuing Review Form can be obtained from the Health Research Division Office (HRDD), Office No. 7A.7 or Ministry of Health website: www.moh.gov.bw or can be requested via e-mail from Mr. Kgomotso Motlhanka, e-mail address: kgmmotlhanka@gov.bw As a courtesy, the HRDD will send you a reminder email about eight (8) weeks before the lapse date, but failure to receive it does not affect your responsibility to submit a timely Continuing Report form

Amendments

During the approval period, if you propose any change to the protocol such as its funding source, recruiting materials, or consent documents, you must seek HRDC approval before implementing it. Please summarize the proposed change and the rationale for it in the amendment form available from the Health Research Division Office (HRDD), Office No. 7A 7 or Ministry of Health website: www.moh.gov.bw or can be requested via e-mail from Mr. Kgomotso Motlhanka, e-mail address: kgmmotlhanka@gov.bw . In addition submit three copies of an updated version of your original protocol application showing all proposed changes in bold or "track changes".

Reporting

Other events which must be reported promptly in writing to the HRDC include:

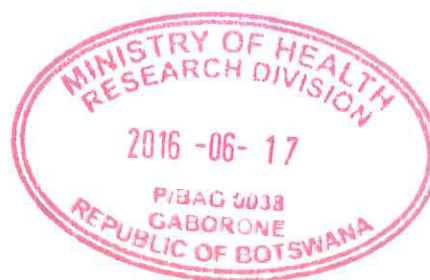
- Suspension or termination of the protocol by you or the grantor
- Unexpected problems involving risk to subjects or others
- Adverse events, including unanticipated or anticipated but severe physical harm to subjects.

If you have any questions please do not hesitate to contact Mr. P. Khulumani at pkhulumani@gov.bw, Tel +267-3914467 or Lemphi Moremi at lamoremi@gov.bw or Tel: +267-3632754. Thank you for your cooperation and your commitment to the protection of human subjects in research.

Yours faithfully



P. Khulumani
For /Permanent Secretary



MINISTRY of HEALTH

Vision: *A Model of Excellence in Quality Health Services.*

Values: *Botho, Equity, Timeliness, Customer Focus, Teamwork.*



Appendix D (I) – Pre Pilot Data Collection Sheet

File code							
Research consent	Yes		No				
Demographics							
Date of Birth				Age:	Years		
Sex	Education			Occupation			
Female (1)		< Primary (1)		Retired (1)			
Male (2)		Primary (2)		Unemployed (2)			
Ethnicity		Jr Secondary (3)		Student (3)			
Black (1)		Sr Secondary (4)		Farmer (4)			
Coloured (2)		> Secondary (5)		Office work (5)			
Indian (3)		Dominant activity			Fishing (6)		
White (4)		Manual labour:1		Labourer (7)			
Other specify		Housework:2		Housework (8)			
Missing		Driving:3		Driver (9)			
Marital Status		Sitting:4		Teacher (10)			
Never married (1)		Standing:5		Health Care (11)			
Married (2)		Fishing (on a boat):6		Police (12)			
Living together (3)		Walking:7		Military (13)			
Separated (4)		Cycling:8		Other professional (14)			
Divorced (5)		Other:9		Service (15)			
Widowed (6)					Not working due to pain (16)		
Missing (7)					Other (17)		
Related to Main Complaint							
Aetiology	Specific diagnosis			Primary pain location		Secondary pain location	
Traumatic:1		Discogenic:1		No Pain:1		No Secondary:1	
Non-Traumatic:2		Joint dysfunction:2		Face/jaw:2		Face/jaw:2	
Neoplastic:3		Soft tissue disorder:3		Head:3		Head:3	
Vascular:4		Discogenic radicular:4		Neck:4		Neck:4	
Pain duration		Stenosis radicular:5		Upper/mid-back:5		Upper/mid-back:5	
<2 days:1		Peripheral nerve lesion:6		Thoracolumbar:6		Thoracolumbar:6	
<1 month:2		Cauda Equina:7		Lower back/pelvis:7		Lower back/pelvis:7	
1 - 3 months:3		Rheumatological:8		Sacrococcygeal:8		Sacrococcygeal:8	
4 - 6 months:4		Fracture:9		Chest:9		Chest:9	
7 - 12 months:5		SC compression:10		Non-regional:10		Non-regional:10	
>1 year:6		Infection:11		Co-morbidity			
Pain Disability		Tumor:12		Cancer:1		High BP:9	
Mild		Organic referred:13		OP:2		Stroke:10	
Moderate		Other Neuro:14		Steroids:3		Depression:11	
Severe					Diabetes:4		Myelopathy:12
Pain Intensity					HIV/Aids:5		Radiculopathy:13
Mild					Infections:6		High BP:9
Moderate					Lung Pathology:7		Stroke:10
Severe					Heart Pathology:8		Depression:11

Appendix D (II) – Post Pilot Data Collection Sheet

FILE					
CONSENT					
DOA					
SECTION A: DEMOGRAPHICS					
A1: AGE					
A2: SEX		A5: DOMINANT ACTIVITY		A6: OCCUPATION	
Female	1	Cycling	1	Driver	1
Male	2	Driving	2	Farmer	2
Missing	99	Fishing (on a boat)	3	Fishing	3
		Housework	4	Health Care	4
A3: MARITAL STATUS		Lying down	5	Housework	5
Single	1	Manual labour	6	Labourer	6
Never married	2	Sitting	7	Military	7
Married	3	Standing	8	Not working due to pain	8
Living together	4	Walking	9	Office work	9
Separated	5	Other	10	Other professional	10
Divorced	6	Missing	99	Police	11
Widowed	7			Retired	12
Missing	99			Service (Waiter, salesperson, mechanic, gardener)	13
				Student	14
A4: EDUCATION				Teacher	15
< Primary	1			Unemployed	16
Primary	2			Other	17
Jr Secondary	3			Missing	99
Sr Secondary	4				
> Secondary	5				

SECTION B: RELATED TO MAIN COMPLAINT							
B1: AETIOLOGY		B5: PAIN INTENSITY		B7: PRESENTING COMPLAINT		B8: SECONDARY COMPLAINT	
Degenerative	1	0%	1	No Pain	1	No Secondary complaint	1
Idiopathic	2	10%	2	Head	2	Abdomen	2
Macrotrauma	3	20%	3	Neck	3	Ankle/Foot	3
Microtrauma	4	30%	4	Upper/Mid Back	4	Chest/Costal	4
Neoplastic	5	40%	5	Thoracolumbar	5	Elbow	5
Non-traumatic	6	50%	6	Lower Back/Pelvis	6	Face/Jaw	6
Vascular	7	60%	7	Sacrococcygeal	7	Forearm	7
Other	8	70%	8	Missing	99	Hand/Wrist	8
Missing	99	80%	9			Head	9
		90%	10			Hip	10
						Knee	11
						Lower Back/Pelvis	12
B2: PAIN DURATION		B6: DIAGNOSIS		B9: CO-MORBIDITY			
> 2 Days	1	Cauda Equina	1	Cancer	1	Lower leg	13
> 1 Month	2	Degenerative	2	Cardiovascular pathology	2	Neck	14
1 - 3 Months	3	Discogenic	3	Degenerative joint disease (OA)	3	Sacrococcygeal	15
4 - 6 Months	4	Discogenic radicular	4	Depression	4	Shoulder	16
7 - 12 Months	5	Fracture	5	Diabetes	5	Thigh	17
< 1 Year	6	Infection	6	Endocrine pathology	6	Thoracolumbar	18
Missing	99	Joint dysfunction	7	Gastrointestinal pathology	7	Upper arm	19
		Organic referred	8	Genitourinary pathology	8	Upper/Mid Back	20
		Other neuro	9	HIV/Aids	9	Other	21
B3: PRIOR SPINAL PAIN						Missing	99
Yes	1	Peripheral nerve lesion	10	Hypertension	10		
No	2	Rheumatological	11	Infections	11		
Missing	99	Soft Tissue disorder	12	Inflammatory arthritides	12		
		Spinal cord compression	13	Integumentary pathology	13		
		Stenosis Radicular	14	Myelopathy	14		
B4: PAIN DISABILITY							
Score out of 32		Tumour	15	Neurological pathology	15		
Missing	99	Other	16	Osteoporosis	16		
		Missing	99	Radiculopathy	17		
				Respiratory pathology	18		
				Steroids	19		
				Stroke	20		
				Tuberculosis	21		
				None	22		
				Other	23		
				Missing	99		

Appendix E - World Spine Care clinic paperwork

CONFIDENTIAL HEALTH RECORD

FILE #:

DATE: dd / mm / yyyy

PERSONAL DETAILS

FIRST NAME LAST NAME.....

DATE OF BIRTH dd / mm / yyyy AGE SEX: MALE FEMALESTATUS: NEVER MARRIED MARRIED LIVING TOGETHER SEPARATED DIVORCED WIDOWED

ADDRESS / PLOT NO. TELEPHONE #

CITY / VILLAGE DISTRICT

NAME OF EMERGENCY CONTACT TEL. NO..... RELATIONSHIP

OCCUPATIONAL DETAILS

OCCUPATION: RETIRED OCCUPATION BEFORE RETIREMENT..... UNEMPLOYED STUDENT FARMER OFFICE WORK FISHING LABOURER HOUSEWORK DRIVER TEACHER HEALTH CARE POLICE MILITARY OTHER PROFESSIONAL SERVICE (Waiter, Salesperson, mechanic, Gardner, Cleaner, Etc.) OTHER NOT WORKING DUE TO PAIN

EMPLOYER IF WORKING

IF YOU ARE WORKING, DO YOU CONSIDER YOUR WORK PHYSICALLY DEMANDING? NO YESWHAT DO YOU SPEND MOST OF THE TIME DOING? MANUAL LABOUR (INCLUDING FARM WORK, CONSTRUCTION)
 HOUSEWORK DRIVING SITTING STANDING FISHING ON A BOAT
 WALKING CYCLING OTHERDO YOU REGULARLY CARRY ANYTHING ON YOUR HEAD? NO YES

YOUR DOCTOR

NAME OF MEDICAL DOCTOR..... SURGERY / CLINIC NAME

DATE YOU LAST SAW YOUR DOCTOR [DD / MM / YYYY]HAVE YOU HAD: X-RAY MRI CT ULTRASOUND? WHEN? [DD / MM / YYYY] WHICH BODY PART? X-RAY MRI CT ULTRASOUND? WHEN? [DD / MM / YYYY] WHICH BODY PART? X-RAY MRI CT ULTRASOUND? WHEN? [DD / MM / YYYY] WHICH BODY PART?

LIFESTYLE FACTORS

DO YOU SMOKE/USE SNUFF? NEVER USED TO CURRENTLYDO YOU CONSUME ALCOHOL? NEVER USED TO
 CURRENTLY CONSUME DRINKS PER WEEKI PLAY SPORTS NEVER SOMETIMES REGULARLY MY PAIN PREVENTS ME FROM PARTICIPATING IN SPORTSI WALK NEVER SOMETIMES REGULARLY MY PAIN PREVENTS ME FROM WALKING

(For exercise or normal activity)

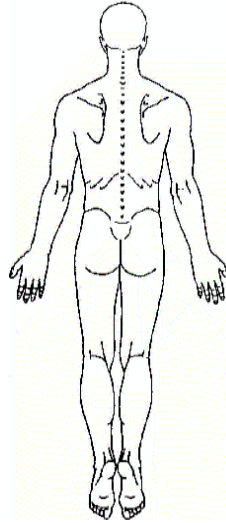
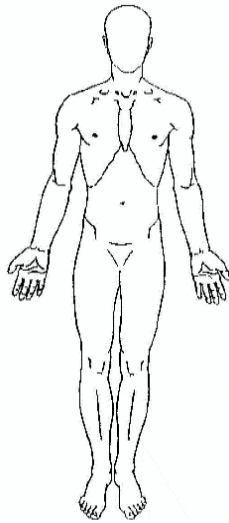
I RIDE A BICYCLE NEVER SOMETIMES REGULARLY MY PAIN PREVENTS ME FROM RIDING A BICYCLE

(For exercise or normal activity)

ARE YOU ABLE TO READ A NEWSPAPER? NO YESWHAT IS THE HIGHEST LEVEL OF EDUCATION YOU HAVE ACHIEVED? LESS THAN PRIMARY PRIMARY JUNIOR SECONDARY
 SENIOR SECONDARY MORE THAN SECONDARY

CURRENT HEALTH CONDITION

1. Where is the pain **that brought you in today**? Please mark the areas of pain on the diagram.
 Check this box if you have no pain .



- LOCATION - Doctor only**
- FACE/JAW
 - HEAD
 - NECK
 - UPPER/MID BACK
 - THORACOLUMB
 - LOWER BACK/PELVIS
 - HIP
 - SAC/COCCYX
 - THIGH
 - KNEE
 - LOWER LEG
 - ANKLE/FOOT
 - SHOULDER
 - UPPER ARM
 - ELBOW
 - FOREARM
 - HAND/WRIST
 - CHEST/COSTAL
 - ABDOMEN
 - NON-REGIONAL
- 2° _____

See other side for more notes.

2. Does the pain stop you from doing any activities? No Yes

If yes, list the activities

3. Is the pain getting better getting worse staying the same?

4. When did this problem first begin? less than 2 days ago less than 1 month ago 1-3 months ago 4-6 months ago
 7-12 months ago more than one year ago

5. Do you think you will recover from your pain? No Yes

HAS THIS PROBLEM:

- 6. Resulted from a work injury? No Yes *
- 7. Resulted from a motor vehicle accident (i.e. no fault insurance claim)? No Yes *
- 8. Caused you to see another health professional? No Yes *

SINCE THIS PROBLEM BEGAN HAVE YOU NOTICED

- 9. So much **weakness** in one or both of your arms that you are unable to lift them? No Yes
- 10. So much **weakness** in one or both of your legs that you are unable walk without help? No Yes
- 11. Difficulty controlling your bowel or bladder, or have been unable to urinate? No Yes
- 12. Pain in your chest, shortness of breath, or coughing up blood? No Yes
- 13. That any joints are more warm, more swollen, more red or more tender? No Yes

HAVE YOU:

- 14. Had blurred vision, double vision, dizziness or fainting **in the past month**? No Yes
- 15. Had any type of infection, fever or chills **in the past month**? No Yes
- 16. Had any type of surgery, surgical procedure or medical procedure **in the past month**? No Yes
- 17. Lost a lot of weight without trying to (i.e. without being on a diet) **in the past month**? No Yes
- 18. Had any type of accident, fall or trauma **in the past month**? No Yes

HAVE YOU EVER:

- 19. Been diagnosed with cancer? No Yes *
- 20. Been diagnosed with osteoporosis or brittle bones (taking Boniva)? No Yes *
- 21. Used any recreational or injected drugs (non-prescription drugs)? No Yes
- 22. Used steroids (such as Prednisolone) for more than 4 weeks? No Yes *
- 23. Had any other health problems related to joints? No Yes

GENERAL

- 24. Are you (or could you be) pregnant? No Yes
- 25. Has your appetite changed recently (more or less hungry)? No Yes

WHAT MEDICATION ARE YOU CURRENTLY TAKING?

.....
.....
.....

LIST ANY ALLERGIES YOU HAVE

.....

PAST MEDICAL HISTORY

Have you ever been **diagnosed** with or had any of the following:

Diabetes No Yes
 HIV/AIDS No Yes Year diagnosed yyyy In medical records? No Yes Antiretroviral No Yes

Other infections None Tuberculosis Malaria Dengue Chikungunya Leptospirosis
 Sexually transmitted disease Other

Details:

Breathing problems such as asthma, Pneumonia, or emphysema? No Yes Detail
 Heart problems such as heart attack, angina or atherosclerosis? No Yes Detail
 High blood pressure No Yes Detail
 Stroke No Yes Detail
 Depression or anxiety No Yes Detail
 Pain, weakness, tingling or numbness in the arms or legs? No Yes Detail

(Doctor only: myelopathy radiculopathy Neither)

Prior spinal pain No Yes Detail
 Prior neck or back surgery No Yes Detail
 Prior neck or back fracture No Yes Detail
 Osteoarthritis (joint degeneration) No Yes Detail
 Spinal deformity such as Scoliosis No Yes Detail

Stomach or bowel problems such as ulcers, gastric reflux, or Crohn's No Yes Detail
 Blood problems such as slow clotting or anaemia No Yes Detail
 Problems with urination or defecation (incontinence, constipation) No Yes Detail
 Epilepsy, seizures or convulsions No Yes Detail
 Fainting spells, dizziness or double vision No Yes Detail
 Severe headaches No Yes Detail
 Low blood pressure No Yes Detail
 Hot flashes No Yes Detail
 Chronic pain (pain for longer than 3 months) No Yes Detail
 Liver problems such and hepatitis or jaundice No Yes Detail
 Conditions affecting your hormones (e.g. thyroid disease) No Yes Detail
 Conditions affecting your reproductive organs No Yes Detail
 Conditions associated with pregnancy or childbirth No Yes Detail
 Conditions affecting eyes, ears, nose or throat No Yes Detail
 Conditions affecting your skin (e.g. eczema, psoriasis) No Yes Detail
 Conditions associated with eating (e.g. anorexia, bulimia) No Yes Detail

Have you ever had surgery or a surgical procedure No Yes Detail
 Have you ever been hospitalised? No Yes Detail
 Have you ever broken any bones? No Yes Detail
 Have you ever had any other trauma? No Yes Detail

FAMILY HISTORY

Has anyone in your immediate family (mother, father, brother, sister) been diagnosed with any of the following:

Cancer Diabetes. HIV/AIDS TB High blood pressure Heart disease Stroke Back or neck pain Osteoporosis
 Psychiatric disorder

CONSENT TO EXAMINATION AND TREATMENT

World Spine Care offers the following Services:

- Examination
- Soft tissue therapy
- Mobilization
- Exercise
- Spinal Education
- Spinal manipulation

These services may cause pain. If this pain does not resolve within 2 days, please talk to your spine care specialist. Rare serious complications may occur. Ask for a long form consent or clarification from your doctor if you would like further information.

World Spine Care specialists will answer any questions that you may have. Do not hesitate to ask.

I consent to the services offered or recommended to me by my spine care specialist. I intend this consent to apply to all my present and future care.

TUMALANO YA TLHATHOBO LE KALAFI

World Spine Care e fa ditlamelong tsa kalafi tse di latelang:

- Tlhatlhobo
- Kalafi ya tshidilo e tseneletseng ya mmele ya dinama tsedi boruma
- Go busetsa mmele mo mannong / seemong
- Itshidilo ya mmele (exercise)
- Thuto ka boleng jwa mokwatla
- Tshidilo ya paakanyo mokwatla

Ditlamelo tse tsa kalafi di kgona go nna botlhoko. Fa botlhoko jo bo sa fele mo sebakeng sa malatsi a mabedi, ka tswee tswee bua le moitsaanape wa gogo wa World Spine Care. Go a kgonega gore go nne le mathata, mme se, ga se gantsi se diragala. Ga o eletsa go itse go feta, kopa tumalano e e nang le molaetsa o o tletseng. Baitsaanape ba World Spine Care ba tla a araba dipotso tsotlhe tse o nang le tsone. O seka wa tshaba go botsa.

Ke dumalana le ditlamelo tsa kalafi tse di fiwang kgotsa tse ke gakololwang ka tsone ke moitsaanape wa World Spine Care. Ke keletso yame gore tumalana e, e dirisiwe ka nako tsotlhe, mo bogompionong le mo nakong e e tlang.

Dated this _____ day of _____, 20_____.
 Letsatsi _____ kgwedi _____

 Name (please print)
 Leina (kwala ka botlalo)

 Signature
 Setlanyo

 Witness Name (please print)
 Leina la mosupi (kwala ka botlalo)

 Witness Signature
 Setlanyo sa mosupi

CONSENT FOR USE OF DATA FOR RESEARCH

World Spine Care would like to continue learning about spinal disorders and related conditions in Botswana and to improve the care of our patients in Shoshong and Mahalapye. By providing your consent, your health information may be used for these research purposes. Research results may be used by World Spine Care clinicians and researchers, and may be included in reports, presentations or publications.

Your name or any information that could identify you will never be used or published. Your clinic information is kept private and confidentiality is always maintained. You have the right to review the information in your clinic file at any time.

Please sign below if you give permission to World Spine Care to use your health information for research purposes. If you do not sign this form, your information will not be used. The treatment you receive at the clinic will in no way be affected by your decision about research consent.

TUMALANO GO TSENELELA DIPATLISISO/CONSENT FOR USE OF DATA FOR RESEARCH

World Spine Care e eletsa go tswelala ka go ithuta ka mathata le malwetse a a amanang le mokwatla mo Botswana, le go tokafatsa tlhokomelo ya balwetse ba rona mo Shoshong le Mahalapye. Go fa tetla ga gago, go ka fa thata ya gore go ka dirisiwa botsogo jwa gago mo dipatlisisong tse. Maduo a dipatlisiso tse, a ka nna a dirisiwa ke baitsanape ba bongaka le ba ba ikemiseditseng go dira dipatlisiso. Gape a ka tsenngwa mo dikitsisong, dipuisanyo le mekwalo e e balwang ke batho.

Ga go na go dirisiwa maina, kgotsa sepe se se ka supang gore motho ke mang. Sengwe le sengwe ka ga gago e tla a nna sephiri. O gololesegile go bala dikarata tsa gago tsa botsogo tse di kwa kokelwaneng nako e nngwe le e nngwe.

Tswee tswee baya setlanyo sa gago fa e le gore o fa World Spine Care tetla ya go dirisa botsogo jwa gago go dira dipatlisiso. Fa o sa beye setlanyo mo pampiring e, botsogo jwa gago ga bo na go dirisiwa. Kalafi e o e fiwang mo kokelwaneng, ga e na go amega ka tsela epe mabapi le tshwetso e o e tsereng ya tumalano ya dipatlisiso.

Dated this _____ day of _____, 20_____.
 Letsatsi kgwedi

 Name (please print)
 Leina (kwala ka botlalo)

 Signature
 Setlanyo

 Witness Name (please print)
 Leina la mosupi (kwala ka botlalo)

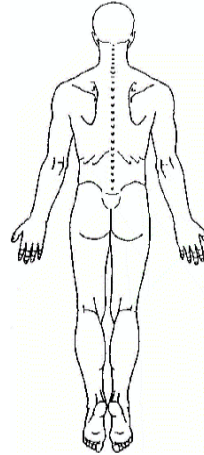
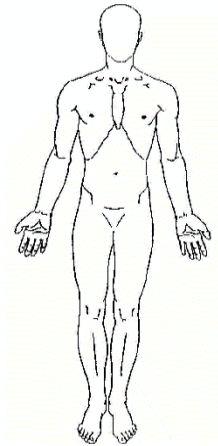
 Witness Signature
 Setlanyo sa mosupi

PHYSICAL EXAMINATION

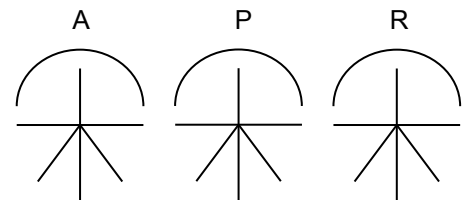
Vitals: HEIGHT: _____ WEIGHT: _____ PULSE: _____ RESPIRATION: _____
 BP: R ____/____ L ____/____ TEMPERATURE: _____

STANDING TESTS

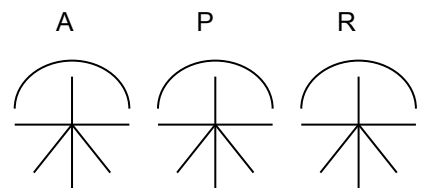
1. OBSERVATION
2. POSTURE
3. GAIT
4. LUMBAR/THORACIC ROM
5. SHOULDER ROM
6. CEREBELLAR TESTS
7. SQUAT/HEEL/TOE



L/S T/S ROM



C/S ROM



SITTING TESTS

8. CRANIAL NERVE EXAMINATION
9. CEREBELLAR EXAMINATION
10. CERVICAL ROM
11. AXIAL CERVICAL COMPRESSION
12. CERVICAL FORAMINAL COMPRESSION
13. CERVICAL DISTRACTION
14. SITTING COMPRESSION
15. SPINAL PALPATION
16. COSTOVERTEBRAL ASSESSMENT
17. MYOFASCIAL PALPATION
18. SITTING SLR (+/- NECK FLEXION)
19. SHOULDER PASSIVE ROM
20. SHOULDER STATIC PALPATION
21. ELBOW/WRIST/HAND EXAM
22. UPPER LIMB NEUROLOGY
23. VALSALVA
24. CHEST EXAMINATION

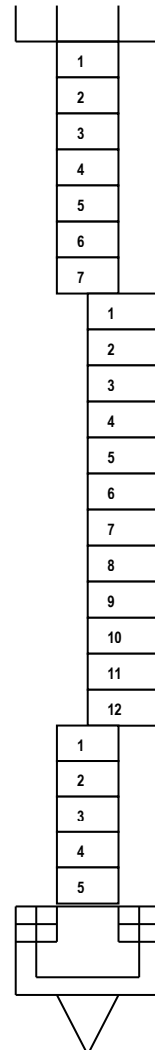
SUPINE TESTS

25. SLR (+/- NECK FLEXION)
26. KNEE FLEXION/EXTENSION
27. ANKLE DF/PF
28. FABERE HIP TEST
29. MYOFASCIAL PALPATION
30. ABDOMINAL EXAM
31. LOWER LIMB NEUROLOGY
32. PERIPHERAL PULSES

PRONE TESTS

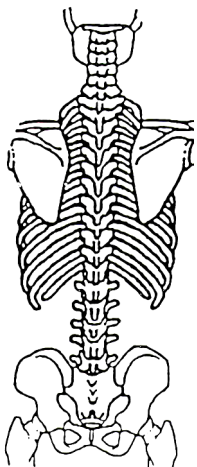
33. PRONE SPRINGING
34. SIJ SPRINGING
35. MYOFASCIAL PALPATION
36. KNEE FLEXION
37. HIP EXTENSION
38. HIP INT ROT/EXT ROT

REFLEX	Lt	Rt
C5		
C6		
C7		
L4		
L5		
S1		
MOTOR	Lt	Rt
C5		
C6		
C7		
C8		
T1		
L4		
L5		
S1		
SENSORY	Lt	Rt
UPPER		
Light		
Sharp		
vibration		
LOWER		
Light		
Sharp		
vibration		



Trigger points:

Tender to Palpate:



Appendix F - World Spine Care Consent Form

CONSENT FOR USE OF DATA FOR RESEARCH

World Spine Care would like to continue learning about spinal disorders and related conditions in Botswana and to improve the care of our patients in Shoshong and Mahalapye. By providing your consent, your health information may be used for these research purposes. Research results may be used by World Spine Care clinicians and researchers, and may be included in reports, presentations or publications.

Your name or any information that could identify you will never be used or published. Your clinic information is kept private and confidentiality is always maintained. You have the right to review the information in your clinic file at any time.

Please sign below if you give permission to World Spine Care to use your health information for research purposes. If you do not sign this form, your information will not be used. The treatment you receive at the clinic will in no way be affected by your decision about research consent.

TUMALANO GO TSENELELA DIPATLISISO/CONSENT FOR USE OF DATA FOR RESEARCH

World Spine Care e eletsa go tswela ka go ithuta ka mathata le malwetse a a amanang le mokwatla mo Botswana, le go tokafatsa tlhokomelo ya balwetse ba rona mo Shoshong le Mahalapye. Go fa tetla ga gago, go ka fa thata ya gore go ka dirisiwa botsogo jwa gago mo dipatlisisong tse. Maduo a dipatlisiso tse, a ka nna a dirisiwa ke baitsanape ba bongaka le ba ba ikemiseditseng go dira dipatlisiso. Gape a ka tsenngwa mo dikitsisong, dipuisanyo le mekwalo e e balwang ke batho.

Ga go na go dirisiwa maina, kgotsa sepe se se ka supang gore motho ke mang. Sengwe le sengwe ka ga gago e tla a nna sephiri. O gololesegile go bala dikarata tsa gago tsa botsogo tse di kwa kokelwaneng nako e nngwe le e nngwe.

Tswee tswee baya setlanyo sa gago fa e le gore o fa World Spine Care tetla ya go dirisa botsogo jwa gago go dira dipatlisiso. Fa o sa beye setlanyo mo pampiring e, botsogo jwa gago ga bo na go dirisiwa. Kalafi e o e fiwang mo kokelwaneng, ga e na go amega ka tsela epe mabapi le tshwetso e o e tsereng ya tumalano ya dipatlisiso.

Dated this _____ day of _____, 20_____.
Letsatsi kgwedi

Name (please print)
Leina (kwala ka botlalo)

Signature
Setlanyo

Witness Name (please print)
Leina la mosupi (kwala ka botlalo)

Witness Signature
Setlanyo sa mosupi

Appendix G – Confidentiality Agreement

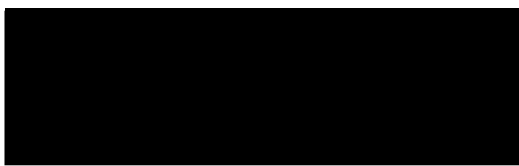
1. All information contained in the research documents and any information collected during data collection will be kept private and confidential. This is especially binding on any information that may identify any of the participants in the research process.
2. The information extracted from WSC clinic files will be kept anonymous in the research process.
3. None of the information shall be communicated to any other individual or organization.
4. The information from this expert group will be made public in terms of a journal publication, which will in no way identify any participants of this research.

Once this form has been read and agreed to, please fill in the appropriate information below and sign to acknowledge agreement.

I, Linda Armstrong, appointed as a research assistant declare that I will maintain confidentiality throughout the study. I will not disclose any information about the details of participants that are involved in the research study.

Name: Linda Armstrong

Signature:



Date:

23 June 2016

Appendix H – Notice of Research

PLEASE NOTE:

Research is taking place on patient files within the next month.

Title: A profile of patients presenting with spinal pain at Mahalapye and Shoshong World Spine Care clinics in Botswana

No names will be included in the data collection process and all information will be kept confidential.

If you would like to know more or do not want your information to be included in this study, speak to Dr. Harrison, Marsha or Kabelo at the WSC clinics.

Thank you

Appendix I – Muscles of the Back

Muscles of the back (Moore and Dalley, 2010)

Name	Proximal Attachment	Distal Attachment	Function
Splenius	Nucal ligament and spinous processes of C7 – T6 vertebrae	<i>Splenius capitis</i> : mastoid process of temporal bone and lateral third of superior nuchal line of occipital bone <i>Splenius cervicis</i> : tubercles of transverse processes of C1 – C3 or C4 vertebrae	<i>Acting alone</i> : laterally flex the neck and rotate head to side of active muscles <i>Acting together</i> : extend head and neck
Quadratus Lumborum	Medial half of inferior border of 12 th ribs and tips of lumbar transverse processes	Iliolumbar ligament and iliac crest	Extends and laterally flexes the vertebral column
Paraspinal muscles: Erector Spinae; Iliocostalis, Longissimus, Spinalis	Tendon on posterior aspect of iliac crest, sacrum, sacroiliac ligaments, sacral and inferior lumbar spinous processes and supraspinous ligament	Angles of lower ribs and cervical transverse processes	<i>Bilaterally</i> : extend vertebral column and head, control movement via eccentric contraction <i>Unilaterally</i> : laterally flex vertebral column
Deep Muscles: Semispinalis Multifidus Rotatores Intertransversarii	<i>Semispinalis (S)</i> : transverse processes of C4 – T12 vertebrae <i>Multifidus (M)</i> : Posterior sacrum, Posterior superior iliac spine, sacroiliac ligaments, lumbar vertebrae, T1-T3, C4-C7. <i>Rotatores (R)</i> : Transverse processes of vertebrae <i>Intertransversarii (I)</i> : Transverse processes of vertebrae	<i>S</i> : occipital bone, spinous processes of cervical and thoracic regions <i>M</i> : 2-4 segments superior to proximal attachment on the spinous process <i>R</i> : Junction of lamina and transverse process of vertebra above or two segments above <i>I</i> : transverse process of adjacent vertebra	<i>S</i> : extends head, cervical and thoracic regions of vertebral column and rotates them contralaterally <i>M</i> : Stabilize vertebrae during local movements of vertebral column <i>R</i> : Assist with local extension and rotatory movements <i>I</i> : Lateral flexion of vertebral column and stability
Gluteal muscles: Gluteus maximus Gluteus medius Gluteus minimus	<i>Max</i> : Ilium posterior to posterior gluteal line, sacrum and coccyx, sacrotuberous ligament. <i>Med</i> : External surface of ilium <i>Min</i> : External surface of ilium	<i>Max</i> : Iliotibial tract, some fibres insert on gluteal tuberosity <i>Med</i> : Lateral surface of greater trochanter of femur <i>Min</i> : Anterior surface of greater trochanter of femur	<i>Max</i> : Extends thigh and assists in lateral flexion. <i>Med and Min</i> : Abduct and medially rotate thigh, keeps pelvis level during ipsilateral limb is weight-bearing
Piriformis	Anterior surface of the sacrum and sacrotuberous ligament	Superior border of greater trochanter of femur	Laterally rotate extended thigh and abduct flexed thigh
Psoas major and minor	Transverse processes of lumbar vertebrae, vertebral bodies of T12-L5 and intervening intervertebral discs	Strong tendon to lesser trochanter of the femur	Flexes the thigh (with iliacus), acts superiorly to flex vertebral column laterally

Appendix J – Dominant activity compared to occupation cross-tabulation

		Dominant Activity									
		Cycling	Driving	Fishing	Housework	Lying down	Manual labour	Sitting	Standing	Walking	Other
		Count	Count	Count	Count	Count	Count	Count	Count	Count	Count
Occupation	Driver	0	3	0	1	0	0	2	0	2	0
	Farmer	0	4	0	11	0	71	1	5	32	0
	Fishing	0	0	0	0	0	0	0	0	0	0
	Health Care	0	0	0	2	0	7	10	15	23	0
	Housework	0	0	0	23	1	16	3	14	11	0
	Labourer	0	0	0	1	0	7	0	3	3	0
	Military	0	1	0	0	0	14	4	1	12	0
	Not working due to pain	0	0	0	0	2	2	5	0	0	0
	Office work	0	1	0	5	0	1	59	3	7	0
	Other professional	0	1	0	0	0	0	0	0	0	0
	Police	0	1	0	0	0	0	2	1	4	0
	Retired	0	3	0	13	1	25	19	4	10	0
	Service (Waiter, salesperson, mechanic, gardener, etc.)	0	3	0	2	0	6	6	9	7	0
	Student	0	0	0	1	0	0	14	0	2	0
	Teacher	0	0	0	1	0	1	5	21	4	0
Unemployed	0	0	0	26	1	26	19	1	25	1	
Other	0	0	0	2	0	4	5	1	3	1	

Appendix K - List of diagnoses

Diagnosis	Urban n (%)	Rural n (%)	Total N (%)
1. Soft tissue disorder	63 (16.1)	65 (21.1)	128 (18.4)
• Soft tissue disorder	61 (15.6)	65 (21.1)	126 (18.1)
• Soft tissue and other e.g. post traumatic fibrosis	2 (0.5)	0 (0.0)	2 (0.3)
2. Joint dysfunction	220 (56.4)	176 (57.1)	396 (56.7)
• Joint dysfunction	51 (13.1)	15 (4.9)	66 (9.5)
• Soft tissue and joint dysfunction	169 (43.3)	160 (51.9)	329 (47.1)
• Soft tissue, joint dysfunction and other e.g. sciatica	0 (0.0)	1 (0.3)	1 (0.1)
3. Discogenic	37 (9.5)	33 (10.6)	70 (10.0)
• Discogenic	21 (5.4)	14 (4.5)	35 (5.0)
• Soft tissue and discogenic	9 (2.3)	15 (4.9)	24 (3.4)
• Joint dysfunction and discogenic	4 (1.0)	2 (0.6)	6 (0.9)
• Soft tissue, joint dysfunction and discogenic	3 (0.8)	2 (0.6)	5 (0.7)
4. Discogenic radicular	19 (5.0)	8 (2.5)	27 (3.8)
• Discogenic radicular	12 (3.1)	4 (1.3)	16 (2.3)
• Soft tissue and discogenic radicular	2 (0.5)	1 (0.3)	3 (0.4)
• Soft tissue, joint dysfunction and discogenic radicular	2 (0.5)	1 (0.3)	3 (0.4)
• Degenerative and discogenic radicular	1 (0.3)	1 (0.3)	2 (0.3)
• Discogenic and discogenic radicular	1 (0.3)	1 (0.3)	2 (0.3)
• Joint dysfunction and discogenic radicular	1 (0.3)	0 (0.0)	1 (0.1)
5. Degenerative	23 (5.9)	16 (5.0)	39 (5.5)
• Degenerative	6 (1.5)	2 (0.6)	8 (1.1)
• Soft tissue, joint dysfunction and degeneration	9 (2.3)	2(0.6)	11 (1.6)
• Soft tissue and degenerative	3 (0.8)	6 (1.9)	9 (1.3)
• Joint dysfunction and degenerative	1 (0.3)	0 (0.0)	1 (0.1)
• Soft tissue, degenerative and discogenic	2 (0.5)	2 (0.6)	4 (0.6)
• Joint dysfunction, degenerative and discogenic	0 (0.0)	1 (0.3)	1 (0.1)
• Degenerative and discogenic	2 (0.5)	3 (1.0)	5 (0.7)
6. Stenosis radicular	16 (4.3)	1 (0.3)	17 (2.3)
• Stenosis radicular	5 (1.3)	1 (0.3)	6 (0.9)
• Degenerative and stenosis radicular	3 (0.8)	0 (0.0)	3 (0.4)
• Soft tissue and stenosis radicular	2 (0.5)	0 (0.0)	2 (0.3)
• Joint dysfunction and stenosis radicular	2 (0.5)	0 (0.0)	2 (0.3)
• Soft tissue, joint dysfunction and stenosis radicular	1 (0.3)	0 (0.0)	1 (0.1)
• Soft tissue, discogenic radicular and stenosis radicular	1 (0.3)	0 (0.0)	1 (0.1)
• Discogenic and stenosis radicular	1 (0.3)	0 (0.0)	1 (0.1)
• Discogenic radicular and stenosis radicular	1 (0.3)	0 (0.0)	1 (0.1)
7. Rheumatological	1 (0.3)	1 (0.3)	2 (0.3)
8. Spinal cord compression, degenerative and discogenic radicular	0 (0.0)	2 (0.6)	2 (0.2)
• Spinal cord compression, degenerative and discogenic radicular	0 (0.0)	1 (0.3)	1 (0.1)

• Spinal cord compression and other neuro	0 (0.0)	1 (0.3)	1 (0.1)
9. Fracture	7 (1.9)	2 (0.6)	9 (1.2)
• Fracture	2 (0.5)	2 (0.6)	4 (0.6)
• Joint dysfunction, fracture and spinal cord compression	1 (0.3)	0 (0.0)	1 (0.1)
• Discogenic radicular and fracture	1 (0.3)	0 (0.0)	1 (0.1)
• Joint dysfunction and fracture	2 (0.5)	0 (0.0)	2 (0.3)
• Soft tissue, joint dysfunction and fracture	1 (0.3)	0 (0.0)	1 (0.1)
10. Infection	1 (0.3)	1 (0.3)	2 (0.2)
• Infection	1 (0.3)	0 (0.0)	1 (0.1)
• Soft tissue and infection	0 (0.0)	1 (0.3)	1 (0.1)
11. Peripheral nerve lesion	2 (0.6)	1 (0.3)	3 (0.3)
• Peripheral nerve lesion	1 (0.3)	0 (0.0)	1 (0.1)
• Soft tissue, joint dysfunction and peripheral nerve lesion	1 (0.3)	0 (0.0)	1 (0.1)
• Soft tissue and peripheral nerve lesion	0 (0.0)	1 (0.3)	1 (0.1)
12. Other e.g. Bells palsy	0 (0.0)	1 (0.3)	1 (0.1)
13. Cauda equina	1 (0.3)	1 (0.3)	2 (0.2)
• Cauda equina	1 (0.3)	0 (0.0)	1 (0.1)
• Soft tissue and cauda equina	0 (0.0)	1 (0.3)	1 (0.1)
Total	390 (100.0)	308 (100.0)	698 (100.0)

Appendix L - Table 4.11

Presenting complaint compared to age of spinal pain patients attending the WSC clinics

Age (years)	Head n (%)	Neck n (%)	Upper/mid back n (%)	Thoracolumbar n (%)	Low back n (%)	Sacrococcygeal n (%)	Total (age) N (%)
1 - 9	0 (0.0)	1 (1.8)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (0.1)
10 - 19	0 (0.0)	0 (0.0)	7 (5.1)	2 (12.5)	3 (0.6)	0 (0.0)	12 (1.7)
20 - 29	0 (0.0)	6 (10.5)	17 (12.5)	0 (0.0)	32 (6.4)	0 (0.0)	55 (7.9)
30 - 39	2 (66.7)	4 (7.0)	37 (27.2)	3 (18.8)	85 (17.1)	1 (50.0)	132 (18.5)
40 - 49	0 (0.0)	14 (24.5)	26 (19.1)	2 (12.5)	94 (18.9)	1 (50.0)	137 (19.2)
50 - 59	0 (0.0)	11 (19.3)	25 (18.4)	7 (43.7)	113 (22.7)	0 (0.0)	156 (21.9)
60 - 69	0 (0.0)	15 (26.3)	16 (11.8)	0 (0.0)	103 (20.7)	0 (0.0)	134 (18.8)
70 - 79	0 (0.0)	4 (7.0)	5 (3.7)	2 (12.5)	42 (8.4)	0 (0.0)	54 (7.6)
80 - 89	0 (0.0)	1 (1.8)	2 (1.5)	0 (0.0)	22 (4.4)	0 (0.0)	25 (3.5)
90 - 99	0 (0.0)	1 (1.8)	1 (0.7)	0 (0.0)	4 (0.8)	0 (0.0)	6 (0.8)
Total	2 (100.0)	57 (100.0)	136 (100.0)	16 (100.0)	498 (100.0)	2 (100.0)	712 (100.0)

(Chi-squared test invalid due to low cell counts)

Appendix M - Table 4.12

Presenting complaint compared to level of education of spinal pain patients attending the WSC clinics

Level of Education	Head n (%)	Neck n (%)	Upper/mid back n (%)	Thoracolumbar n (%)	Low back n (%)	Sacrococcygeal n (%)	Total N (%)
< Primary	0 (0.0)	4 (7.0)	10 (7.4)	0 (0.0)	58 (11.8)	0 (0.0)	72 (10.1)
Primary	1 (33.3)	22 (38.6)	35 (25.7)	8 (50.0)	167 (33.9)	0 (0.0)	233 (32.7)
Junior secondary	0 (0.0)	10 (17.5)	22 (16.2)	3 (18.8)	85 (17.3)	1 (50.0)	121 (16.9)
Senior secondary	1 (33.3)	5 (8.8)	18 (13.2)	1 (6.3)	47 (9.6)	0 (0.0)	72 (10.1)
More than secondary	1 (33.3)	16 (28.1)	51 (37.5)	4 (25.0)	135 (27.4)	1 (50.0)	208 (29.2)
Total N (%)	3 (100.0)	57 (100.0)	136 (100.0)	16 (100.0)	492 (100.0)	2 (100.0)	706 (100.0)

Chi-squared test invalid due to low cell counts