The epidemiology of work-related low back pain in full-time restaurant waitron staff within the eThekwini Municipality

By

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I, Alexia Michaela Wolff, 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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ABSTRACT

Background

Low back pain (LBP) is one of the leading causes of morbidity in high-, middle- and low-income populations and is one of the most common and most expensive occupational health problems in developed and developing countries. This affects the working population as LBP has a detrimental effect on work performance, therefore it is an important clinical, social, economic, and public health problem affecting the population. Internationally, risk factors in the development of LBP in the working population include prolonged standing, awkward posture and incorrect lifting. There is limited literature on prevalence of LBP, the risk factors associated with LBP and its impact on waitrons in South Africa. This study aims to determine the prevalence, clinical presentation, risk factors and impact of work-related LBP amongst full-time restaurant waitron staff within the eThekwini Municipality.

Methodology

This study was a mixed methods study comprising qualitative and quantitative components. The quantitative research tool consisted of a previously validated self-administered questionnaire whilst the qualitative component consisted of voice recorded semi-structured interviews using an interview guide to obtain information on low back pain from participants. The data collected from the questionnaires were entered into an Excel spreadsheet and thereafter analysed using SPSS. Descriptive statistics were used to describe categorical outcomes, whilst Pearson's chi square or Fisher's exact tests in the case of categorical variables, and t-tests for continuous variables were used to assess factors associated with LBP. The audio recordings from the qualitative interviews were transcribed verbatim and exported into a Microsoft Word document. Thereafter, thematic analysis was used to analyse the qualitative data to identify common themes and subthemes.

Results

Of the 340 questionnaires which were distributed, a total of 180 questionnaires were completed by waitrons in the eThekwini Municipality, resulting in a 52.9% response rate. The point, three-month period and annual prevalence was recorded at 50.0%, 62.2% and 78.2%, respectively. Within this population, LBP was associated with the ethnicity of the participants (p=0.002) where Indians had a 7.7 times increase in the odds of prevalent LBP compared with Black Africans (OR = 7.713; 95% CI = 1.273-46.718; p = 0.026) and Whites a 5.9 times increase in the odds of prevalent LBP than Black Africans (OR = 5.891; 95% CI = 1.429-24.289; p = 0.014). Low back pain was associated with the education of the participants (p = 0.002) where participants with high school education had an almost 12 times increase in the odds of prevalent LBP than those with tertiary education (OR = 11.967; 95% CI = 1.399-102.387; p = 0.023). Prolonged standing or walking during a work shift was associated with LBP (OR = 42.808; 95% CI = 2.346-780.985; p = 0.011).

Onset of LBP was common during a long single shift or when working a double shift and pain sessions tended to last between one to two hours. The frequency of LBP experienced averaged two to three times a week, where pain was at its worst in the evenings. Low back pain in waitrons commenced gradually without injury and the severity of LBP was unchanged since it initially started. Low back pain resulted in moderate impact on the work of waitron staff, sometimes resulting in absenteeism and bed rest.

Eight in-depth, qualitative interviews were conducted. Two main themes emerged from the data: low back pain characteristics and type of treatment. Interviewees discussed pain, onset and duration, and relieving factors as part of LBP characteristics, where they reported first experiencing LBP as young adults. Their onset of LBP was common during a long single work shift or when working a double shift. They re-iterated that prolonged standing and lifting or carrying heavy objects aggravated their LBP. Various therapies were used by interviewees to relieve the pain which included analgesics, anti-inflammatories, heat therapy and topical gels. Type of treatment included chiropractic. There was good knowledge of the services offered by chiropractors and various types of chiropractic treatment available.

Conclusion

The prevalence of LBP amongst waitron staff within the eThekwini Municipality was high. Work-related factors were associated with the onset of LBP. These included prolonged standing, constant walking for long periods of time, carrying heavy loads and falling. Low back pain negatively impacted on their work due to absenteeism as bed rest was required. Various treatment options, including chiropractic were utilized. Participants had some knowledge of what constitutes chiropractic treatment and the types of services offered.

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CHAPTER ONE: INTRODUCTION

The background to this study, the aims and objectives, and summary of the chapters will be discussed in this chapter.

1.1 Background of the study

Low back pain is a major cause of morbidity in high-, middle- and low-income countries (Hoy *et al.* 2009). It has a complex aetiology which could initially result from injury or irritation of the muscles, ligaments, connective tissues, joints, intervertebral discs or spinal nerve roots (Roffey *et al.* 2010a). Erick and Smith (2011) stated that musculoskeletal disorders (MSD) represent one of the most common and most expensive occupational health problems in both developed and developing countries. Musculoskeletal disorders are responsible for a substantial impact on the quality of life and can result in a major economic burden in terms of compensation costs and lost wages, which often affect the working-age population (Roffey *et al.* 2010b).

Low back pain is an MSD involving an interaction between anatomical, psychological, socioeconomic, and occupational risk factors that may end in varying degrees of pain and disability (Wai *et al.* 2010). According to Louw, Morris and Grimmer-Somers (2007), LBP is the most prevalent musculoskeletal condition and one of the most common causes of disability. LBP affects many people and has a damaging effect on work capacity and the overall well-being of an individual (Manchikanti *et al.* 2012), as well as being an important clinical, social, economic, and public health problem affecting the population (Manchikanti 2000). Hartvigsen *et al.* (2018) state that LBP is characterized by psychological, biophysical, and social dimensions with the intention of impairing function, societal involvement, and personal economic prosperity. The author further elaborates that the financial impact of LBP is cross-sectoral as it increases expenses in both health-care and social support systems, where the economic impact related to LBP is comparable to other prevalent, high-cost conditions, such as cancer, cardiovascular disease, mental health, and autoimmune diseases.

According to Manchikanti *et al.* (2012), evidence shows that there is an increase in prevalence, chronicity, and perceived severity of LBP, with resulting disability, which may lead to significant impairment of physical and psychological health. This may result in a decline in the performance of social responsibilities at work and with the family.

Erick and Smith (2014) stated that possible occupational risk factors for LBP include work posture, repetitive movements, physical strain and poor work conditions. Psychosocial risk factors include lack of social support, high work demands, and job dissatisfaction in many professions, however these psychosocial factors have not been investigated in the waitron population. In other countries, environmental risk factors that may be experienced by the waitron population group included slippery floor surfaces, air drafts, heat, cold, poor quality of internal air and bright lighting (Van Nieuwenhuyse *et al.* 2006). These have not been investigated in South Africa. The impact of LBP, within the waitering profession, has also not been addressed in the literature.

The research study aims to determine the epidemiology of LBP amongst full-time restaurant waitron staff within the eThekwini Municipality, as little research has investigated the prevalence of LBP in the waitron profession in South Africa. Therefore, the purpose of this study is to report on the prevalence of LBP, the associated risk factors, and its impact on the waitron profession.

1.2 Research aim

The aim of the study was to determine the epidemiology of LBP amongst full-time restaurant waitron staff within the eThekwini Municipality.

1.3 Research objectives

- To establish the point, three-month and annual prevalence of LBP amongst waitron staff.
- To determine the nature, severity and clinical presentation of LBP in the waitron staff and whether this results in absenteeism from work.
- To ascertain the risk factors for LBP in waitron staff.
- To determine the impact of LBP on full–time restaurant waitron staff.

1.4 Summary

Chapter One motivates and establishes the importance of the research study, followed by Chapter Two which expands on a literature review on LBP. Chapter Three will discuss the methodology of the study. Chapter Four presents the results of the study, followed by Chapter Five which will discuss these results. Chapter Six is the conclusion of the study which will outline the highlights of the study.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

Chapter Two provides a comprehensive review of the current literature on low back pain (LBP). It includes the anatomy and biomechanics of the lumbar spine, epidemiology of LBP, risk factors in developing LBP pertinent to full-time waitron staff and treatment. To source the data, the following search engines were used: EBSCO host, Google scholar, Medline, PubMed, Science Direct and Summon. The key words utilized to source the relevant information were: lumbar anatomy, sacrum anatomy, low back pain, low back pain prevalence, low back pain incidence, low back pain risk factors and low back pain treatment. The number of articles identified and utilized in the literature review were one hundred and forty-nine.

2.2 Anatomy of the spine

The anatomy of the spine includes bony structures, muscles, ligaments, joints, blood, and nerve supply. The vertebral column extends from the skull to the apex of the coccyx. It functions in the protection of the spinal cord and spinal nerves, helps to maintain posture, and allows for locomotion. The adult vertebral column consists of 33 vertebral segments which are divided into five sections, each with a different number of vertebrae as follows: seven cervical, twelve thoracic, five lumbar, five sacral and four coccygeal. The five sacral, and four coccygeal segments fuse to make up the sacrum and coccyx respectively (Moore, Agur and Dalley 2015).

The back is the posterior aspect of the trunk, which is inferior to the neck and superior to the gluteal region. The back consists of skin, subcutaneous tissue, muscles, ligaments, vertebral column, ribs, spinal cord, various vessels and nerves (Moore, Agur and Dalley 2015).

The back can be divided into two areas: the upper back and the lower back. The upper back commences from the base of the neck to the bottom of the rib cage, whereas, the low back begins from the superior aspect of the 12th rib to terminate at the inferior gluteal folds (Standring 2008; Moore, Agur and Dalley 2015).

2.3 Anatomy of the low back

2.3.1 Osseous structures of the low back

The low back comprises of the lumbar spine, which is made up of five lumbar vertebrae and their intervertebral discs and is bordered by the thoracic spine superiorly and the sacrum inferiorly. The sacrococcygeal region is made up of five sacral and four coccygeal vertebrae. The os coxae are two pelvic bones located on the sacrum bilaterally, which are formed by the ilium, ischium and pubic bones. The lumbar spine consists of vertebral bodies (VB), intervertebral discs (IVD) and ligaments that hold two or more vertebrae together (Oxland 2016). A functional spinal unit is formed by the combination of two adjacent vertebrae, IVD, facet joints, and associated ligaments (Drake 2015; Moore, Agur and Dalley 2015; Oxland 2016).

2.3.1.1 The lumbar vertebrae

There are five lumbar vertebrae which are made up of a vertebral body, two pedicles, two laminae, one spinous process, two transverse processes and four articulating processes, illustrated in Figure 2.1 (Moore, Agur and Dalley 2015; Kishner 2017). The lumbar vertebral bodies increase in size from L1 to L5 to necessitate weight bearing (Bogduk 2005). The articulating processes form the superior and inferior zygapophyseal joints, which along with the transverse processes, allow movements such as flexion, extension, and lateral rotation (Bogduk 2005; Fast and Goldsher 2007; Moore, Agur and Dalley 2015).

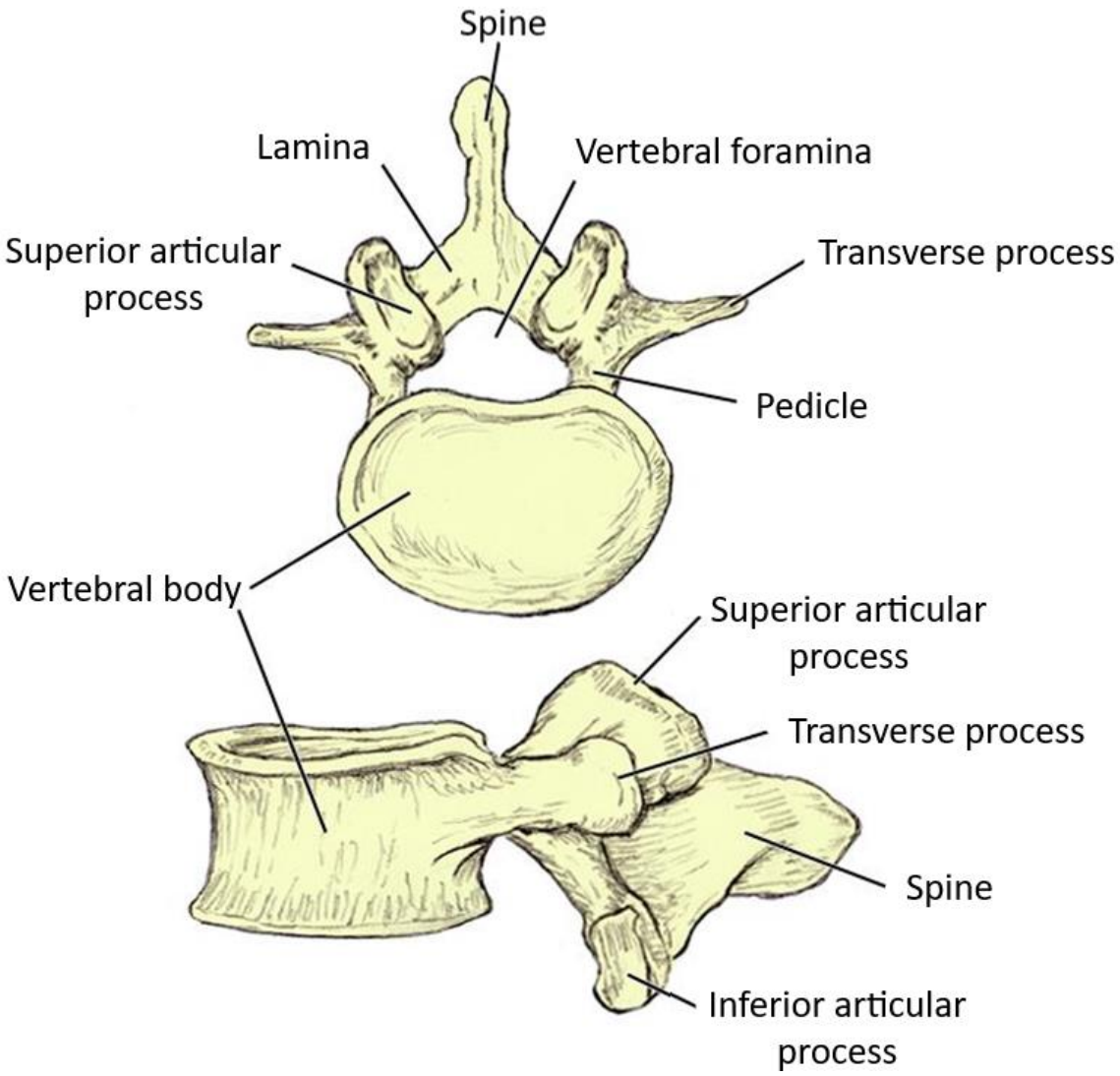

Figure 2.1 Anatomical structure of lumbar vertebrae (Kishner 2017)

2.3.1.2 The sacrum and coccyx

Moore, Agur and Dalley (2015) explain that the sacrum, which is located at the base of the vertebral column, is designed to transmit loads which support the lumbar spine. The terminal end of the sacrum, or the S5 vertebral body, articulates with the coccyx through the sacrococcygeal intervertebral disc (Bogduk 2005). Fast and Goldsher (2007) describe the coccyx as consisting of four small fused coccygeal vertebral bodies and its stability is enhanced through the sacrococcygeal ligaments which fix the coccyx to the sacrum.

2.3.1.3 Os coxae

Moore, Agur and Dalley (2015) describe the os coxae as two pelvic bones formed by the ilium, ischium and pubis. The ilium, the most superior part of the pelvis, is responsible for the transfer of weight from the spine to the pelvis and serves as a point for muscle attachment (Moore, Agur and Dalley 2015). The ischium, which lies inferior to the ilium, serves as an attachment point for the lower limb muscles and contains the acetabulum which forms part of the hip joint (Moore, Agur and Dalley 2015; Lewis 2017). The pubic bones, united by the pubic symphysis, serve as an attachment point for various lower limb muscles and function in pelvic stabilization (Standring 2008; Drake 2015).

2.3.2 Articulations and ligaments of the low back

2.3.2.1 Lumbar vertebral joints

The joints of the lumbar vertebral bodies (VB) are designed to function in weight bearing and strength, where the articulating surfaces of the adjacent vertebrae are connected by intervertebral discs (IVD) and ligaments (Moore, Agur and Dalley 2015). The IVDs are fibrocartilaginous structures that connect the vertebral bodies, as seen in Figure 2.2. They function in shock absorption and resistance to stress (Fast and Goldsher 2007). There are two parts of the IVD; the central nucleus pulposus and the peripheral annular fibrosis (Fast and Goldsher 2007). The nucleus pulposus is a gelatinous semifluid mass of mucoid material, which allows it to become distorted under pressure, whereas the annulus fibrosis consists of a highly ordered pattern of collagen fibres arranged in concentric rings around the nucleus pulposus (Bogduk 2005; Moore, Agur and Dalley 2015).

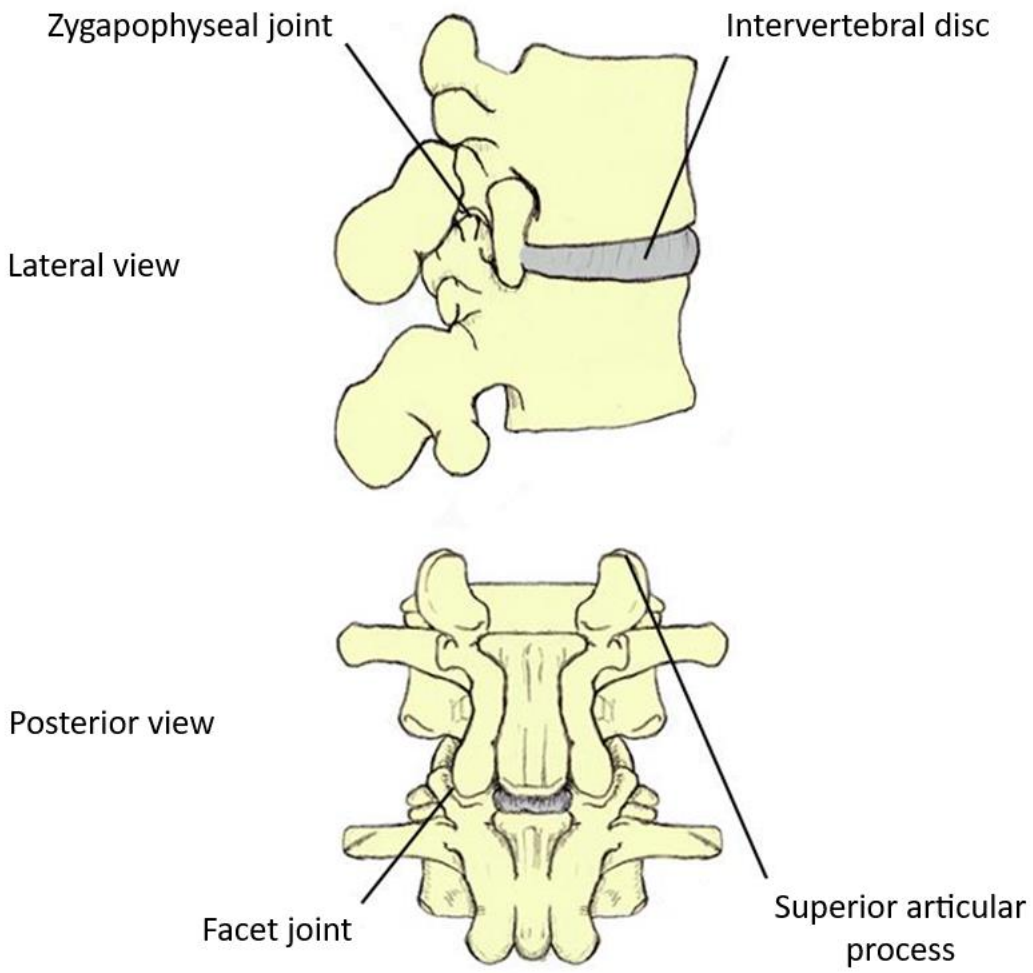

Figure 2.2 Three-joint complex (Kishner 2017)

2.3.2.2 Lumbar vertebral ligaments

There are three ligaments in the lumbar spine which aid in spinal stability: the anterior longitudinal ligament, the posterior longitudinal ligament, and the ligamentum flavum (Bogduk 2005; Moore, Agur and Dalley 2015). The anterior longitudinal ligament and posterior longitudinal ligament interconnect the vertebral bodies, whilst ligaments that interconnect the posterior elements include the ligamentum flavum, interspinous ligament and supraspinous ligament (Bogduk 2005). The ligaments of the lumbar spine also include the iliolumbar ligament and the false ligaments as illustrated by Figure 2.3 (Bogduk 2005; Drake 2015; Moore, Agur and Dalley 2015).

The anterior longitudinal ligament consists of several sets of collagen fibres, which cover the anterior aspect of the lumbar IVD and attaches to the margins of the VBs. The anterior longitudinal ligament comprises of three layers, a superficial layer which traverses three to four vertebrae, an intermediate layer which transverses two to three vertebrae, and a deep layer between individual vertebrae (Bogduk 2005). The function of the anterior longitudinal ligament is to limit hyperextension of the vertebral column (Moore, Agur and Dalley 2015).

The posterior longitudinal ligament is located within the spinal canal and attaches to the posterior wall of the of the VBs and IVDs, where the ligament is narrower at the level of the VBs and wider at the IVD space (Bogduk 2005; Standring 2008). The posterior longitudinal ligament consists of superficial layers which occupy the interval between three or four vertebrae. It also has deeper layers, which extend between adjacent vertebrae. The function of this ligament is to prevent hyperflexion of the vertebral column (Moore, Agur and Dalley 2015).

The laminae of consecutive vertebral arches are united by the ligamentum flavum and extend vertically from the lamina above to the lamina below, binding the laminae of adjoining vertebrae together whilst extending posteriorly to the spinous process (Bogduk 2005; Moore, Agur and Dalley 2015). This ligament functions to maintain the upright posture, and to assist with straightening the vertebral column after flexion (Moore, Agur and Dalley 2015).

The interspinous ligaments are divided into ventral, middle, and dorsal parts, which connect with adjacent spinous processes (Bogduk 2005; Scapinelli *et al.* 2006; Moore, Agur and Dalley 2015). The supraspinous ligament originates from C7, extends caudally to L5 vertebra, runs posteriorly, connecting the tips of the lumbar spinous processes and bridges the interspinous spaces, (Bogduk 2005; Standring 2008; Drake 2015; Moore, Agur and Dalley 2015). The iliolumbar ligaments are divided into five parts and connect the transverse process of L5 vertebra to the ilium bilaterally (Bogduk 2005; Standring 2008; Moore, Agur and Dalley 2015). The ligament prevents anterior translation of the L5 VB on the sacrum, and aids in resisting twisting and forward, backward as well as lateral bending of L5 VB (Bogduk 2005).

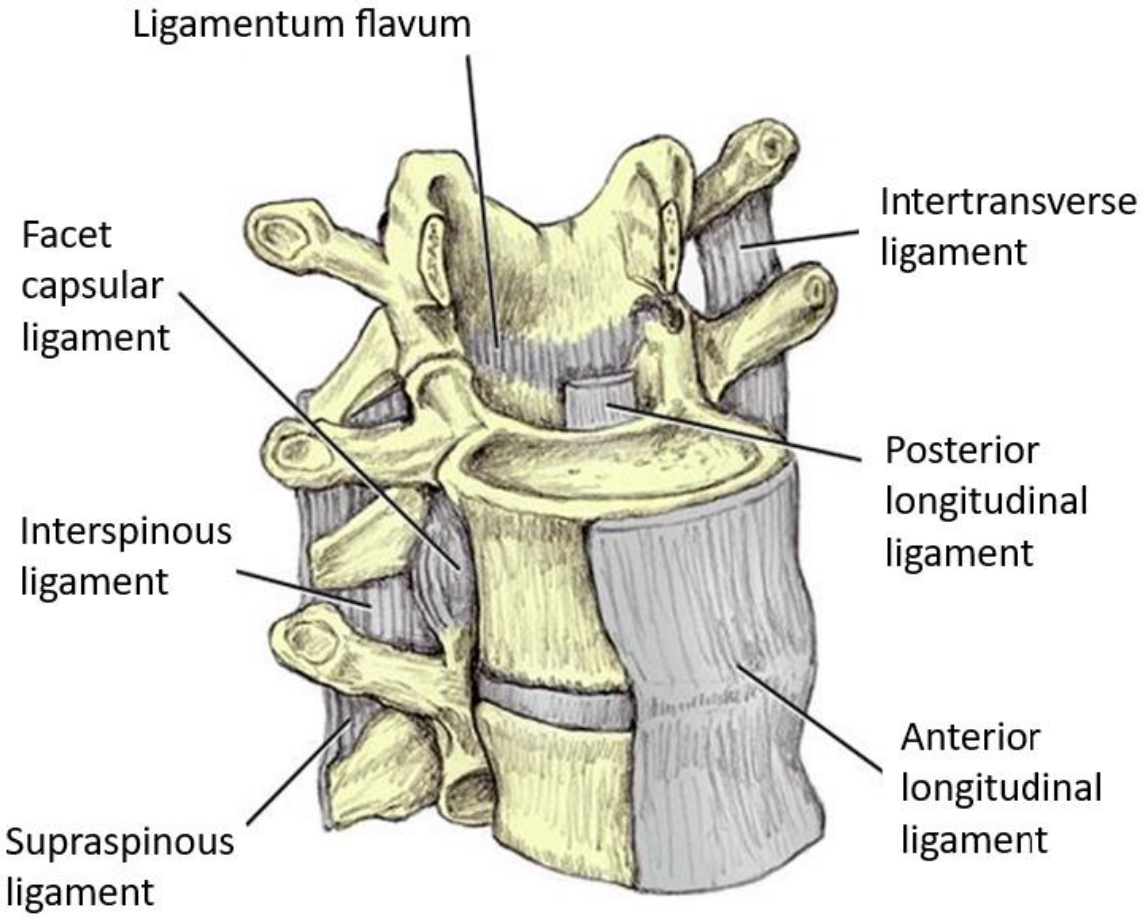

Figure 2.3 Ligaments of the lumbar spine (Kishner 2017)

2.3.3 Musculature of the low back

The lumbar spine is surrounded by muscles named according to their shape or location and are categorized further according to their function such as flexion, extension, rotation, or lateral flexion. Muscles and ligaments work together to provide spinal stability and to control movement during rest and activity. The muscles of the lumbar spine commonly involved in movement are described according to origin, insertion, innervation and action in Table 2.1.

The lumbar back muscles, as illustrated in Figure 2.4, can be divided into three groups consisting of the short segmental muscles, including the interspinales and intertransverserii mediales; the polysegmental muscles, which include the multifidus and lumbar components of the longissimus and iliocostalis; and the long polysegmental muscles, which include the thoracic components of the longissimus and iliocostalis muscles (Bogduk 2005).

The short lumbar interspinales muscles produce posterior sagittal rotation of lumbar vertebrae and the intertransverserii mediales are small muscles, which function in lateral rotation and posterior sagittal rotation. The multifidus muscle is involved in posterior sagittal rotation of the lumbar vertebrae and spans three joint segments for stabilization at each level (Bogduk 2005; Hebert *et al.* 2015; Moore, Agur and Dalley 2015; Bridwell 2018).

The lumbar erector spinae consist of the muscles iliocostalis lumborum and longissimus thoracis. These can be further divided into a thoracic part, consisting of fascicles arising from thoracic vertebrae or ribs, and a lumbar part, consisting of fascicles from lumbar vertebrae. These can be referred to respectively as longissimus thoracis pars thoracis, iliocostalis lumborum pars thoracis, longissimus thoracis pars lumborum and iliocostalis pars lumborum (Daggfeldt, Huang and Thorstensson 2000; Bogduk 2005).

The erector spinae aponeurosis (ESA) is formed exclusively by the longissimus thoracis pars thoracis and iliocostalis lumborum pars thoracis tendons. Its tendinous fibres attach to the ilium, sacrum, and the lumbar and sacral spinous processes (Daggfeldt, Huang and Thorstensson 2000).

The thoracolumbar fascia consists of three layers of fascia, namely the anterior, middle, and the posterior layers, which enclose the lumbar spine musculature and divides them into three compartments. The thoracolumbar fascia plays a role in lumbar spine stability in lifting and in the flexed posture (Bogduk 2005).

Table 2.1 Muscles involved in the movement of the lumbar spine

Muscle	Origin	Insertion	Innervation	Action
External oblique	Ext. surface & inf. borders of the inf. 8 ribs	Attaches to the ant. half of the iliac crest, linea alba & pubic tubercle	Thoracoabdominal nerves T7- T11 & subcostal nerve	Bilaterally: Compresses the abdomen & flexion of the lumbar spine
Internal oblique	Thoracolumbar fascia, ant. two-thirds of iliac crest & inguinal ligament	Cartilage of the inf. 3-4 ribs & linea alba	Thoracoabdominal nerves T8-T12, iliohypogastric & ilioinguinal nerves	Bilaterally: Compresses the abdomen & flexion of vertebral column Unilaterally: Lat. flexion & rotation
Quadratus lumborum	Iliac crest & iliolumbar ligament	Inf. border of the 12th rib & L1-L4 vertebrae	Thoracic spinal nerve T12 & lumbar spinal nerves L1-L4	Bilaterally: Lumbar extension & inf. descent of 12th rib during exhalation Unilaterally: Lat. flexion of vertebral column
Rectus abdominus	Pubic crest & pubic symphysis	5th-7th costal cartilages & xiphoid process	Thoracoabdominal nerves	Flexion of trunk, compression of abdominal viscera & controls pelvic tilt
Transversus abdominus	Int. surface of 7th-12th costal cartilages, iliac crest, lumbar fascia & lat. 3rd of inguinal ligament	Linea alba with aponeurosis of int. oblique muscle, pubic crest & pubis	Thoracoabdominal nerves & 1st lumbar nerve	Compresses & supports abdominal viscera
Multifidus	Inf. tip of spinous process	Travels 2-4 vertebral levels to attach to transverse process	Post. rami of spinal nerves	Stabilizes vertebrae during local movements

Key: Ext. = external, Int. = internal, Sup. = superior, Inf. = inferior, Ant. = anterior, Post. = posterior, Lat. = lateral

Table compiled from Standring (2008); Moore, Agur and Dalley (2015); and Lewis (2017).

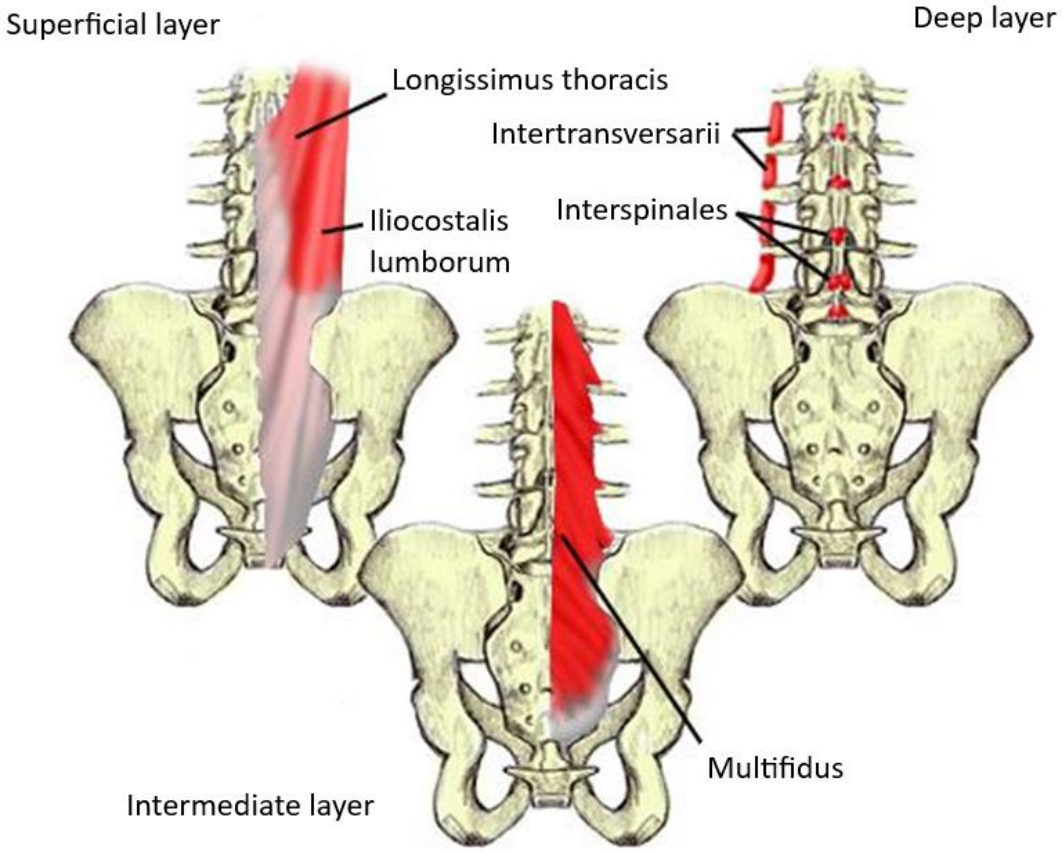

Figure 2.4 Supporting muscles of the lumbar spine (Kishner 2017)

2.3.4 Vasculature of the low back

2.3.4.1 Arterial supply

Figure 2.5 and Figure 2.6 illustrate the arterial supply of the low back. In front of each vertebra from L1-L4, a pair of lumbar arteries arise from the aorta, and at L5, the lumbar arteries arise from the median sacral artery (Bogduk 2005). Each individual lumbar artery passes posteriorly around its associated vertebral body and divides into numerous branches upon reaching the level of the intervertebral foramen laterally (Bogduk 2005).

The abdominal wall is supplied by lateral branches passing through the quadratus lumborum and psoas muscles, whilst the paravertebral muscles are supplied by other branches that pass with the dorsal and ventral rami, which innervate this same muscle. A branch directed posteriorly enters the back muscles by passing under the transverse process and runs perpendicular to the lateral border of the pars interarticularis of the lamina, which also form

anastomoses around the zygapophysial joints and plexuses that surround and supply the spinous processes and laminae (Bogduk 2005).

The lumbar artery gives rise to three medially directed branches opposite the IVF: the anterior spinal canal branch; the posterior spinal canal branch; and the radicular branch (Bogduk 2005; Drake 2015). The anterior spinal canal branch enters the IVF at each level and bifurcates into ascending and descending branches, where the ascending branch crosses the IVD and anastomose with the descending branch from the next higher segmental level by circumventing the base of the pedicle above, which forms arterial arcades along the vertebral canal floor (Bogduk 2005; Moore, Agur and Dalley 2015). The posterior spinal canal branches form arterial arcades on the internal surface of the vertebral canal roof along the ligamentum flavum and laminae, where the branch to each lamina penetrates near its connection with the pedicle which then divides into branches that ascend and descend within the bone into the superior and inferior articular processes (Bogduk 2005; Drake 2015).

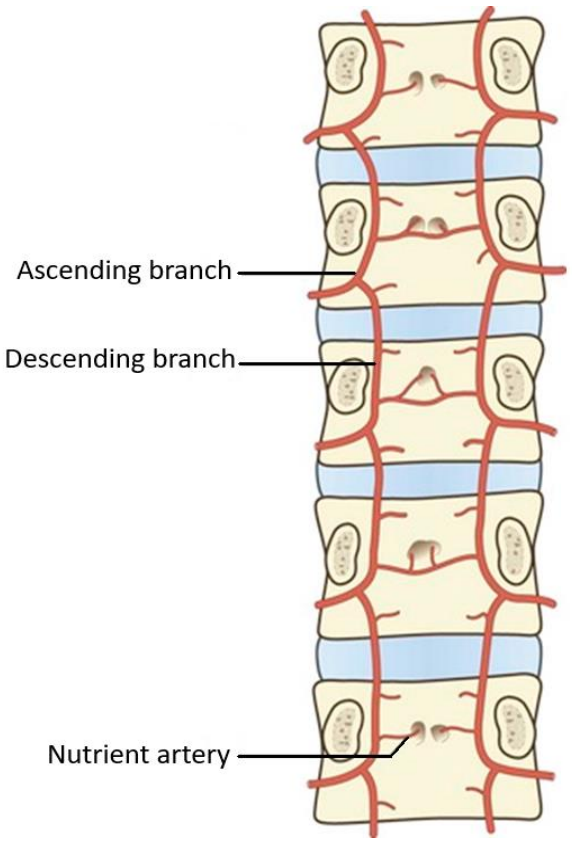

Figure 2.5 Anterior view of the blood supply of the lumbar spine (Gate 2015)

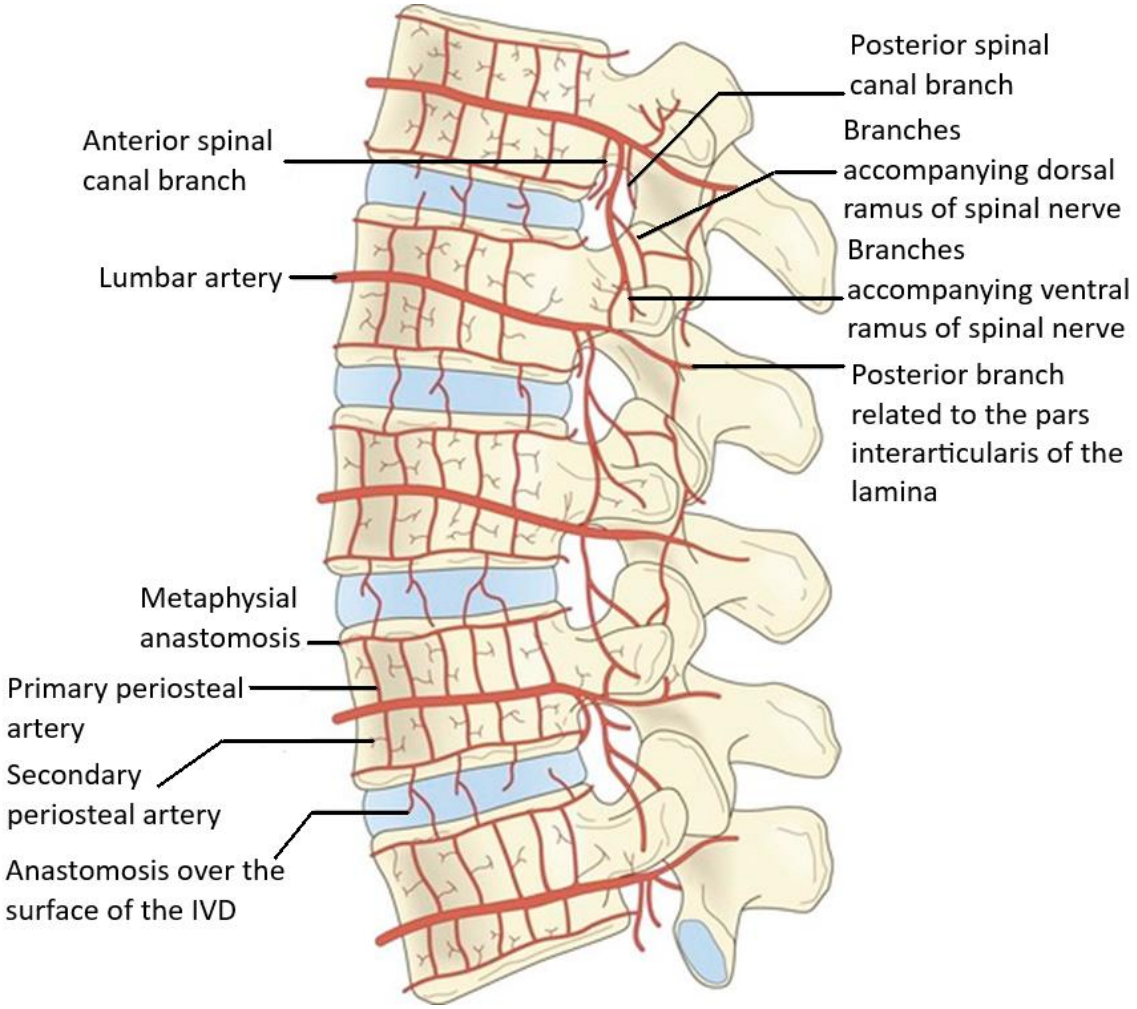

Figure 2.6 Lateral view of the blood supply of the lumbar spine (Gate 2015)

2.3.4.2 Venous drainage

Figure 2.7 and Figure 2.8 illustrate the venous drainage of the low back. The lumbar veins, ascending lumbar veins and the vertebral venous plexuses surround and drain the lumbar spine (Bogduk 2005). The lumbar veins pass around the vertebral bodies and drain into the inferior vena cava, where these lumbar veins communicate with the ascending lumbar veins opposite the IVF (Bogduk 2005; Standring 2008). The ascending lumbar vein communicates with the common iliac vein inferiorly, while superiorly, the right ascending lumbar vein joins the azygous vein, and the left ascending lumbar vein joins the hemi-azygous vein (Bogduk 2005; Moore, Agur and Dalley 2015).

Veins along the vertebral column form venous plexuses outside and inside the vertebral canal. The anterior external vertebral venous plexus is found on the anterolateral aspects of the lumbar spine, the anterior internal vertebral venous plexus covers the floor of the vertebral canal, and the posterior internal vertebral venous plexus lines the vertebral canal roof (Bogduk 2005; Moore, Agur and Dalley 2015). The external aspects of posterior elements of the lumbar vertebrae and veins from the muscles of the back drain towards the IVF, where they join the lumbar veins or ascending lumbar veins, and the posterior elements are drained internally by the posterior internal vertebral venous plexus (Bogduk 2005; Standring 2008; Moore, Agur and Dalley 2015).

The venous drainage of the sacrum follows a comparable arrangement to that of the arterial supply. The median and lateral sacral veins accompany their respective arteries and drain into the internal iliac veins which unite with the external iliac veins to form the common iliac veins, which form the inferior vena cava as they unite at the level of L4 (Bogduk 2005; Cramer and Darby 2014; Drake 2015; Moore, Agur and Dalley 2015).

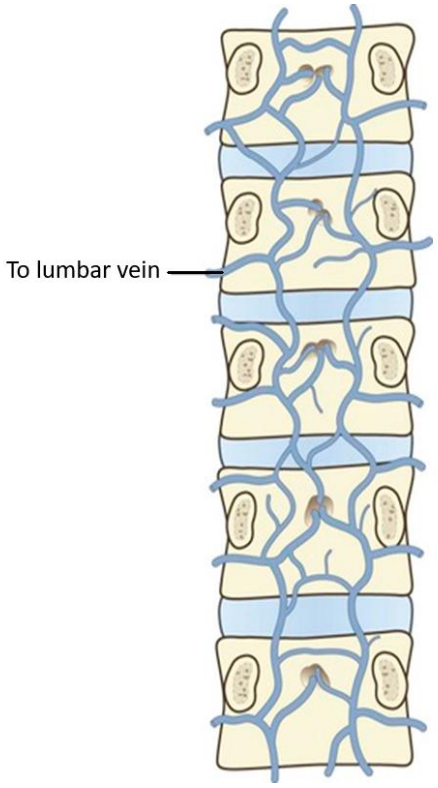

Figure 2.7 Anterior view of the venous drainage of the lumbar spine (Gate 2015)

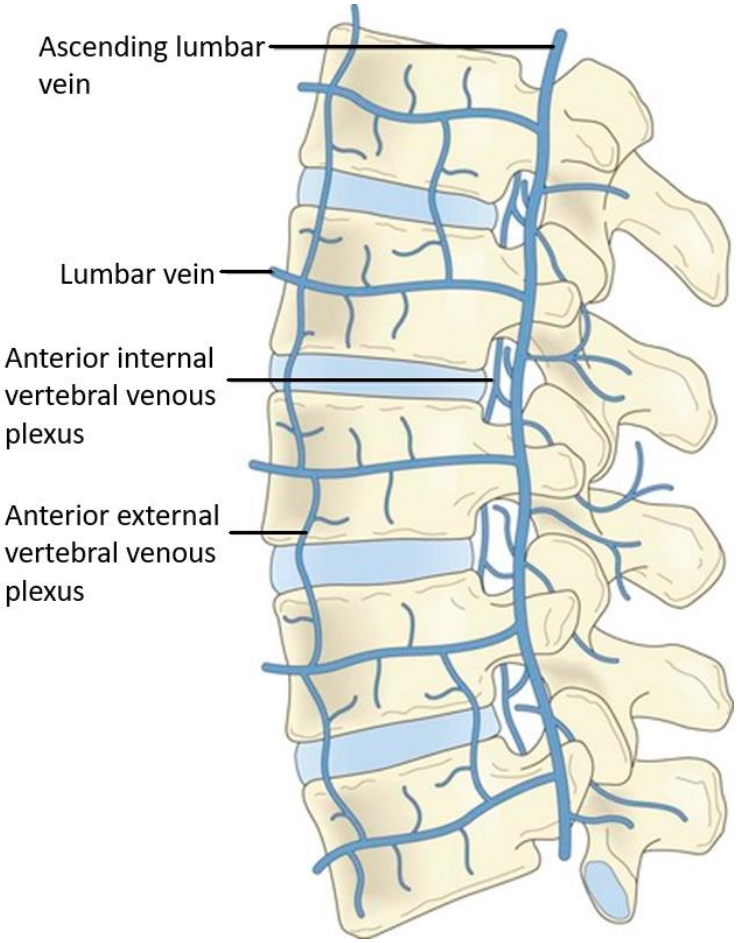

Figure 2.8 Lateral view of the venous drainage of the lumbar spine (Gate 2015)

2.3.5 Innervation of the low back

Lumbar spinal nerves lie within the IVF where spinal nerve roots connect these lumbar spinal nerves to the spinal cord by dorsal (sensory) and ventral (motor) nerve roots which divide into dorsal and ventral rami on exiting the IVF and are numbered according to the vertebrae under which they lie (Bogduk 2005).

The sacrum and its neighbouring structures are innervated by five sacral nerves that arise from the sacral foramina (Standring 2008). The innervation of the skin is provided by the medial and lateral cutaneous nerves as well as anterior and posterior cutaneous nerves. These nerves arise from the dorsal ramus and anterior ramus, respectively, which are branches of the spinal nerves exiting at each vertebral level (Standring 2008; Cramer and Darby 2014; Moore, Agur and Dalley 2015).

2.4 Low back pain

Low back pain (LBP) is a symptom classified by pain, muscle tension or stiffness. It is defined by the location of pain which typically occurs between the lower rib margins and the gluteal creases (Hartvigsen *et al.* 2018). Low back pain is a common musculoskeletal condition, which is one of the five most common causes of disability worldwide and places a large economic burden on healthcare across the world (Ardakani, Leboeuf-Yde and Walker 2018). Low back pain according to Krath *et al.* (2017) is categorized according to duration, where acute LBP is less than six weeks, sub-acute LBP ranging from six to 12 weeks, and chronic LBP being 12 weeks or more.

2.5 Epidemiology of low back pain

2.5.1 Incidence and prevalence of low back pain

Incidence represents the number of new cases of disease among the number of susceptible persons in a given location and over a span of time. Prevalence is a measure of the burden of disease in a population in a given location time. This can be further classified as period prevalence and point prevalence, where the period prevalence represents the proportion of the population affected within a specific time period while the point prevalence is the proportion affected at that point in time (Ward 2013; Anderson 2019).

Manchikanti (2000) found that the incidence of LBP at three, six and 12 months, ranges from 35% to 79%, while the lifetime prevalence of LBP can be up to 90% in some populations (Dagenais, Caro and Haldeman 2008; Bell and Burnett 2009). Roffey *et al.* (2010a) reported that the annual incidence of LBP within the general population of Manchester, UK, is 5%, whilst the lifetime prevalence is 60%-90%.

Within South Africa, Dyer (2012) recorded a point prevalence of 34%, and a lifetime prevalence of 48% within the White population in the greater eThekwini metropolitan area. Docrat (1999) recorded the prevalence of LBP in the Coloured and Indian community, in greater Kwazulu-Natal, as 45.0% and 32.6% respectively.

Research from studies in developing countries including Tibet (Hoy *et al.* 2003), Nigeria (Omokhodion 2002), Lesotho (Worku 2000) and South Africa (Van Der Meulen 1997; Docrat

1999) suggest that LBP is as common among these populations as in more developed nations, however LBP research is scarce in Africa compared to developed countries, therefore resulting in little being known regarding prevalence and associated risk factors among African populations (Louw, Morris and Grimmer-Somers 2007). A study done in Denmark by (Jørgensen *et al.* 2013) reported that musculoskeletal pain is influenced by an array of factors such as socio-economic, genetic, lifestyle and individual influences. The latter study highlights that high physical work demands are largely considered to be one of the main causes of musculoskeletal pain among workers, and that workers with high physical work demands, including awkward body postures; prolonged standing; heavy lifting; repetitive arm movements and working with arms above shoulder height have the highest prevalence of musculoskeletal pain.

According to Alghadir, Zafar and Iqbal (2015), who did a study on work-related musculoskeletal disorders (WMSD) among dental professionals in Saudi Arabia, occupations which require prolonged periods of sitting, lifting, stooping, twisting or standing result in an increased likelihood for developing LBP. In a study conducted in Hong Kong relating to WMSD in surgeons by Szeto *et al.* (2009), it was noted that a high prevalence of work-related musculoskeletal symptoms existed mainly in the neck (82.9%), low back (68.1%), shoulder (57.8%) and upper back (52.6%) regions. In a study to determine the prevalence of WMSD in nurses, in an eThekwini District Hospital, Kumalo (2015), found that the lifetime prevalence of LBP in nurses was 77% and the annual prevalence was 67% indicating a strong relationship between WMSD and physical workload. The prevalence of LBP was higher than that of other body regions.

Individuals working in the restaurant industry work roughly 60 to 70 hours per week, where waitrons and managers are on their feet between 12 to 15 hours a day (Kamp 2014). A study conducted on task demands and musculoskeletal discomfort among restaurant waitron staff (*n* =100) in the USA revealed that 42% of participants experienced musculoskeletal symptoms in the past 12 months, with 18% reporting LBP (Dempsey and Filiaggi 2006). Such a study has yet to be conducted in South Africa.

2.6 Impact of work-related low back pain

Low back pain was found to be the most significant cause of chronic disability in working professionals in the USA and resulted in more than 101.8 million absenteeism days per year with an estimated 50 billion dollars spent on LBP treatment (Bergeron, Wright and Killion 2006).

A study conducted in New Zealand reported that absenteeism due to LBP was 9%. The same study also reported that LBP reduced work-related activities by 18% (Widanarko *et al.* 2012). Pain severity can hinder regular daily activities, result in work absenteeism, and cause sleep disturbances (Sinclair *et al.* 2014). A systematic review conducted by Wai *et al.* (2010) suggested that bending activities involving higher degrees of trunk flexion were associated with disabling types of LBP in certain working populations.

A study on occupational health problems of restaurant workers in Pune, India identified that musculoskeletal disorders are more common among waiters who bear heavy loads, stand for prolonged periods and maintain awkward postures to deliver the orders to customers (Kokane and Tiwari 2011). However, a study to identify musculoskeletal disorders in hotel restaurant workers (n = 905) in Taiwan found that only a small proportion (12%) of the restaurant workers considered their work activities affected by pain, and only 12% of workers with work related musculoskeletal disorders reported absence from work due to pain (Chyuan *et al.* 2004).

2.7 Risk factors

2.7.1 Age

An increase in age has been associated with degenerative conditions of the spine which can result in LBP. This can be due to the aging process and “wear and tear” from mechanical trauma, but some are determined by genetic influences (Manchikanti *et al.* 2012). A study conducted on the African continent suggested that lifetime LBP increased with age (Louw, Morris and Grimmer-Somers 2007).

The average age-related prevalence of persistent LBP in the USA is approximately 15% in adults aged between 35-55 years and 27% in the elderly population over the age of 65 years (Manchikanti *et al.* 2012). Various authors stated that the onset of LBP is highest in the third decade of life and overall prevalence increases with age until the 60- or 65-year age group and

then slowly decreases due to poorer recall, mortality or experiencing less back pain as this population is less likely to perform heavy physical activities (Hoy *et al.* 2010; Balagué *et al.* 2012; Kherad *et al.* 2017; Maher, Underwood and Buchbinder 2017). In contrast, a systematic review by Fejer and Leboeuf-Yde (2012) showed no significant increase of LBP with age and found that LBP is similar in the elderly population (>60 years) when compared to the middle-aged population.

2.7.2 Gender

Reporting of LBP is higher by females than males, as women tend to report symptoms more frequently than men and therefore more readily seek treatment (Hoy *et al.* 2012). According to Wijnhoven, de Vet and Picavet (2006) women have a higher number of comorbidities, due to LBP, than men and an increased degree of disability generated by LBP. A study conducted in Australia on comorbidities and LBP by Ramanathan *et al.* (2018) found that amongst LBP patients, comorbidity was more prevalent in the female population.

2.7.3 Body mass index

Body Mass Index (BMI) indicates the relationship between a person's weight and height. There is a relationship between BMI and LBP with a higher prevalence in obese individuals, as obesity contributes significantly to the development of LBP due to the mechanical overload on the paraspinal tissues (Hoy *et al.* 2010; Balagué *et al.* 2012; Manchikanti *et al.* 2012; Shiri *et al.* 2013; Citko *et al.* 2018).

2.7.4 Ethnicity

In South Africa, the prevalence of LBP in Black South Africans was recorded by Van Der Meulen (1997) as 53.1%, whilst Docrat (1999) reported that the prevalence in the Coloured and Indian South Africans was 32.6% and 45.0%, respectively. In the White South African population, a prevalence of 47.5% was reported by Dyer (2012). The difference in prevalence between ethnicities can be attributed to inaccessible health care, poorer levels of education and variances in the labour intensity of the work environment which play an important role in development of LBP (Dagenais and Haldeman 2012).

2.7.5 Education

There is an inverse relationship between the prevalence of LBP and level of education, with a prevalence of 32% in people who had less than a high school diploma compared to 22% in those with tertiary education (Hoy *et al.* 2010; Manchikanti *et al.* 2012; Bento *et al.* 2019). This is most likely related to the type of employment amongst those with different education. Men who received fewer years of formal education were involved in physical activities which were more strenuous, had less involvement in health-related activities such as exercise, and had less access to health information and services (Bento *et al.* 2019).

2.7.6 Marital status

Various authors (Hammed and Agbonlahor 2016; Rana *et al.* 2016; Bento *et al.* 2019) reported that single or married individuals have a lower risk for developing LBP than widowed or separated individuals regardless of gender. The authors stipulated that this could be due to the loss of social support, therefore increasing the risk of developing anxiety and depression which have been linked to musculoskeletal conditions such as LBP. This is elaborated upon later in this chapter.

2.7.7 Physical work

Multiple studies have investigated the correlation between physical work demands and musculoskeletal pain, however, Roffey *et al.* (2010a) stated that systematic reviews have indicated there is no relationship between excessive physical work and LBP. A study conducted by Jørgensen *et al.* (2013) stated there are multiple systematic reviews which concluded that there is scarce scientific documentation for a causal relationship between musculoskeletal pain and high physical work demands. The study does however specify that blue collar workers with increased physical work demands have the highest prevalence of musculoskeletal pain (Jørgensen *et al*. 2013). Examples of these physical work demands include heavy lifting, prolonged standing, awkward body postures, repetitive arm movements and working with arms above shoulder height (Jørgensen *et al*. 2013). Another study on occupation health problems on restaurant workers in India found that symptoms such as LBP, body ache, fatigue and limb pain were present in 14.2% of the study population and that their symptoms were attributed to awkward postures in delivering food orders to dining customers as well as long hours of standing (Kokane and Tiwari 2011). The correlation between high physical workloads and the

prevalence of LBP can also be seen in other professions such as nursing, where Kumalo (2015) indicated the prevalence of LBP was higher than that of any other body region. A study done by Bento *et al.* (2019) revealed occupational activities involving frequent heavy lifting, leaning forward and long periods of standing were associated with LBP in women.

Excessive bending, twisting and lifting, sustained abnormal posture and incorrect ergonomic positioning may place an extreme demand on the anatomical structures of the low back which may result in damage to these structures and lead to tissue failure and inflammation (Morris 2006; Balagué *et al.* 2012; Walker 2012). These anatomical structures include the lumbar discs, facets and muscles. If the integrity of the anatomical structures within the lumbar spine are compromised, an inflammatory process results which becomes the principle pain source (Walker 2012; Cramer and Darby 2014). Rotation and flexion of the lumbar spine with a compression component causes the annulus to tear which results in inflammation, herniation or protrusion of the disc. Rotation and extension of the lumbar spine may result in capsular tears causing synovitis of the posterior joint capsule and facet joint impaction, thereby limiting normal movement and resulting in inflammation, restricted joint movement and degeneration. Overuse and fatigue of the lumbar muscles may result in muscle spasms and limited movement of the lumbar spine resulting in pain, ischemia and hypertonic contraction (Vlok 2005; Cramer and Darby 2014). Signs and symptoms of LBP include: reduced range of motion, myofascial trigger points, muscle spasms, muscle dysfunction, oedema and tenderness of bony prominences (Bogduk 2005; Haldeman 2005; Vlok 2005; Bergmann and Peterson 2011).

Posture involves reflexive muscular control which allows for sitting, standing, walking and running. A correlation exists between postural control problems and chronic pain (Weiniger and Enix 2018). Excessive physical load and prolonged posture reflect the characteristics of the working environment and tasks performed by causing LBP which in turn limits activity, decreases productivity at work and increases absenteeism (Park *et al.* 2018; Cargnin *et al.* 2019). Poor posture can cause muscle imbalance and exerts a large mechanical load on the lower back. This may lead to mechanical LBP as excessive trunk flexion or extension increases the compressive force on an intervertebral disc (Hasegawa *et al.* 2018).

2.7.8 Medical insurance

In a study conducted in rural Tibet, Hoy *et al.* (2003) found that the prevalence of LBP decreased if individuals were in a financial position to seek medical care, in comparison to individuals who earn less and cannot afford medical care. A study done by Ward and Franks (2007) revealed that a lack of medical insurance compromises health care availability, use of preventive health services and management of chronic disease. Hadley (2007) confirmed this by stating that an uninsured individual who may experience an unintentional injury or onset of chronic disease, will find it problematic to obtain recommended medical care and seek treatment after the disease has progressed, hence full recovery may take more time. A study conducted in the USA by Dolot *et al.* (2016) found that one-third of adults with private medical insurance admitted to postponing treatment for a health condition due to cost concerns. However, it was argued by Lin *et al.* (2018), in an Australian study, that issues such as medical insurance cover, socioeconomic factors and income did not influence seeking care regarding LBP. This conflicts with earlier findings from studies conducted in other health conditions.

Low back pain treatment strategies are extensive and if treatment is sought immediately, can reduce pain and the severity of the disability (Westrom *et al.* 2010). Patient education and patient reassurance plays an important role in the treatment process for LBP as the condition requires minimal non-invasive interventions to produce substantial results (Casazza 2012). To prevent re-injury, measures are emphasized to the patient to avoid re-occurrence by practicing appropriate postures for lifting, sitting and driving (Patel and Ogle 2000).

2.7.9 Pregnancy

The prevalence of LBP during pregnancy is 45% and this is due to hormonal, mechanical, personal and environmental factors (Wu, Meijer and Uegaki 2004; Pennick and Young 2007; Mogren 2008; Katonis *et al.* 2011; Dagenais and Haldeman 2012). Performing physically strenuous work during pregnancy increases the risk of developing LBP and sacroiliac dysfunction (Bastiaanssen *et al.* 2005; Borggren 2007).

Low back pain seems to be a substantial problem during pregnancy and the condition often continues post-partum, thereby causing disability during movement related activities (Manchikanti *et al.* 2012; Thorell and Kristiansso 2012). Approximately 77% of women with

moderate to severe pregnancy-related sacroiliac joint dysfunction and pelvic pain suffer with continuing complaints post-partum, resulting in an estimated 43% prevalence for persistent LBP post-partum (Borggren 2007; Mogren 2007, 2008).

A Japanese study on nurses reported a strong association of LBP and having children, as recreational activities undertaken with children may strain the back (Smith *et al.* 2006). A study conducted on South African nurses by Dasappa (2007) reported that having children increased risk of LBP by 3.8 times in comparison to having no children.

2.7.10 Smoking

In a systematic review, Leboeuf-Yde, Kyvik and Bruun (1998) found evidence from 47 epidemiological studies that there is a greater prevalence of LBP in those who smoke. The components of a cigarette change the nutrition and pH of the IVDs, therefore predisposing disc herniations, decreased muscle resistance in lumbar spine stabilization, and altered pain perception (John *et al.* 2006; Wijnhoven, de Vet and Picavet 2006). A study conducted on automotive industry workers found that smoking exacerbated LBP (Oleske *et al.* 2004) and that an increase in smoking is associated with an increased frequency and duration of LBP (Manchikanti *et al.* 2012; Alzidani *et al.* 2018).

2.7.11 Alcohol consumption

Leboeuf-Yde (2000) noted in a systematic review that although uncoordinated movements could make the spine more vulnerable to injuries when under the influence of alcohol, there is no association between alcohol consumption and LBP. Later, in another systematic review, Ferreira *et al.* (2013) found that the prevalence of LBP was associated with alcohol consumption, however, the association was negligible and inconsistent across the studies reviewed.

2.7.12 Exercise

Exercise, according to Long, Donelson and Fung (2004), is used in the management of musculoskeletal disorders for pain reduction and disability which is associated with LBP. Low back pain is less frequent in individuals who exercised on a regular basis because activity is a form of pain prevention (Morris 2006; Dagenais and Haldeman 2012). A systematic review, on exercise for the prevention of LBP in the general population, found that exercises targeting

abdominal and spinal muscles were effective in preventing LBP and that the risk of LBP decreased by 33% due to exercise (Shiri, Coggon and Falah-Hassani 2017). A combination of stretching, strengthening and aerobic exercise performed two to three times a week is beneficial for the prevention of LBP (Shiri, Coggon and Falah-Hassani 2017; Gupta, Mohanty and Pattnaik 2019).

2.7.13 Pre-existing medical conditions

Rheumatoid arthritis, diabetes, heart disease, psychiatric illness, anxiety and depression, according to Ritzwoller *et al.* (2006), were associated with increased LBP. Rheumatoid granulomatous nodules, facet joint erosion, spondylolisthesis, disc narrowing without osteophytes, and osteoporosis are distinct radiological features of the lumbar spine in rheumatoid arthritis patients (Kothe *et al.* 2007; Baykara *et al.* 2013). A study in Japan found that there was a significantly higher degree of disability and lower quality of life in rheumatoid arthritis patients with LBP than in those without LBP. This was attributed to vertebral fractures and spinopelvic malalignment in the patients with LBP (Miura *et al.* 2019).

Diabetes mellitus and LBP often develop simultaneously and are due to the accumulation of advanced glycation end-products causing anatomical changes of the spine, such as early degeneration of vertebrae, cartilage and intervertebral discs (Dario *et al.* 2017).

A German study conducted by Schneider *et al.* (2007), found that LBP is associated with cardiovascular disease and overall poor health as both conditions share common risk factors such as obesity and physical inactivity. In a patient with comorbidities, the degree of disability, whether physical or social, rises with the number of co-existing conditions, thereby complicating care (Søndergaard *et al.* 2015). There is a link with LBP and musculoskeletal conditions, cardiovascular illness and poorer general health, with the most significant finding of the study being that patients with LBP and comorbidities were less likely to receive proper care for their LBP (Ramanathan *et al.* 2018).

Depression, stress and anxiety influence the course of LBP, where patients suffering from depression and LBP have an increase in pain intensity; physical and psychosocial disability; medication use and higher probability of unemployment (Sathya, Ramakrishnan and Shah

2015). Depression worsens the prognosis of LBP, thereby contributing to the chronicity of LBP (Nicholas *et al.* 2011; Ramond *et al.* 2011; Ramond-Roquin *et al.* 2015; Robertson *et al.* 2017).

2.8 Treatment and management of low back pain

Treatment of LBP is aimed at pain relief, improving functional ability and preventing chronicity (Gouveia *et al.* 2017). There has been movement away from medical management of LBP, where international clinical guidelines recommend that primary care physicians manage uncomplicated cases by educating patients on the nature of LBP, reassuring patients that LBP is treatable and advising patients on how to self-manage LBP. Clinicians caring for patients who are at risk for developing chronic LBP should consider offering a multidisciplinary approach which may include treatments such as massage, spinal manipulation, yoga, acupuncture and psychological therapies (Traeger *et al.* 2019). A multidisciplinary approach is more appropriate to manage LBP as no single treatment indicates superiority, as often a single treatment may not have a significant effect (Westrom *et al.* 2010; Pincus and McCracken 2013, Murthy *et al* 2015).

Clinical practice guidelines for acute LBP recommend reassuring the patient that LBP is treatable. A brief education on acute LBP, advice on the benefits of correct posture and exercise, drug therapy, spinal manipulative therapy (SMT) as well as heat application for pain relief are useful guidelines. Recommendations for chronic LBP include brief education on the nature of chronic LBP, advice to stay active, drug therapy, exercise therapy and SMT (Balagué *et al.* 2012).

2.8.1 Drug therapy

The standard treatment for LBP is the use of analgesics, otherwise known as painkillers, to reduce pain. These drugs are prescribed based on the functional status and pain intensity of the patient. Over the counter analgesics available to the public include paracetamol/acetaminophen, non-steroidal anti-inflammatory drugs (NSAIDs) such as aspirin and ibuprofen and weak opioids such as codeine (Golar 2011). Pharmacological medications for LBP according to the World Health Organisation analgesic ladder include non-opioids (e.g. acetaminophen/paracetamol), mild opioids (e.g. codeine) and strong opioids (e.g. morphine). However, the selection of the correct drug should be appropriate to pain severity (Schiphorst Preuper *et al.* 2014; Gouveia *et al.* 2017).

Paracetamol is used for mild pain relief and as an anti-pyretic drug however the mechanism of action of the drug is not clearly understood. Theories suggest that the drug acts as a selective inhibitor of the cyclooxygenase enzyme isoform (COX-3), however it has no anti-inflammatory action. A side effect is that the drug may cause irreversible liver damage when taken in excess or if the drug is ingested with alcohol hepatotoxicity (Blough and Wu 2011; Golar 2011).

Non-steroidal anti-inflammatory drugs such as aspirin and ibuprofen produce analgesia, decrease inflammation and reduce fever. This class of drug inhibits COX-1 and COX-2 isoforms, thereby inhibiting the biosynthesis of prostaglandins in order to produce an anti-inflammatory effect. The use of NSAIDs may however result in upper gastrointestinal damage (Golar 2011).

Opioids such as Codeine produce morphine-like effects for patients experiencing moderate or severe pain. The use of Codeine is not recommended in children and asthmatics and can cause drug dependence. Opioids have a short-term analgesic effect for chronic LBP and can cause significant side effects, which include nausea, constipation, sedation, risk of falls, sexual dysfunction and depression (Golar 2011; Deyo, Von Korff and Duhrkoop 2015).

Clinical practice guidelines recommend beginning LBP treatment with low dosage analgesic options such as paracetamol and aspirin before moving to more powerful analgesics such as tramadol (Benzon 2011). However, a systematic review conducted by Machado *et al.* (2015) on the use of paracetamol for spinal pain found evidence indicating that paracetamol is ineffective in reducing LBP and disability when compared to placebo groups. It therefore questioned the use of paracetamol as a first line drug for LBP. Any potential benefits of NSAIDs and muscle relaxants should be weighed against the risk of harm (Maher, Underwood and Buchbinder 2017).

2.8.2 Topical treatment

Topical medication treatment, such as Capsaicin, is easy to use, usually in the form of an ointment or cream and can achieve a similar effect to that of oral medication for pain relief without systemic side effects. This type of treatment is applied directly to the skin, targets the

site of pain by allowing a higher local concentration of the drug, whilst keeping systemic absorption to a minimum (Khouzam 2000; McCarberg and D'Arcy 2007; Stanos 2007).
Advantages of topical treatment include easy application to the target site, reduced side effects, easy discontinuation in the event of adverse side effects, avoidance of hepatic metabolism, decreased drug level fluctuations and improved patient adherence to the drug. It is hence a viable alternative to oral medication (Stanos 2007; Moody 2010). However, disadvantages of topical treatments may include allergic reactions, skin irritation and in some instances certain medications have poor permeability through the skin (Moody 2010).

2.8.3 Heat therapy

The use of heat therapy is inexpensive for the treatment of varying medical conditions and may be used by practitioners as part of a treatment regimen. It can also be used as a self-treatment option, at home (French *et al.* 2006; Chou *et al.* 2018b; Freiwald *et al.* 2018). Heat therapy has many physiological effects which include: pain relief, increased tissue temperature, increased blood flow, increased conduction of nerve impulses , increased metabolism, improved elasticity of connective tissues, improved relaxation of the treated area and decreased muscle spasms (Kim *et al.* 2015; Malanga, Yan and Stark 2015; Freiwald *et al.* 2018). A study conducted by Nadler *et al.* (2003) found that heat therapy had a greater effect than a placebo in relieving pain, improving range of motion, decreasing muscle tension and decreasing disability.

There are two types of heating, superficial heating and deep heating. Superficial heat is used as a second line or adjunctive treatment option in treating LBP and works by conveying heat by convection or conduction. This method has the best effect at 0.5 cm or less from the skin surface and elevates the temperature of the tissues. Superficial heating includes methods much as heat pads, heat wraps, hot water bottles, grain filled soft heated packs, heated stones, hot baths, saunas and infra-red heat lamps (French *et al.* 2006; Foster *et al.* 2018). Deep heating involves the conversion of energy to heat using ultrasound, microwave diathermy or shortwave diathermy (French *et al.* 2006).

2.8.4 Chiropractic

Chiropractors specialize in the holistic treatment of musculoskeletal disorders. They focus on the diagnosis, treatment and prevention of neuromusculoskeletal disorders and how these may affect general health. Chiropractors help to preserve the body’s integrity by directing their

treatment approaches on the connection between the nervous system and the spine by involving an array of treatment and management strategies (Ailliet, Rubinstein and de Vet 2010; Chou *et al.* 2018a).

Chiropractors commonly use spinal manipulative therapy which involves the application of a high-velocity, low-amplitude thrust to the spine by hand or with an instrument. This manipulation causes the vertebra to move beyond its normal physiological range of movement, however, does not exceed the boundaries of its anatomical integrity. This causes a brief deformation of the spine and the surrounding soft tissues to cause a cavitation of the facet joints, thereby eliciting a direct neurological pain-reducing effect, due to the physiologic pain-modulating mechanisms being evoked through this process (Millan *et al.* 2012; Coulter *et al.* 2002).

In addition to spinal manipulative therapy, chiropractors may include other treatment techniques such as mobilization, traction, soft tissue and trigger point therapy, dry needling, electro-modalities as well as bracing and supports for the affected area (Coulter *et al.* 2002; Rubinstein *et al.* 2010; Ernst and Posadzki 2011).

2.8.4.1 Mobilization and traction

Mobilization is when the selected joint is taken to its end range of motion but is not taken to its passive limit. Traction is also a non-invasive method of relieving pressure within the intervertebral disc by creating zero gravity inside the disc, thereby decreasing pressure in the affected area (Millan *et al.* 2012; Oh *et al.* 2017).

2.8.4.2 Soft tissue and trigger point therapy

Soft tissue therapy involves manually lengthening shortened facia. It also involves releasing scar tissue adhesions through deep muscle massage, cross-frictional massage, myofascial release and ischemic compression. Trigger point therapy involves treating an active myofascial trigger point through dry needling, ischemic compression, muscle energy techniques and massage in order to alleviate pain (Shah *et al.* 2015; Smith, Olivas and Smith 2019).

Dry needling is the insertion of a single, sterile needle into a myofascial trigger point which inhibits the transmission of pain impulses on unmyelinated axonal C-fibres. When the needle is inserted into the skin, A-delta fibres are activated resulting in the inhibition of the C-fibres,

thereby initiating relaxation of the myofascial trigger point muscle. The benefits of dry needling include pain relief, decreased muscle tension, improved muscle strength and increased range of motion (Unverzagt, Berglund and Thomas 2015; Rodríguez-Mansilla *et al.* 2016; Fernández-de-Las-Peñas and Nijs 2019).

2.8.4.3 Electro-modalities

Electro-modalities are commonly used treatment adjuncts in clinical practice and include modalities such as transcutaneous electrical nerve stimulation (TENS), interferential current (IFC), therapeutic ultrasound (US), and infrared radiation (IRR) (Rasul *et al.* 2014).

Transcutaneous electrical nerve stimulation (TENS) creates an afferent barrage of nerve impulses within the spinal cord through the activation of afferent A-beta fibres through pulsed high frequency stimulation which inhibits the transmission of nociceptive neurons, therefore eliciting an analgesic effect (Astokorki and Mauger 2017; de Almeida *et al.* 2018).
Interferential current (IFC) reduces pain transmission by using alternating currents which activates the gate control mechanisms, which results in increased circulation and endorphin release (Astokorki and Mauger 2017; de Almeida *et al.* 2018). When endorphins are released, they interact with the opiate receptors in the brain, thereby reducing pain perception (Sprouse-Blum *et al.* 2010).

Therapeutic ultrasound (US) decreases muscle spasms through a thermal effect. This effect is achieved when electrical energy is converted into an acoustic waveform which is transformed into heat as it passes through tissue (Adhya *et al.* 2013).

Infrared radiation is electromagnetic radiation giving rise to heat when absorbed by tissues. It reduces pain, decreases metabolites, increases blood flow and increases cell activity. Advantages of this include increased range of motion, increased tissue extensibility and enhancement of the healing of soft tissue lesions (Ojeniweh, Ezema and Okoye 2018).

2.8.4.4 Lumbar bracing

Lumbar bracing and supports are used to manage and prevent LBP by limiting spinal motion, stabilizing the spine, correcting spinal deformity and decreasing mechanical uploading (Jellema *et al.* 2001; Morrisette *et al.* 2014). However, there are some disadvantages of this technique,

which include: muscle deconditioning/wasting, skin lesions and gastrointestinal disorders (Anders and Hübner 2019).

2.8.5 Physiotherapy

Physiotherapists assess the clinical presentation of each patient in order to select the type of treatment protocol to be used on a patient. They decide on the type of treatment for the patient as well as the duration and frequency of treatment based on the patient's clinical presentation (Moseley 2002; Orozco *et al.* 2017). Physiotherapy combines manual therapy, exercise and education of posture correction to treat LBP. However, treatment is normally used in conjunction with analgesic medication (Moseley 2002; Frost *et al.* 2004; Morris *et al.* 2016). Manual therapy consists of joint manipulation, joint mobilization and manipulation or kneading of muscles (Bishop *et al.* 2015). Physiotherapy is perceived by patients as being helpful for injuries, reducing stiffness, strengthening muscles, promoting health and weight loss (Chou *et al.* 2018a).

2.9 Conclusion

A multitude of epidemiological studies have been conducted in various countries around the world which suggests that LBP represents a global burden. The impact of LBP specifically within the waitron profession has not been given enough attention in the literature as little research has investigated the prevalence of LBP in the waitron profession. There is a paucity in the literature regarding work related to LBP in waitron staff in South Africa which suggests a need to establish the prevalence of LBP, occupational risk factors for developing LBP and its impact on the waitron profession in full time restaurant waitron staff within South Africa.

CHAPTER THREE: METHODOLOGY

3.1 Introduction

The materials and methods used to conduct the research study are described in this chapter. Attention is paid to the type of research and its design, the procedures followed, the research tools, sampling process, ethical considerations, and the methods used for statistical analysis.

3.2 Research design

This study is a mixed methods study comprising of qualitative and quantitative components, where qualitative information can be used to enhance quantitative findings, by providing in depth explanations (Fetters, Curry and Creswell 2013). Mixed method studies provide an improved understanding of research issues instead of using either quantitative or qualitative approaches alone. A quantitative method is used to test and confirm hypotheses, whereas a qualitative method is used to explore and obtain depth of understanding of a research issue (Palinkas *et al.* 2011).

A quantitative research approach focuses on counting data (USC 2017), which is used when a phenomenon is studied in terms of quantity. Cross-sectional studies use data from many participants and focus on finding relationships between different variables (Barratt and Kirwan 2009). Kothari (2004) states that this is the best design to evaluate specific answers to specific questions, which in this context consists of the nature, severity, impact, and the clinical presentation of LBP in full-time restaurant waitron staff within the eThekwini Municipality.

A qualitative research method is used to collect emerging and open-ended data in order to develop themes which allow an exploratory nature to take place in a study (Campbell 2014).

3.3 Study location

The study was conducted within the eThekwini Municipality of KwaZulu-Natal, South Africa. The eThekwini Municipality is the largest city within the province and is the third largest city in the country. The total population size consists of 3 442 398 people, as reported in the last population Census (Stats SA 2011), with the total land area of the eThekwini Municipality being 2,297 km2, which is larger than all other South African cities (eThekwini Municipality 2011).

3.4 Study population

The target population included 2 916 full-time restaurant waitron staff employed at dining restaurants within the eThekwini Municipality. This population group was selected to determine the risk factors, nature, severity, and impact of work-related LBP in waitron staff. Both genders and all race groups were included, if participants qualified according to the inclusion and exclusion criteria.

3.4.1 Inclusion criteria

- Full-time waitron staff at dining restaurants within the eThekwini Municipality.
- Waitrons who worked a minimum of five shifts a week, resulting in 40 hours a week.
- Participants needed to be over the age of 18 years.
- Those who read the information form and signed a consent form.

3.4.2 Exclusion criteria

- Waitron staff that were not at work on the day of data collection.
- Those who participated in the pilot study

3.5 Sample size

The total population, of 2 916 full-time waitrons was determined by telephonically contacting all dining restaurant managers within the eThekwini Municipality. Using the total population size of 2 916 full-time waitron staff, a 6.65 percent margin of error and a 95% confidence interval, a sample size of 180 was calculated by a statistician, for the quantitative component of the study (Esterhuizen 2019). A sample size of 180 produces a two-sided 95% confidence interval with a width equal to 0.133 when the sample proportion is 0.706 (Esterhuizen 2019). For the qualitative component, two focus group interviews were conducted with four participants in each group, therefore eight participants were interviewed in total. The sample size was guided by saturation and eight interviews were enough to reach saturation in a homogenous sample as no new ideas or themes emerged from the interviews (Guest, Bunce and Johnson 2006).

3.6 Sampling strategy

A list of restaurants within the eThekwini Municipality was created to make up the population, and restaurants were selected randomly by a ballot method. Random sampling is a form of probability sampling which involves sample members being selected by chance (Setia 2016). All full-time waitrons at the selected restaurants were included in the sample. Sampling continued until the full sample size was reached.

Sampling for the qualitative component commenced with purposive sampling, followed by snowball sampling. Purposive sampling is used to identify and select knowledgeable or experienced individuals or groups of individuals regarding a phenomenon of interest (Creswell and Plano Clark 2018). Snowball sampling allows the first set of recruited participants to identify acquaintances who would be familiar with the subject of interest, hence the first set of participants were recruited by the researcher and the subsequent participants were recruited by the first set (Naderifar, Goli and Ghaljaei 2017). Four participants were purposefully chosen, and four participants were recruited by snowball sampling.

3.7 Participant recruitment

A letter of information regarding the research was sent to 40 restaurant owners, to seek permission to conduct the study among their waitron staff (Appendix A). Participants were recruited by the researcher once permission was granted by the restaurant owner. The study was initially explained verbally to all potential participants, who were also provided with a written letter of information (Appendix B). Those willing to participate were required to sign a consent form (Appendix C). Participation in the study was voluntary and no-one was coerced into participating in the study. After receiving the signed informed consent, the questionnaire (Appendix D) was given to the participant for the quantitative component of the study. Each participant could take the questionnaire away for completion in privacy and subsequently place it into a sealed ballot box, which was left at the restaurant. The researcher returned at an appointed time to collect the completed questionnaires. For the qualitative component, face-to-face, semi-structured interviews were conducted using a question guide (Appendix E). Participants did not receive any remuneration or other incentive and were free to decline participation or to withdraw from the study at any point without any adverse consequences.

3.8 Research procedure

3.8.1 Quantitative

The research tool for the quantitative component was a self-administered questionnaire (Appendix D). The researcher distributed the relevant number of questionnaires for full-time waitron staff employed at each selected restaurant. Those who were willing to participate were required to complete the 15-minute questionnaire in their own time. The researcher monitored the number of questionnaires completed at regular intervals to establish if the target sample size had been achieved.

3.8.2 Qualitative

The research tool for the qualitative component consisted of audio recorded semi-structured interviews, following an interview guide, to obtain information on LBP from participants. No pre-existing interview guide was available, and hence the researcher generated an interview guide with questions that were considered relevant and specific to the experiences of waitrons with LBP in the eThekwini Municipality. The interview questions were phrased in order to receive open-ended responses which allowed the participants to offer as much information as possible, whilst permitting the researcher to ask probing questions (Appendix E). Open-ended questions allow the participants to reveal information in areas of the study that may not have been predicted by the researcher which may be useful when complex issues are studied (Yilmaz 2013).

All data was collected from 20/11/2018 to 16/12/2019.

3.9 Questionnaire development

The questionnaire was modified from a previously validated questionnaire on generalised LBP (Appendix F), used in a study done by a Durban University of Technology student, Khumalo (2017). A formal letter was sent to the student requesting permission to use the questionnaire (Appendix G) and approval was given by the student (Appendix H). The questionnaire was reviewed, and some changes were made to make it more relevant for waitron staff. Questions that were irrelevant to the target population were deleted.

3.9.1 Validity and reliability

Validity of a research tool refers to the extent to which the tool measures what it is required to measure and consistently has the same outcome, if it is used in the same situation on multiple instances. Reliability is the research tool's ability to acquire consistent results every time the tool is used (Delport and Roestenburg 2011; Heale and Twycross 2015).

An expert group discussion comprising six people was conducted to determine the validity of the questionnaire (Fowler 1995). The expert group comprised the researcher, the supervisor, two waitron staff suffering from LBP, one practicing chiropractor, and one person with research experience. All these participants signed an informed consent form and a confidentiality agreement (Appendix I) prior to participating in the group discussion. A pre-expert group questionnaire was given to each participant (Appendix J). The expert group discussions were audio-recorded, and all information discussed was kept confidential. Recommended changes post expert group discussions were made to the questionnaire, such as moving questions from one section to another section, elaborating of questions for ease of reading for the participant and including more options for multiple choice questions.

Different styles of questioning were used in the final questionnaire. The types of questions that were present varied from open-ended questions, multiple choice questions, dichotomous (yes/no options), and questions that required answers on a Likert scale. This allowed for structured and open-ended questions which increased the reliability of the questionnaire (Struwig and Stead 2001). The questionnaire was divided into three sections in order to obtain the desired data for this study. The sections included demographics (biographical information), risk factors, and clinical characteristics of LBP.

A pilot study is used for the improvement of the efficiency and quality of the main study to ensure reliability (In 2017). The pilot study, which consisted of 5 participants from the study population, received the questionnaire to test the reliability and validity of the questionnaire. Minor changes were made to some questions for better understanding of those questions.

3.10 Data analysis

3.10.1 Quantitative data

The raw data for the quantitative component was coded and exported into a Microsoft Excel spreadsheet. This was subsequently transferred onto Statistical Package for the Social Sciences (IBM® SPSS® Statistics) Version 25 software for data analysis, with the assistance of a biostatistician, T Esterhuizen. Descriptive statistics such as frequencies and percentages were used to describe categorical outcomes while mean (± standard deviation) and range (where relevant) were used to summarise continuous normal variables. Median (and range) was used to summarise continuous skewed variables or ordinal variables. To assess factors associated with LBP, those with and without LBP were compared in terms of risk factors, using Pearson's chi square or Fisher's exact tests in the case of categorical variables, and t-tests for continuous variables (Lind, Marchal and Mason 2004). Where the univariate *p* value was < 0.05, those variables were entered into a binary logistic regression model using backward selection to eliminate non-significant predictors until a final model was reached where only significant predictors remained. Odds ratios and 95% confidence intervals were reported.

Risk factors which were considered for inclusion in the multivariable logistic regression model included race, highest level of education, standing or walking, carrying more than one plate, number of plates carried while serving customers, slipping and falling, alcohol consumption and being diagnosed with HIV.

3.10.2 Qualitative data

3.10.2.1 Transcription, coding and entering of interview data

The audio recordings were transcribed verbatim by the researcher into a Microsoft Word document by listening to the interview audio recordings. The transcriptions and audio recordings were sent to the researcher's supervisor to verify the interview conclusions and furthermore establish that no valuable information was omitted.

Interview participants were assigned participant numbers to protect their identities and to maintain confidentiality. The participant numbers used reflected the individual waiter

designation and placement in the sequence of the eight interviews. The numbering sequence was as follows:

1. Waitron designation (P = waitron).
2. Placement within the 8 pairs of interviews (1,2,3, up to 8).

Thematic analysis was used to analyse the qualitative data to identify common themes, ideas, topics and patterns that arose repeatedly (Vaismoradi, Turunen and Bondas 2013). Thematic analysis is a process whereby patterns or themes are identified within qualitative data (Braun and Clarke 2006). The transcripts were read by the researcher to get a sense of the data. Key paragraphs were identified within the transcripts which covered areas of interest and these areas of interest were grouped together and analysed in context of all the transcripts to form themes and subthemes.

3.11 Ethical considerations

Ethical approval to conduct this study was obtained from the Institutional Research and Ethics Committee (IREC 152/18) (Appendix K) at the Durban University of Technology (DUT) after submitting the research proposal (Appendix L). Approval from restaurant owners was obtained prior to distribution of questionnaires to the waitron staff. Participation in the study was completely voluntary and the prospective study participants were free to refuse participation and were able to withdraw from the study at any point in time.

All participants were treated equally and fairly in respect of justice. Participants were required to provide written informed consent prior to answering the questionnaire, in respect of autonomy. Participants' and restaurants' names were not included in the questionnaire to ensure anonymity and confidentiality. Only the researcher, statistician and supervisor had access to the data obtained from the questionnaire. The researcher analysed and reported on the data objectively. None of the study participants received any form of remuneration. The completed questionnaires and signed consent forms were collected in separate sealed ballot boxes to protect the participants in the form of nonmaleficence by inflicting the least amount of harm to reach an advantageous outcome.

When the qualitative study was administered to the focus group, the members were requested to sign a confidentiality letter to ensure the confidentiality of the research study content/questionnaire.

The results of the study will be made available in the form of a completed dissertation at the Durban University of Technology, in respect of beneficence. Any participant or restaurant owner who requests the results, will be provided with a copy of the dissertation.

CHAPTER FOUR: RESULTS

4.1 Introduction

The aim of this chapter is to present the results that were obtained from the quantitative and qualitative components of the study. The quantitative aspect consisted of a self-administered questionnaire, whereas the qualitative aspect consisted of semi-structured focus group interviews.

4.2 Quantitative study

At the start of the study, 340 questionnaires were distributed to consenting participants. A total of 180 responses were received from participants resulting in a 52.9% response rate.

4.2.1 Demographics

As shown in Table 4.1, 180 waitrons participated in the quantitative study, where the study population comprised of more females (54.4%; *n* = 98) than males (45.6%; *n* = 82). The mean age of the participants was 26 ± 6 (mean ± SD) years and there was a significant difference in age between males and females (*p* = 0.004). The mean body mass index (BMI) of the participants was calculated as 24.61 ± 5.15 kg/m2 and was not different between males and females (*p* > 0.05, Table 4.1).

Table 4.1 Demographic characteristics of participants

	Gender		
	Female (*n* = 98)	Male (*n* = 82)	Total (*n* = 180)
Age (Mean ± SD)	25 ± 6	27 ± 7	26 ± 6
BMI	24.40 ± 5.56	24.86 ± 4.64	24.61 ± 5.15

Over half of the participants were White (52.8%; *n* = 95), and over a quarter were Black African (27.8%; *n* = 50). The ethnic distribution of the participants is indicated in Table 4.2.

Table 4.2 Ethnicity of participants

Race	Female *n* (%)	Male *n* (%)	Total *n* (%)
Black African	25 (25.5)	25 (30.5)	50 (27.8)
Coloured	5 (5.1)	5 (6.1)	10 (5.6)
Indian	13 (13.3)	12 (14.6)	25 (13.9)
White	55 (56.1)	40 (48.8)	95 (52.8)
Total	98 (100.0)	82 (100.0)	180 (100.0)

Figure 4.1 represents the marital status of the participants. There were more single (70.6%; *n* = 127) participants than those who were married (8.9%; *n* = 16), divorced (3.9%; *n* = 7) or cohabitating (16.7%; *n* = 30).

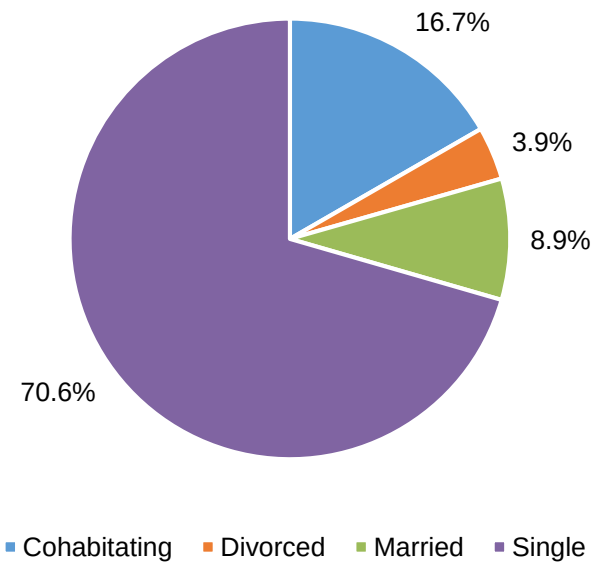

Figure 4.1 Marital status of participants

Most of the participants had some form of education which included tertiary education (55.6%; *n* = 100), matriculation (35.0%; *n* = 63) or primary school education (9.4%; *n* = 17). Figure 4.2 represents the duration of employment within the waitering profession, where 28.9% (*n* = 52) had been working in the waitering industry for five years or more.

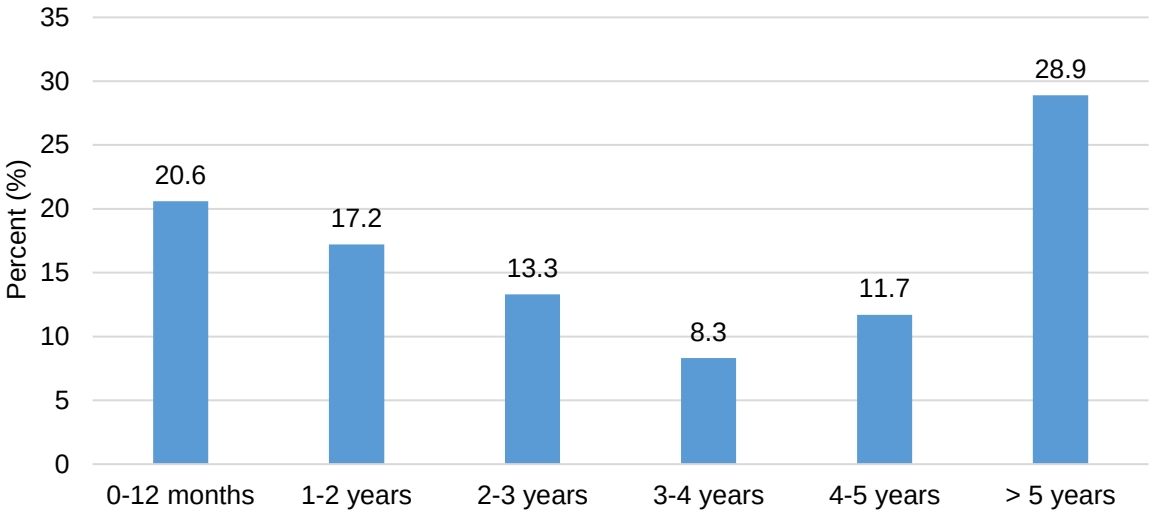

Figure 4.2 Duration of employment of participants

More than half of the participants (55.0%; *n* = 99) did not have any form of health insurance or medical aid, however two-thirds of the participants (68.9%; *n* = 124) felt that they had sufficient access to health care services.

There was a significant difference between genders regarding duration of employment, with males being employed for longer than females (33 *vs* 19; *p* = 0.041). It must be noted that the males were also significantly older than females (Table 4.1). Females were more likely to have medical aid than males (*p* = 0.003), and therefore reported better access to health services (*p* = 0.036).

4.2.2 Prevalence of low back pain

Table 4.3 represents the prevalence of LBP amongst waitron staff. Half of the participants (50.0%; *n* = 90; *p* = 0.231) experienced current LBP, 62.2% (*n* = 112; *p* = 0.063) experienced LBP in the last three months and 72.8% (*n* = 131; *p* = 0.216) experienced LBP in the last 12 months, of which 76.5% (*n* = 75) were female. There was no difference between genders regarding current, 3-month and 12-month LBP (Table 4.3).

Table 4.3 Prevalence of low back pain in waitron staff

	Female *n (%)*	Male *n (%)*	Total *n (%)*	*p* Value
Point Prevalence	53 (54.1)	37 (45.1)	90 (50.0)	0.231
Prevalence in last 3 months	67 (68.4)	45 (54.9)	112 (62.2)	0.063
Annual prevalence	75 (76.5)	56 (68.3)	131 (72.8)	0.216

4.2.2.1 Nature, severity and clinical presentation of low back pain

The results of those who had experienced LBP in the last 12 months were selected for further analysis (*n* = 131). On average, the LBP session lasted between one to two hours (24.4%; *n* = 32), and the frequency of LBP experienced was on average two to three times a week (33.6%; *n* = 44). Figure 4.3 illustrates causes of possible injuries to the low back. Over half the participants (53.4%; *n* = 70) reported no injury to the low back.

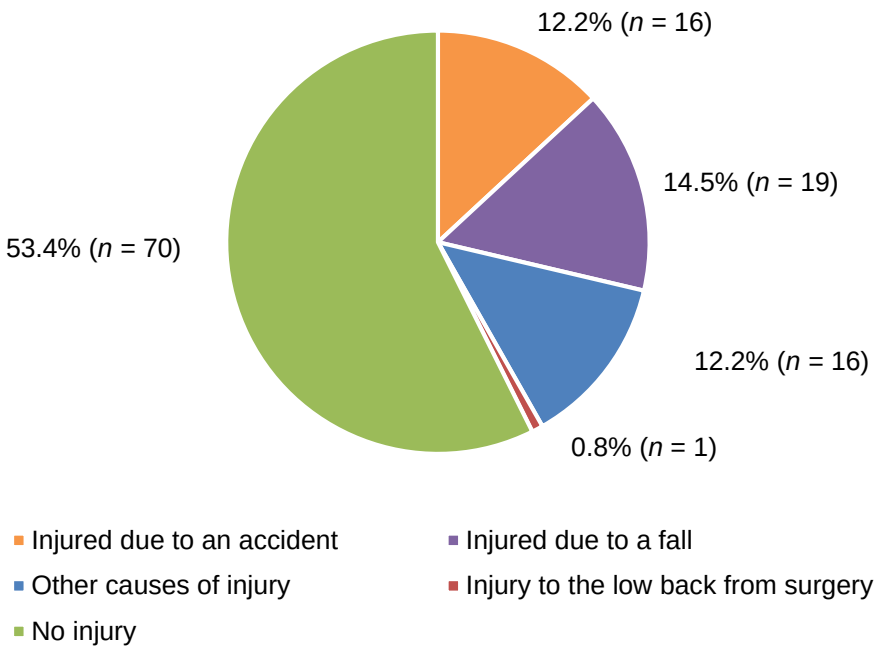

Figure 4.3 Causes of possible injury to the low back

Almost half the participants recorded that LBP was usually at its worst in the evening (49.5%; *n* = 55). The participants found their LBP began gradually without injury (65.8%; *n* = 73), and that the severity of LBP was unchanged since it first began (64.9%; *n* = 72).

Low back pain impacted on participants' work. Figure 4.4 illustrates the difficulty in performing tasks as a result of LBP. Some difficulties experienced as a result of the LBP included bending (43.5%; *n* = 57), standing (36.6%; *n* = 48) and lifting heavy items (35.9%; *n* = 47).

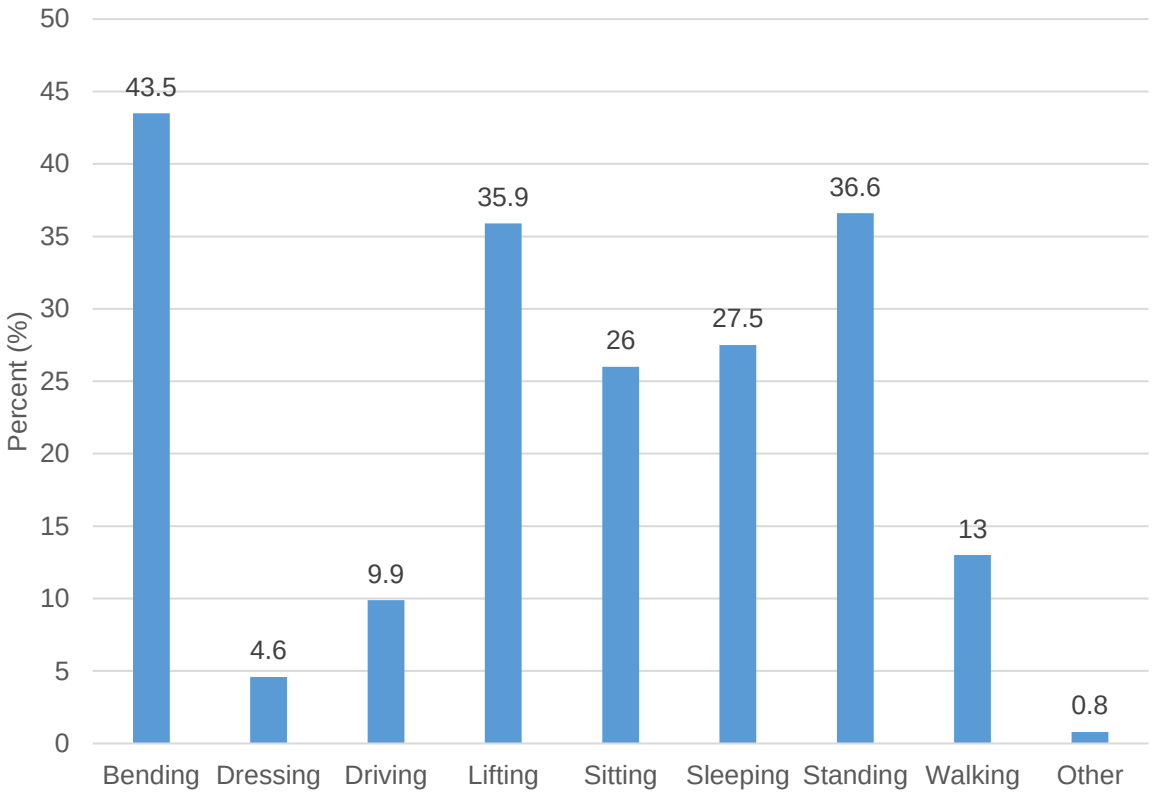

Figure 4.4 Task difficulties as a result of low back pain

The median age at which participants first recalled their LBP was at 18 years (range: 1-36). The participants were asked to score their LBP using a pain rating scale as illustrated in Figure 4.5, where zero indicated no pain experienced and ten indicated worst pain experienced. The median pain rating was five (range: 1-10).

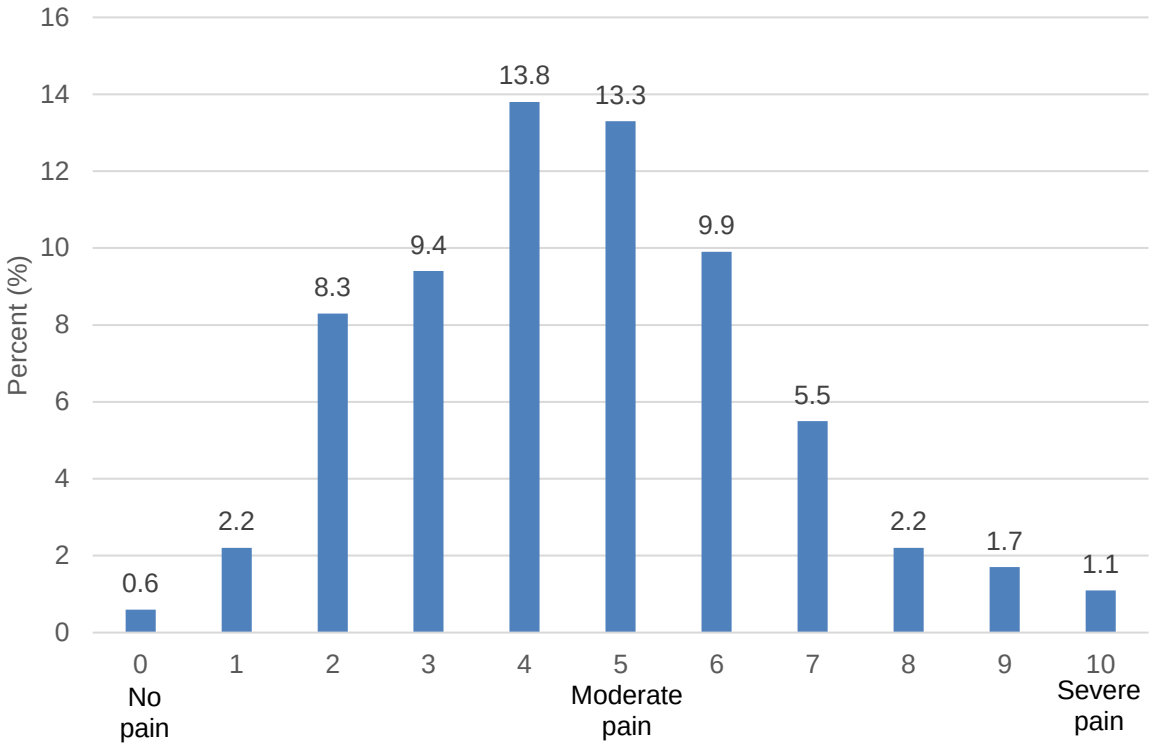

Figure 4.5 Frequency of pain rating scale

4.2.3 Factors associated with low back pain

Low back pain was associated with the ethnicity of the participants (p=0.002). Multivariate logistic regression indicated that Indians had a 7.7 times increase in the odds of prevalent LBP compared with Africans (OR = 7.713; 95% CI = 1.273-46.718; p = 0.026) and Whites a 5.9 times increase in the odds of prevalent LBP than Africans (OR = 5.891; 95% CI = 1.429-24.289; p = 0.014). Low back pain was associated with the education of the participants (p = 0.002) and multivariate logistic regression showed that those with high school education had an almost 12 times increased in the odds of prevalent LBP than those with tertiary education (OR = 11.967; 95% CI = 1.399-102.387; p = 0.023). Factors associated with LBP are illustrated in Table 4.4.

Factors such as age (p = 0.274), BMI (p = 0.320), gender (p = 0.216), marital status (p = 0.419), employment duration (p = 0.303), having medical aid (p = 0.305) and access to health care services (p = 0.525) were not associated with LBP. There was no association between LBP and working single (p = 0.104) or double shifts (p = 0.409).

More participants who were standing and/or walking for long periods of time during their work (74.7%; *n* = 130) experienced LBP compared to those who did not stand / walk for long periods (25.3%, *n* = 44; *p* = 0.002). Multivariate logistic regression indicated that standing or walking during the work shift increased the odds of experiencing LBP by 43 times (OR = 42.808; 95% CI = 2.346-780.985*; p* = 0.011; Table 4.4).

More of those who carried more than one plate at a time reported LBP (93.5%; *n* = 58) compared to those who did not do so (61.9%; *n* =73; *p* < 0.001). Multivariate logistic regression indicated that participants who carry more than one plate had 3.8 times higher odds of experiencing LBP (OR = 3.802; 95% CI = 0.862-16.776; *p* = 0.078; Table 4.4).

Table 4.4 Odds of reporting factors associated with low back pain

	OR (95% CI)	***p* Value**
Race		
Black African*	1.00	1.00
Indian	**7.713 (1.273; 46.718)**	**0.026**
White	**5.891 (1.429; 24.289)**	**0.014**
Coloured	1.533 (0.150; 15.681)	0.719
Highest level of education		
Tertiary*	1.00	1.00
Matric	0.782 (0.246; 2.485)	0.677
High school	**11.967 (1.399; 102.387)**	**0.023**
Work related factors		
Sitting*	1.00	1.00
Standing or walking	**42.808 (2.346; 780.985)**	**0.011**
Carrying one plate at a time*	1.00	1.00
Carrying more than one plate	**3.802 (0.862; 16.776)**	**0.078**

* Referent category

Significant associations shown in boldface (*p* < 0.05)

There was no relationship between footwear and LBP. Participants (65.6%; *n* = 118; *p* = 0.146) indicated they were required to wear a certain type of shoe, where 30.0% (*n* = 54) of women and 17.2% (*n* = 31) indicated they were required to wear sneakers/trainers. When asked if their shoes were comfortable to work in, 81.7% (*n* = 147; *p* = 0.085) of the population indicated their

shoes were comfortable to work in. Other factors such as falls (87.1%; *n* = 54; *p* = 0.002) were also linked with experiencing LBP.

There was no relationship between smoking and LBP within this sample population (*p* = 0.710). There was no relationship between the number of participants who consumed alcohol and experienced LBP (*p* = 0.073). There was also no relationship between participation in exercise and LBP (*p* = 0.400).

Some participants with a 12-month prevalence of LBP also suffer with other minor pre-existing medical conditions which include arthritis (1.1%; *n* = 2), depression (12.2; *n* = 22), diabetes mellitus (0.6%; *n* = 1), hypertension (1.7%; *n* = 3), HIV infection (1.1%; *n* = 2), meningitis (2.2%; *n* = 4) and tuberculosis (0.6%; *n* = 1). As the number of participants who had each of these conditions was very small, no further analysis of these conditions with LBP were conducted. As these may have been confounding factors for LBP, they were excluded from the multivariate logistic regression, reported in the previous paragraphs.

4.2.4 Impact of low back pain

Almost half of the participants with LBP reported that it had a moderate impact on their work (49.1%, *n* = 54), whilst 10.9% (*n* = 12) reported that their LBP had no impact on their work. Absenteeism from work due to LBP was reported by 17.1% (*n* = 19) of the participants and the number of days absent ranged between one day (40.0%; *n* = 8) and two to three days (50.0%; *n* = 10). Of these participants, 78.9% (*n* = 15) had been bed-ridden due to their LBP and 31.6% (*n* = 6) were bed-ridden on average for a duration of one to two days. Few participants had to change their job due to LBP (3.6%; *n* = 4), however none of the participants lost their job due to LBP.

4.2.5 Treatment for low back pain

More than half (60.4%; *n* = 67) of the participants were treated for their LBP. Figure 4.6 indicates that the most common treatment sought for LBP was from a chiropractor (32.1%, *n* = 42), followed by a general practitioner (20.6%, *n* = 27), physiotherapist (16.0%, *n* = 21) and a pharmacist (13.0%, *n* = 17).

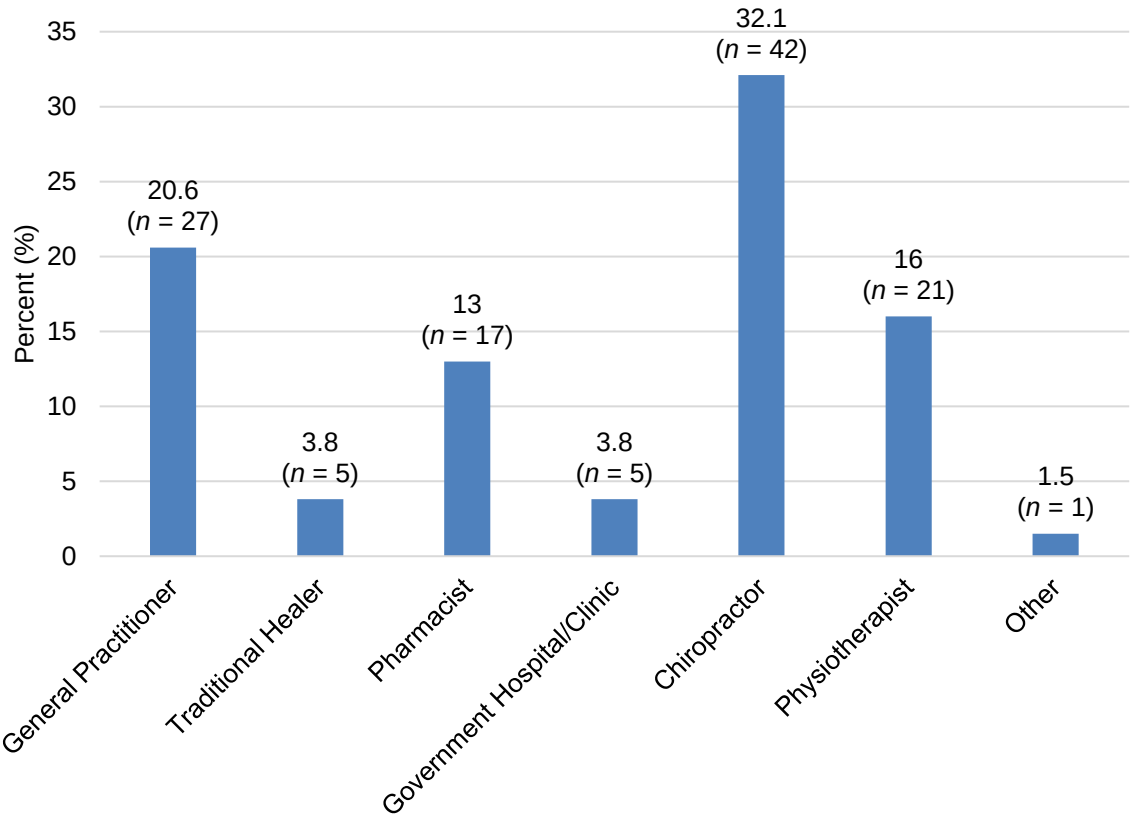

Figure 4.6 Practitioner from whom the participant received treatment for low back pain

Almost half the participants (43.5%, *n* = 30) felt that chiropractic treatment provided the most amount of pain relief for LBP. Treatment by a general practitioner (18.8%, *n* = 13) and a physiotherapist (15.9%, *n* = 11) was also beneficial for LBP. Participants were asked if they would consider chiropractic treatment and 65.8% (*n* = 73) responded that they would consider visiting a chiropractor for their LBP. Some participants reported they would consider visiting a chiropractor for pain relief for their LBP (12.8%, *n* = 23). Participants who had previously seen a chiropractor for treatment of conditions other than LBP experienced positive results and therefore would consider visiting a chiropractor (10.0%, *n* = 18), whilst other participants wanted to have their pain effectively treated by a chiropractor (8.9%, *n* = 15).

Common responses against visiting a chiropractor included the participants not being in enough severe pain to warrant chiropractic treatment (5.0%, *n* = 9), treatment being too expensive (4.4%, *n*= 8) and not knowing what a chiropractor is (3.9%, *n* = 7).

More than half of the participants had used pain-relief medication (analgesics) (56.5%, *n* = 74), almost half had used anti-inflammatories (46.6%, *n* = 61) and over a third used a wheat bag (35.9%, *n* = 47) to relieve LBP. Many participants had used a variety of medications and all these pain-relieving medications are indicated in Figure 4.7 below.

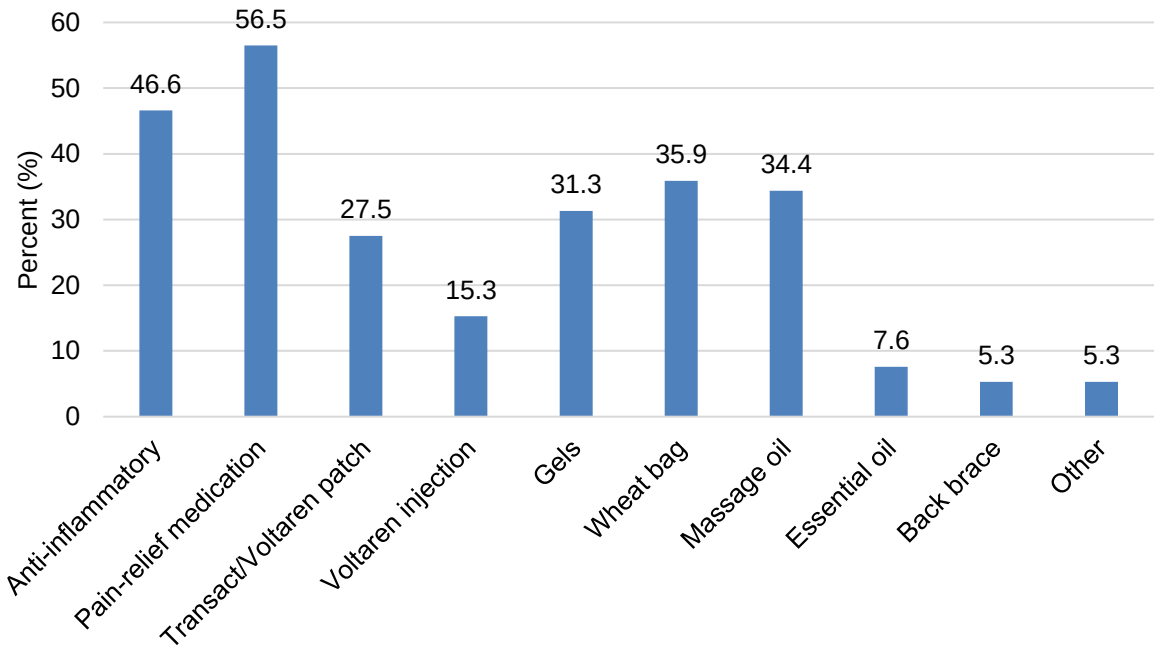

Figure 4.7 Medication used for treatment of low back pain

The medications that were reported to provide the most relief included analgesics (29.0%, *n* = 38), anti-inflammatories (26.0%, *n* = 34) and topical gels (14.5%, *n* = 19). The monthly costs related to medication for LBP were low. More than half of the participants spent less than R100 on medication for their LBP (52.2%; *n* = 58), while only 19.8% (*n*=22) spent more than R100. More than a quarter (27.9%; *n* = 31) did not have any monthly costs related to LBP.

Costs related to treatment for other conditions, besides LBP, were also low. Less than a quarter of the participants (20.7%; *n* = 23) spent over R200 per month, while more than half (56.8%; *n* = 63) had no monthly costs for other ailments.

4.3 Qualitative interviews

4.3.1 Demographics

Eight participants took part in two focus group interviews, comprising of four participants each. Saturation was reached at this point and hence further interviews were not necessary. Six participants were male (75.0%) and two were female (25.0%). The mean age of the participants was 28.25 ± 6.87 years (mean ± SD; Range:19-41).

4.3.2 Themes

Three main themes emerged from the data. These were: low back pain characteristics and knowledge of chiropractic. Sub-themes emerged from each of the themes as indicated in the sections that follow. Verbatim quotations are included in order to support the results.

4.3.2.1 Theme one: Low back pain characteristics

This theme contained three sub-themes pertaining to the characteristics of LBP which included the pain onset, severity of pain and causes of LBP.

4.3.2.1.1 Pain onset

All the interviewed participants (100.0%, *n* = 8) were experiencing LBP at the time of the interviews. They mentioned that the LBP started when they were young adults. An older participant reported that the pain started when he was a teenager.

"It started when I was 18, so that's about 18 years ago." [P5]

Younger participants mentioned a more recent onset of the LBP.

"About 2 years ago." [P1]

"It started 3-4 years ago." [P8]

All the participants reported that their LBP either started during their shift, usually about three hours after the shift had commenced. Onset was common during a long single shift or when working a double shift.

"Three hours into my shift, it starts. My shifts are about six and half to seven hours a day." [P3]

"After a long shift. Usually about three to four hours into the shift of working a 12 to 14 hour shift." [P4]

"….. its more along the double shifts." [P6]

4.3.2.1.2 Severity of pain

Participants reported that the severity of pain increased as soon as the shift was complete.

"And especially when you get home after work, then it's the worst it's been because the body's like, relaxed a bit more and the pain is probably worse then." [P8]

4.3.2.1.3 Causes of low back pain

All the participants agreed that their duties as a waitron were the cause of their LBP. Work activities which aggravated the participant's LBP included prolonged standing and lifting or carrying heavy objects.

"As I mentioned, generally just carrying multiple plates all the time and serving large amounts of customers throughout the day. Carrying plates and beverages, having to clear large amounts of plates." [P1]

"Whenever we get deliveries from our suppliers, carrying the boxes to the kitchen obviously, carrying around the plates and beverages also takes huge strain." [P3]

"Ah yeah, it does, especially when standing. I, uh, I've found that if I'm busy at work then I'm like running, then my back pain is less at the end of the day than if I'm standing around a lot." [P5]

"Well, also if you're picking up heavy objects it will get worse. Also, with the standing, I find if I sit down after a couple of hours it releases a bit of the pressure. If I don't, the pain keeps on going." [P6]

Although the latter participant (P6), felt that sitting for a few hours relieved the pain to some extent, other participants reported that the pain got worse after the shift ended, when they returned home.

"Uhm, anything from just walking. Even when I'm standing, I think when you stand, and you rest it actually gets worse. And especially when you get home after work, then it's the worst it's been because the body's like, relaxed a bit more and the pain is probably worse then." [P8]

The quality of shoes worn by staff was related to walking and standing for prolonged periods of time, Participants reported that wearing poor quality shoes aggravated the back pain.

"….. and eventually bad footwear" [P1]

The floor surface of the restaurant also had an effect in causing pain.

"I think it's worse working on a concrete floor, like being on a hard floor does make it worse" [P5]

4.3.2.2 Theme two: Types of treatment

This theme contained six sub-themes which were general pain-relieving mechanisms, chiropractic treatment, knowledge of chiropractic, awareness of chiropractic services, types of chiropractic treatment and education of chiropractic.

4.3.2.2.1 General pain-relieving mechanisms

Various therapies were used to relieve the pain. These included analgesics, anti-inflammatories, heat therapy and topical gels.

"So, initially just with anti-inflammatories and pain killers up to a certain extent they worked." [P4]

"What I do is, uhm I rub Vicks on my lower back, and I think with the heat of the Vicks, it actually relieves the pain and the pressure." [P6]

When the heat therapy was not effective, anti-inflammatories were used to relieve the pain.

"I usually put a hot water bottle on my back because it seems to help for some reason. I don't know if it's just the heat. Uhm, or I take anti-inflammatory medication, and that usually helps. Uhm, and that's pretty much it." [P8]

4.3.2.2.2 Chiropractic treatment

Five of the participants had seen a chiropractor previously, either for their LBP or to treat another condition. They were satisfied with the services that they received and continue to visit a chiropractor regularly. Anti-inflammatories were often used in conjunction with chiropractic treatment.

"I generally seek assistance of a chiropractor in conjunction with pain medication like taking an anti-inflammatory." [P1]

"So, initially I treated the LBP with anti-inflammatories and pain killers, they worked up to a certain extent, but it passed a point where I couldn't get it sorted. I was referred to a chiropractor by word-of-mouth and found the treatment successful" [P4]

Only one of the participants reported that post chiropractic treatment, resulted in much discomfort and hence did not return for this treatment.

"I don't think it was worse, I think that was just probably from like being stretched and what not. I just don't know why I never went back." [P5]

4.3.2.2.3 Knowledge of chiropractic

This theme contained three sub-themes, which included awareness of chiropractic services, types of chiropractic treatment and education of chiropractic.

4.3.2.2.4 Awareness of chiropractic services

All the participants had some knowledge of the nature of a chiropractor and what kind of services are offered. Those who had been to a chiropractor before (*n* = 5) knew more regarding the profession than those who had never visited a chiropractor (*n* = 3). Of the many participants who had visited a chiropractor before, most had continued follow up treatments for their LBP.

"Uhm, yes. Like a little bit. I know the basics. Obviously, I don't know in depth what different procedures there are and different ways of treating, but I have a rough idea." [P8]

It was reported that the general public tends to have negative perceptions about chiropractic, which may deter people from using this form of treatment.

"The reason I left it for so long was due to the negative stereotypes created about chiropractic which was instantly changed after having the treatment." [P4]

The participants who had never visited a chiropractor before had misconceptions regarding the services offered by a chiropractor. These concerns included negative stereotypes created by the media regarding the profession as well as seeing it as an expensive treatment option.

"Generally scared of needles." [P2]

"Probably a cost aspect and, also probably a bit afraid. You see what's happening on TV and people crack their necks and bodies." [P6]

"Because usually it is quite expensive." [P8]

4.3.2.2.5 Types of chiropractic treatment

The participants who had visited chiropractors underwent an array of different treatment approaches to manage their LBP. These treatment options ranged from adjustments, dry needling, soft tissue therapy, electrotherapy and strapping.

"So, I went in for low back pain and he did multiple adjustments as well as using a muscle stimulant machine as well." [P1]

"Well, I had it (LBP) for 3 years. Like I said, about 2 months ago I was complaining about my back pain, my LBP, by word-of-mouth, I went to see a chiropractor and I had dry needling done together with electro-shock to calm or sort out the muscles in the lower back." [P3]

"It was a deep tissue massage followed by dry needling in multiple different locations to sort out what the back pain had caused, not only treating the back pain. This was followed by a lumbar adjustment and strapping to assist until I could rebuild the core strength which resulted in successful treatment and multiple follow ups which has consistently improved my outcome." [P4]

4.3.2.2.6 Education of chiropractic

The participants who did not know about chiropractic were educated on the different types of services offered by a chiropractor. Procedures such as adjustments, dry needling, soft tissue therapy, electrotherapy, the application of heat and cryotherapy were explained during the focus group discussion. Those participants who did not see a chiropractor due to the cost implications were told about the Durban University of Technology's Chiropractic Day Clinic, where members of the public are able to see senior chiropractic students at an affordable rate compared to the cost of seeing a chiropractor in private practice. After the education session, the negative opinions of the participants changed, and they felt that they would now consider visiting a chiropractor.

"I would be interested, yes." [P6]

CHAPTER FIVE: DISCUSSION

5.1 Introduction

This chapter will provide a discussion of the results presented in Chapter 4 and compare these results to similar studies conducted in local and international settings.

5.2 Demographic profile of participants

The mean age of the study population was 26 ± 6 years which was comparable to studies conducted on restaurant workers in other parts of the world. For instance, in Turkey the mean age was 21.3 ± 3.5 years and in India it was 28.23+11.01 years (Kokane and Tiwari 2011; Ilban 2013). Therefore, the age range of waitrons is comparable in different parts of the world.

Educational levels within the population were relatively high with most having a tertiary education (55.6%) or a matric certificate (35.0%). A study conducted by Ilban (2013) on restaurant staff in Turkey indicated that 54% of their staff were secondary school graduates. The high education levels within this study population is relevant to the high youth unemployment rate in South Africa. This result could possibly be due to skilled graduates unable to find employment after qualifying. Many tertiary education students also supplement their finances with part time employment such as working as waitrons in their spare time, particularly over weekends and in the evenings. This can account for the long shifts that many of them work.

The duration of employment within the sample population indicated that 28.9% of the participants had been working in the waitering industry for five years or more. These results show similarities with studies such as those of Chyuan *et al.* (2004) and Ilban (2013) who showed the mean average duration of employment as a waitron was 8.0 ± 8.3 years and 6.0 ± 6.4 years respectively. However, there was no association between LBP and employment duration.

5.3 Prevalence of low back pain

The point, three-month and annual prevalence for LBP in the sample population was reported at 50.0%, 62.2% and 72.8% respectively. Of this, 76.5% of women reported annual LBP. An

international study conducted in a Taiwanese restaurant; staff indicated a point prevalence of 53.0% for LBP (Chyuan *et al.* 2004) while a study conducted on Iranian restaurant workers reported annual LBP prevalence at 57.0% (Jahangiri *et al.* 2019). Low back pain research is scarce in Africa compared to developed countries; therefore, little is known regarding prevalence in developing countries. The differences in prevalence in different countries may be due to different work responsibilities and procedures, age, gender, ethnicity, body posture and stress experienced by restaurant workers in restaurants in various countries.

An epidemiological review conducted by Manchikanti (2000) recorded annual LBP at 79.0% in the general population in the USA, whilst a study conducted on the general working population in the USA recorded LBP at 26.4% (Luckhaupt *et al.* 2019). A Brazilian population study found that the prevalence of LBP was higher in woman (60.9%) than men, where LBP for women was associated with occupation specific activities involving frequent heavy lifting and standing (Bento *et al.* 2019). It could be assumed that this is due to women reporting LBP symptoms more frequently than men. This assumption can be confirmed by Hoy *et al.* (2012) who stated that women tend to report pain more often than men and therefore more readily seek help and treatment.

A study conducted on LBP in nurses in Jordan indicated a slightly higher point prevalence of 69.0% within the population (Suliman 2018). Reasons for a higher prevalence in nurses could be attributed to the type of work that they do, which includes a high workload and heavy lifting. The annual prevalence of LBP among Nigerian farmers was reported at 74.4% where LBP was attributed to repetitive strain of low back muscles and ligaments due to considerable physical activity and poor posture (Tella *et al.* 2013). Surgeons in Saudi Arabia reported an annual and lifetime prevalence of LBP at 65.9% and 73.2% respectively where overall standing time and stress at work contributed to their LBP (Alzidani *et al.* 2018).

A South African study by Dyer (2012) identified a point prevalence of 34.0% amongst Whites in the general population, which was comparable to a study conducted in Tibet which found a point prevalence of 34·1% (Hoy *et al.* 2003). South African nurses were found to have an annual prevalence of LBP recorded at 21.0% which is attributed to awkward postures, bending and manual lifting (Kumalo 2015). The findings of this study of a higher prevalence of LBP among waitron staff can be attributed to the type of work that they do, which includes lifting heavy items

and standing for long periods of time. Both factors were associated with LBP. Qualitative interviewees indicated that their LBP began as a result of working as a waitron and was aggravated by their occupational activities, which involves heavy lifting, carrying heavy objects and standing for prolonged hours. These activities predispose waitrons to LBP as a high demand is placed on the low back and its anatomical structures, thereby leading to inflammation, tissue failure and increased compressive forces on the intervertebral discs (Morris 2006; Balagué *et al.* 2012; Walker 2012; Hasegawa *et al.* 2018).

The sample consisted of different ethnic groups and the results show that Indians and Whites had a higher risk of LBP compared to Black Africans. These findings are similar to a South African study by Docrat (1999) who showed the prevalence of LBP in the Indian community in Kwazulu-Natal as 45.0%. Other studies also showed that LBP varied with ethnicity. A study conducted in the USA by Portenoy *et al.* (2004), on the general population, indicated that ethnicity played a large role in reporting LBP, where certain ethnicities are more susceptible to under or over report the experience of pain. The author stated that the reporting of pain can be explained by factors such as demographics and medical conditions (Portenoy *et al.* 2004).

Low back pain was found to be higher among the waitron staff who have lower education levels. Participants with high school education had an almost 12 times higher risk than those with tertiary education. These findings are comparable to a study conducted by Manchikanti *et al.* (2012) who indicated that LBP prevalence decreased with an increase in educational levels.
It could be assumed that the higher the educational status of the participants, the higher the salary income which allows better access to health care.

No association between LBP and marital status was noted in the present study. In contrast, a study conducted by Hammed and Agbonlahor (2016) found that single people had a greater prevalence for LBP than those who were married. In addition, further contrasting results were shown by Bento *et al.* (2019) who stated that separated or widowed participants presented a greater risk of LBP than those who were either married or single. This could possibly be due to the lack of a supportive and caring environment that is offered by a companion.

The participants noted that their LBP session on average lasted between one to two hours and that the frequency of LBP experienced occurred on average two to three times a week. This

result is in line with a study conducted in restaurant workers in Turkey, who reported an occurrence of LBP two to three times a week (Ilban 2013). Qualitative interviewees stated that their LBP began either during a shift or as soon as the shift was completed. This finding could possibly be due to the task demands of waitrons during a shift resulting in pain and discomfort once the shift had been completed. It is likely that due to them being busy, they could be subconsciously ignoring the pain while working. This concept is in line with the gate control theory by Melzack and Wall (1965) who stated that certain pain signals do not go straight to the brain, but instead encounter a neurological gate within the spinal cord which determines which signals are to be passed to the brain. Pain perceived by the brain is dependent on whether the neurological gate is open or closed, therefore if the gate is open, pain signals are more intense, and if the gate is closed, pain is perceived as less intense. The theory proposes that the gate control works with thin C and large A diameter nerve fibres by transmitting information to transmission cells and inhibitory cells in the dorsal horn of the spinal cord (Moayedi and Davis 2013). Transmission cells pass the pain signal to the brain when thin C nerve fibres impede the inhibitory cells. Inhibitory cells hinder transmission cell activity. Therefore, perception of pain is either blocked or diminished when large A nerve fibres activate the inhibitory cells (Beychok 2018). Various factors can either open or close the gate. Fear and anxiety, for example, can open the gate and hence pain impulses will be transmitted during these states. In contrast, distraction and a positive mood can close the gate and hence pain would not be transmitted if a person is distracted by something or is in a good mood (Katz and Rosenbloom 2015).

Low back pain was recorded at its worst in the evening and its least in the morning. This result could be due to the high workload of waitrons during the day resulting in pain experienced after work had ended. More than half of the participants (53.4%) who experienced LBP reported the cause for their LBP was insidious, whilst the remainder reported their cause for their LBP was from injury to their low back from either a fall, accident or surgery. Participants found that their LBP began gradually without injury (65.8%) and that the severity of LBP experienced was unchanged since it first began. It can be assumed that the gradual onset of LBP in this population is as a result of repetitive microtrauma over time, due to the repetitive nature of their work which caused strain to the back. This is supported by a previous report which indicated that occupations requiring heavy lifting, standing, stooping, twisting or prolonged periods of sitting could result in an increased possibility of LBP (Alghadir, Zafar and Iqbal, 2015).

This study shows a very strong association between standing and /or walking for long periods of time during working hours and the onset of LBP. This could be increasing the strain on the low back, particularly if heavy items are being carried. Qualitative interviewees specified that prolonged standing and carrying heavy objects aggravated their LBP. These findings can be confirmed by Bento *et al.* (2019) who noted that occupation specific activities involving frequent heavy lifting, standing and leaning forward were associated with LBP. This is also supported by other studies which report that these activities cause LBP (Roffey *et al.* 2010b; Alghadir, Zafar and Iqbal 2015; Alzidani *et al.* 2018; Bento *et al.* 2019). It is assumed that high physical work demands are one of the main causes of musculoskeletal pain among workers, which is substantiated by Jørgensen *et al.* (2013) who indicated that workers with high physical work demands, including prolonged standing; heavy lifting, awkward body postures, repetitive arm movements and working with arms above shoulder height have the highest prevalence of musculoskeletal pain.

Factors such as falls were linked with experiencing LBP. It could be assumed that falls resulting in injury during work increase the likelihood of LBP in waitron staff. Qualitative interviewees felt that working as a waitron was the cause of their LBP and they experienced LBP after a long single shift, a double shift or as soon as they started working regardless of the length of the shift. These findings are comparable to Kokane and Tiwari (2011) who identified that waitron staff who commonly stand for prolonged periods, bear load and maintain awkward postures to deliver orders placed by customers experience musculoskeletal pain.

There was no association between smoking cigarettes and the prevalence of LBP, however this could be due to a small number of participants who smoked due to greater current awareness regarding the dangers of smoking cigarettes. These findings are in contrast to that of Oleske *et al.* (2004); John *et al.* (2006); Wijnhoven, de Vet and Picavet (2006); Manchikanti *et al.* (2012) and Alzidani *et al.* (2018) who noted that an increase in smoking is associated with an increased frequency and duration of LBP, as the components of a cigarette change the nutrition and pH of the intervertebral discs. This predisposes cigarette smokers to altered pain perception, decreased muscle resistance in lumbar spine stabilization and disc herniations.

There was no relationship between alcohol consumption and LBP. The findings in the present study correspond to that of Leboeuf-Yde (2000) and Ferreira *et al.* (2013), however the authors

also stated that uncoordinated movements could make the spine more vulnerable to injuries when under the influence of alcohol.

Quantitative analysis showed that there was no relationship between footwear and LBP. Most participants (81.7%) stated their shoes were comfortable to work in and 34.4% of the population stated they were not required to wear any particular type of shoe. However, quantitative participants and qualitative interviewees indicated that some restaurants required their waitrons to wear sneakers/trainers for comfort during work shifts. The qualitative interviews also revealed that when wearing inappropriate footwear, the LBP was aggravated. When standing for prolonged periods, footwear is the only component creating a level of comfort between the body and the floor and it is thus important to wear comfortable shoes. Kersting *et al.* (2005) found that footwear modifications in the catering industry would be of great benefit and that shoes should be of intermediate stiffness to provide flexibility and stability. This is also confirmed by Anderson, Williams and Nester (2017) who stated that alterations in footwear must be able to have an impact on movement and posture.

Qualitative interviewees stated the flooring surface of the restaurant aggravated their LBP. Orlando and King (2004) found working on a softer flooring surface decreased discomfort levels and general fatigue which corroborates with Anderson, Williams and Nester (2017) who compared the hardness of flooring and the thickness and materials of footwear, stating that working on soft flooring mats decreased work related musculoskeletal disorders in professions which require prolonged standing.

5.4 Impact of low back pain

Most participants reported difficulty in bending (43.5%), standing (36.6%) and lifting heavy items (35.9%) due to their LBP. This could possibly be due to preexisting LBP hindering activities in the participants as some of these positions can cause increased strain and pressure on the low back, thereby resulting in excessive stretching of the muscles and ligaments.

Nearly half of the participants with LBP reported that it had a moderate impact on their work (49.1%). It is assumed that the types of activities carried out as a waiter during their shift has an impact on their LBP. These findings are in line with studies conducted by various authors who noted that LBP has a considerable impact on work performance, work capacity or activities

of daily living which could be due to the biomechanical load placed on the low back and spine during periods of prolonged standing and walking, as well as from repeatedly working in an awkward posture (Roffey *et al.* 2010b; Widanarko *et al.* 2012; Alzidani *et al.* 2018; Bento *et al.* 2019).

Absenteeism from work due to LBP was reported by 17.1% of the participants and the number of days absent ranged between one day and two to three consecutive days. This is similar to a study conducted among U.S. workers on work-related LBP where absenteeism due to LBP was 20.1% (Luckhaupt *et al.* 2019). Furthermore, 13.5% of the study participants had been bed-ridden due to their LBP and were bed-ridden on average for a duration of one to two days. These findings are similar to those of Chyuan *et al.* (2004) who noted 12.0% of Taiwanese hotel restaurant workers reported absenteeism from work, due to pain. A study conducted on surgeons with LBP by Alzidani *et al.* (2018) identified that LBP resulted in a substantial impact on job performance and frequently caused absenteeism from work. A study conducted by Li *et al.* (2018) on nurses with LBP working in Chinese hospitals indicated that there was a limited ability to perform tasks when the nurses had LBP. They had to rest frequently and often wanted to leave their jobs when they experienced LBP. In the nursing profession, there are similar work demands of prolonged standing and carrying/lifting heavy loads, which have a negative impact on their work with resultant absenteeism.

5.5 Treatment of LBP

More than half (60.4%) of the participants were treated for their LBP and the most common treatments sought for LBP were either from a chiropractor, a general practitioner, a physiotherapist or a pharmacist. Chiropractic treatment was regarded as the best relief for LBP by almost half the participants.

Treatment from a general practitioner was also beneficial for LBP. More than half of the participants had used pain-relief medication (56.5%) and almost half had used anti-inflammatories (46.6%) which were either prescribed by a general practitioner or a given over the counter by a pharmacist. A general practitioner provides ongoing medical care to patients and is often the first point of contact for anyone with pain. Their treatment can include giving patient information, prescribing medication, advising on a course of action and providing reassurance. Pain relief medication or analgesics for relief of LBP is considered a first line option

due to its affordability and safeness (Chou *et al.* 2007). General guidelines recommend paracetamol as the first choice in drug treatment followed by nonsteroidal anti-inflammatory drugs (NSAIDs) if the paracetamol is insufficient (Piccoliori *et al.* 2013; Enthoven *et al.* 2016). Anti-inflammatories or NSAIDs are widely available by either prescription or over the counter and the treatment is based on the analgesic and anti-inflammatory mechanisms of the drug (Enthoven *et al.* 2016). Many qualitative interviewees stated that they either used pain medication or anti-inflammatories to help relieve their LBP before considering other treatment options. This could possibly be due to participants wanting a quick fix for their LBP which was cost effective as many of these medications can be bought over the counter.

Topical gels were also effective in providing relief for LBP. Topical gels or topical analgesics offer the same analgesic relief but with minimal adverse systemic effects compared to those of oral analgesics (Argoff 2013).

Heat therapy was also useful in relieving LBP. Over a third used a wheat bag (35.9%) and it could be assumed that this was directed by a medical professional such as a chiropractor or physiotherapist, however this advice could also be on recommendation from family members or available on the internet. Wheat bags provide relief to the spasmed muscles as heat generated from the wheat provides pain relief, increases blood flow to the area and removes metabolites (Kim *et al.* 2015; Malanga, Yan and Stark 2015; Freiwald *et al.* 2018).

Some participants sought physiotherapy to treat their LBP. A physiotherapist combines manual therapy, exercise training and neurophysiological education in treating LBP. Guidelines state that one should remain active and not become bed-ridden while on analgesic medication (Moseley 2002; Frost *et al.* 2004). Various authors noted general practice guidelines which included exercise to help strengthen the musculature of the lower back muscles (Lin *et al.* 2011; Wong *et al.* 2017).

More than half (65.8%) of the sample population said they would consider visiting a chiropractor for their LBP as they felt that it would relieve pain. Others had previously achieved positive results from chiropractic treatment for other conditions. Qualitative interviewees had similar responses regarding visiting a chiropractor for their LBP where they received effective treatment. This is in line with an Australian study conducted by Chou *et al.* (2018a) on patients'

perceived needs for chiropractic, physiotherapy and complementary and alternative medicines for LBP management. This study recognized that patients preferred visiting a chiropractor over a medical practitioner due to treatment bringing about rapid, non-pharmacological pain relief. It has been stated by Peterson, Bolton and Humphreys (2012) that acute and chronic patients suffering from LBP benefit from chiropractic treatment. It is possible that participants who used chiropractic treatment found that allopathic treatment approaches were either no longer working or because they were looking for an alternative conservative treatment approach.

Those who reported that they would not consider visiting a chiropractor for their LBP, felt that the pain was not severe enough to warrant visiting a chiropractor. They also felt that chiropractic treatment is too expensive. These findings are similar to a study conducted by Dolot *et al.* (2016) in the USA where adults admitted to postponing treatment for a health condition due to cost concerns. Some negative stereotypes of chiropractic treatment were mentioned during the qualitative interviews; however, these were dispelled when other participants within the focus group mentioned the benefits of chiropractic. A mini information session about this treatment was also provided by the researcher and the participants felt that this was beneficial.

Although 55.0% of the participants did not have any form of medical aid or health insurance, 68.9% of participants felt they had adequate access to health care services. This is possibly due to either the population being young, as they do not have as many diseases as the aged population, or not using health services. As shown by Ward and Franks (2007), people who are uninsured do not use health care services for chronic disease management or for preventive care as often as those who use these services if they have some form of health insurance.

Furthermore, marketing of the DUT Chiropractic clinic can help to improve awareness of the profession and increase uptake of services offered by chiropractors.

5.6 Limitations of the study

The response rate for the quantitative aspect of the study was low with just over half the targeted people answering the questionnaire. This was largely due to nine large chain restaurants denying permission to collect data on their premises or from any of their staff. Thus, data was mainly collected from smaller restaurants. There was also a low response rate from the waitron staff, as many waitrons who agreed to participate in the study did not have time to fill out the

questionnaire on site, requiring them to take the questionnaire home and subsequently not returning it. In turn, this affected the response rate of the quantitative aspect of the study. Therefore, it is very likely that the prevalence of the LBP in waitron staff may be different to that reported.

The cross-sectional nature of the study precludes causal inferences. Although the results indicate associations between various work-related factors and LBP, it cannot be determined from the study that these factors are causally associated with the development of LBP and that intervening on these factors would necessarily reduce the incidence and prevalence of LBP. Future studies should be longitudinal in nature so that causes of LBP can be determined.

Conclusion

In summary, the prevalence of LBP among waitron staff in the eThekwini district of KwaZulu-Natal, South Africa is high. There is an association between LBP and the work performed by waitron staff. The high physical work demands such as prolonged standing, constant walking for long periods of time and carrying heavy loads were the leading factors associated with LBP among waitron staff.

CHAPTER SIX: CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion

This study investigated and reported on the epidemiology of LBP amongst full-time restaurant waitron staff within the eThekwini Municipality. The point, three month and annual prevalence of LBP amongst waitron staff were recorded at 50.0%, 62.2% and 72.8%, respectively. Low back pain lasted between one to two hours at a time. Participants reported experiencing LBP two to three times a week. Low back pain in waitrons commenced gradually without injury and the severity of LBP was unchanged since it initially started. Factors that were associated with LBP included prolonged standing, constant walking for long periods of time and carrying heavy loads. Low back pain resulted in a moderate amount of absenteeism due to required bed rest.

6.2 Recommendations

It is recommended that health and safety as well as educational protocols are implemented within restaurants. These should include correct posture during standing and walking, particularly when lifting heavy objects. The length of shifts should be shorter as prolonged standing is associated with LBP. Working double shifts should not be allowed, unless there is a substantial break between the two shifts. Trolleys or trays on wheels should be introduced in order to carry large numbers of plates or drinks, thereby alleviating strain on the lower back and decreasing the incidence of LBP. Correct footwear should be issued in order to reduce foot and low back discomfort. Flooring surfaces should be modified so that floors are not too hard and not slippery so that falls may be avoided.

It is also recommended that future studies include a larger sample size and that these are longitudinal in nature so that causal associations can be determined.

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APPENDICES

Appendix A: Restaurant owner letter of information

Letter of Information: Restaurant Owner

To whom it may concern,

I am a chiropractic master's student who is doing research on the epidemiology of work related low back pain in full-time restaurant waitron staff within the eThekwini Municipality.

Researcher: Alexia Wolff (071 874 5464)
Supervisor: Prof. F. Haffejee (031 373 2395)

Institution: Durban University of Technology

Title of the Research Study:
The epidemiology of work-related low back pain in restaurant waitron staff within the eThekwini Municipality

Brief Introduction and Purpose of the Study:
Several studies have shown a high prevalence of low back pain in certain occupations. We do not know what proportion of waitron staff suffer from low back pain and how this may affect their work, particularly in terms of absenteeism.
Thus, the aim of this research is therefore, to determine the prevalence of low back pain amongst full-time restaurant waitron staff within the eThekwini Municipality, and to identify the risk factors that they may be exposed to. This study will also identify the impact of low back pain in these individuals in terms of absenteeism.

How are you able to assist with this research study?
Your restaurant has been selected to take part in the above study. Participation for the study in terms of the restaurant and the employees is at all times voluntary and refusal to participate will not result in adverse consequences of any kind to either the restaurant or the employee. The results of this study will be made available in the Durban University of Technology library in the form of a mini dissertation.

Procedures:
Full-time employees from your restaurant will be selected to take part in the study. Each employee will be given a letter of information and should he/she agree to take part in the study, will sign informed consent. This will be followed by completion of the research questionnaire either on site or at the employee's residence. The completed questionnaire will then have to be returned within a specified time.
The researcher will be available to assist with any queries that may arise. Total time to fill out all paperwork will take approximately 15 minutes and all information will be strictly anonymous and confidential.
Confidentiality:
All information is confidential. Neither the restaurant nor the employees name will be on the questionnaire and the results will be used for research purposes only.

The restaurant's approval for access to your employees would be of importance in allowing for this process to be completed and feedback will be sent to you / your restaurant, if you require it.

Risks/Discomfort and Cost:
There are no risks/discomfort or cost involved from your restaurant or employee as a result of your collective participation in the study.

Persons to contact with problems or questions:
Should you have any questions that you may want answered by an independent source, you can contact my supervisor on the above number. If you are not satisfied with any aspect of this study, feel free to forward any concerns to the Durban University of Technology Research and Ethics Committee.

In order to move forward with this study, would you be so kind as to respond to this letter in writing indicating whether you would approve of this study taking place on your premises , provided that the attached proposal is approved by the Faculty of Health Sciences Research and Ethics Committee.

Thank you.

Alexia Wolff

Signature: _____Date: _____

Appendix B: Participant letter of information

LETTER OF INFORMATION

Dear Participant,

Title of the Research Study:
The epidemiology of work related low back pain in full-time restaurant waitron staff within the eThekwini Municipality.

Researcher: Alexia Wolff
Supervisor: Firoza Haffejee (PhD)

Brief Introduction and Purpose of the Study:
Low back pain is a common problem; therefore, the purpose of the study is to determine the occurrence of low back pain, any risk factors that may cause it, and the effects of low back pain on work.

Outline of the Procedures:
If you agree to participate in this study, you are requested sign an informed consent form and answer a questionnaire on low back pain. Your name is NOT required; as all questionnaires are to be kept anonymous. Once you have completed the questionnaire, place the questionnaire in the appropriately marked box and the informed consent form in the other appropriately marked box. This will ensure that the questionnaires are completely confidential and that your answers will not be disclosed to any third parties Please answer all the questions as this will enable accurate statistical results.

Risks or Discomforts to the Participant:
There will be no risk to you, if you participate in this study.

Benefits:
Your full co-operation will assist in expanding knowledge of low back pain and thus making future treatment of patients suffering from low back pain more effective.

Reason/s why the Participant May Be Withdrawn from the Study:
If you do not agree to sign the letter of information and informed consent form.

Remuneration:
No remuneration will be given.

Costs of the Study:
There will be no costs to you - the participant.

Confidentiality:

All completed questionnaires are kept in complete confidence. The questionnaire will be administered and collected by the researcher (Collection Box Method) so as to maintain confidentiality at all times. The researcher will thereafter document the information for statistical analysis. All the information is confidential, and the overall results of the study will be made available in the Durban University of Technology library in the form of a dissertation.
None of your individual responses will be made available to the restaurant or to the university. The restaurant will only receive the information regarding this study after all the data has collectively been analyzed, meaning that your individual data will not be identifiable.

Research-related Injury:
None.

Persons to Contact in the Event of Any Problems or Queries:
Please contact the researcher Alexia Wolff (071 874 5464), my supervisor Dr. F Haffejee (031 262 1433) or the Institutional Research Ethics Administrator on 031 373 2375. Complaints can be reported to the Director: Research and Postgraduate Support, C. Napier on 031 373 2326 or carinn@dut.ac.za

Appendix C: Participant informed consent

CONSENT

Statement of Agreement to Participate in the Research Study:

- I hereby confirm that I have been informed by the researcher, Alexia Wolff (Name of Researcher), about the nature, conduct, benefits and risks of this study – Research Ethics Clearance Number: 152/18.
- I have also received, read and understood the above written information (Participant Letter of Information) regarding the study.
- I am aware that the results of the study, including personal details regarding my sex, age, date of birth, initials and diagnosis will be anonymously processed into a study report.
- In view of the requirements of research, I agree that the data collected during this study can be processed in a computerised system by the researcher.
- I may, at any stage, without prejudice, withdraw my consent and participation in the study.
- I have had sufficient opportunity to ask questions and (of my own free will) declare myself prepared to participate in the study.
- I understand that significant new findings developed during the course of this research which may relate to my participation will be made available to me.

_____	_____	_____	_____
Full Name of Participant	**Date**	**Time**	**Signature**

I, Alexia Wolff (Name of Researcher), herewith confirm that the above participant has been fully informed about the nature, conduct and risks of the above study.

Alexia Wolff	_____	_____
Full Name of Researcher	**Date**	**Signature**
_____	_____	_____
Full Name of Witness (If applicable)	**Date**	**Signature**
_____	_____	_____
Full Name of Guardian (If applicable)	**Date**	**Signature**

Appendix D: Quantitative data collection tool

QUESTIONNAIRE

Coded questionnaire
The epidemiology of work related low back pain in full-time restaurant waitron staff within the eThekwini Municipality
(Please answer the following questions)
Questionnaire Number _____ Date of interview _____

A. Demographics

1. Age (years) _____
2. Gender

   □1 Female □2 Male
3. Height (centimeters) _____
4. Weight (kilograms) _____
5. Race

   □1 Black African □2 Coloured □3 Indian □4 White
   □5 Other (specify) _____
6. Marital status

   □1 Cohabiting □2 Divorced □3 Married □4 Separated □5 Single □6 Widowed
7. Highest level of education

   □1 No formal education □2 Primary school □3 High school □4 Matriculated
   □5 Tertiary □6 Other (specify) _____
8. Duration of employment in the waiting industry

   □1 < 6 mnths □2 6-12 mnths □3 1-2 yrs □4 2-3yrs
   □5 3-4yrs □6 4-5yrs □7 > 5 yrs
9. Do you have medical aid?

   □1 Yes □0 No
10. Do you feel that you have sufficient access to health services?

    □1 Yes □0 No

11. If no to **Q10**, please specify why _____

B. Risk factors

(If male, proceed to **Q20**)

12. Do you have any children?

□1 Yes □0 No

13. If yes, how many? _____

14. Have you had any miscarriages?

□1 Yes □0 No (If No, proceed to **Q20**)

15. If yes, how many? _____

16. Did you have a C-section?

□1 Yes □0 No

17. If yes, how many? _____

18. Did you have an epidural?

□1 Yes □0 No

19. If yes, how many? _____

20. How long does a single shift at work last?_____(hours)

21. Do you work a double shift?

□1 Yes □0 No

22. If yes, how many double shifts do you work in a month? _____

23. Are you standing or walking throughout your shift?

□1 Yes □0 No

24. If yes, please specify (Tick only one block)

□1Standing □2 Walking □3 Both

25. How many hours at a time are you usually on your feet (walking or standing)?

□1 1-5 □2 6-10 □3 11-15 □4 16-20

26. How many plates at a time do you usually carry when serving customers?

□1 1 □2 2 □3 3 □4 4

27. How many plates do you usually carry when clearing tables?

□1 1 □2 2 □3 3 □4 4 □5 5 □6 6 □7 >6

28. Do you use a serving tray to carry plates?

□1 Yes □0 No

29. Does carrying more than one plate cause any strain on your back?

□1 Yes □0 No

30. What is the main flooring surface of the restaurant made of?

□1 Concrete □2 Brick □3 Tile □4 Vinyl □5 Wood □6 Carpet

31. Do you climb stairs during your shift?

□1 Yes □0 No

32. Have you ever slipped and fallen during your shift?

□1 Yes □0 No

33. Are your shoes comfortable to work in?

□1 Yes □0 No

34. Are you required to wear a certain type of shoe?

□1 Yes □0 No

35. If yes to question 34, what type of shoes are you required to wear?

<u>Female:</u>
□1 High heels □2 Kitten heels □3 Flat pumps □4 Sneakers/trainers □5 Flat boots □6 Heeled boots
<u>Male:</u>
□7 Men's formal shoe □8 Sneakers/trainers □9 Boots □10 Loafers

36. Do you feel that your job increases the chances of you getting low back pain?

□1 Yes □0 No

37. Do you smoke?

□1 Yes □0 No (if no, proceed to **Q43**)

38. If yes, how many cigarettes do you smoke per day?

□1 1-5 □2 6-10 □3 11-15 □4 16-20 □5 21-30 □6 31-40 □7 >40

39. For how long have you been smoking? (years)

□1 1-5 □2 6-10 □3 11-15 □4 16-20 □5 21-30 □6 >30

40. If you are a former smoker, how many cigarettes per day did you smoke in the past?

□1 1-5 □2 6-10 □3 11-15 □4 16-20 □5 21-30 □6 31-40 □7 >40

41. How long ago did you quit smoking? (years)

□1 1-5 □2 6-10 □3 11-15 □4 16-20 □5 21-30 □6 >30

42. For how long did you smoke? (years)

□1 1-5 □2 6-10 □3 11-15 □4 16-20 □5 21-30 □6 31-40 □7 >40

43. Do you drink alcohol?

□1 Yes □2 No

44. How many days during the week do you drink alcohol? _____(days)

45. How many units/glasses of alcohol do you drink in a day? (i.e. 25ml single measure of a spirit, a third of a 500ml beer, or 175ml glass (gl) of red wine)

□1 1 □2 2-3 □3 3-4 □4 >5

46. Do you exercise/play sport?

□1 Yes □0 No (If no, proceed to **Q50**)

47. What type of exercise do you perform? (You may tick more than one block)

□1 Boxing □2 Dance □3 Karate □4 Netball □5 Running □6 Skipping
□7 Soccer □8 Walking □9 Weight training □10 Other (specify) _____

48. What is the total amount of time (hours) spent per day exercising/playing sport? _____

49. Number of exercise sessions per week _____ (hours)

50. Have you been diagnosed with any of the following? (You may tick more than one block)

□1 Arthritis □2 Depression □3 Diabetes Mellitus □4 HIV □5 Hypertension
□6 Meningitis □7 Tuberculosis □8 Other (specify) _____

51. Are you currently experiencing low back pain?

□1 Yes □0 No

52. Have you experienced low back pain in the last 3 months?

□1 Yes □0 No

53. Have you experienced low back pain in the past year?

□1 Yes □0 No

54. How long does your low back pain session last? (Hours)

□1 < 1 □2 1-2 □3 2-3 □4 3-4 □5 >4

55. How often do you experience low back pain?

□1 Every day □2 2-3 times a week □3 Once a week □4 Every second week
□5 Once a month □6 Occasionally

C. Clinical
(Only participants with back pain are to answer this section)

56. Has any of the following caused injury to the low back? (You may tick more than one block)

□1 Accident □2 Fall □3 Injury to low back □4 Surgery □5 None

57. What was your approximate age when you first experienced low back pain? _____(years)

58. On a scale of 1-10, how would you rate your pain? (Tick one block)

0	1	2	3	4	5	6	7	8	9	10
No pain	Least pain								Worst pain	

59. At what time of the day is the pain at its worst?

□1 Morning □2 Afternoon □3 Evening □4 Night

60. At what time of the day is the pain at its least?

□1 Morning □2 Afternoon □3 Evening □4 Night

61. How did your low back pain begin?

□1 Gradually without injury □2 Gradually after injury □3 Abruptly without injury
□4 Abruptly after injury

62. Progression of low back pain?

□1 Getting worse □2 Getting better □3 Staying the same

63. Do you experience any difficulty in doing any of the following things as a result of your low back pain? (You may tick more than one block)

□1 Bending □2 Dressing □3 Driving □4 Lifting □5 Sitting □6 Sleeping
□7 Standing □8 Walking □9 Other (specify) _____

64. How would you describe the impact of your low back pain in relation to your work?

□1 Mild □2 Moderate □3 Severe □4 None

65. Have you ever had to stay away from work as a result of your low back pain?

□1 Yes □0 No

66. If yes, for how long?

□1 0-1 day □2 2-3 days □3 4-5 days □4 5-6 days □5 7-8 days
□6 9-10 days □7 >10 days

67. Have you ever been bed-ridden because of your low back pain?

□1 Yes □0 No

68. If yes, for how long? _____ (days)

69. Have you ever had to change your job due to low back pain?

□1 Yes □0 No

70. Have you ever lost your job due to low back pain?

□1 Yes □0 No

71. Were you ever treated for low back pain?

□1 Yes □0 No

72. Where are/were you treated for low back pain? (You may tick more than one block)

□1 General practitioner □2 Herbalist □3 Inyanga □4 Isangoma
□5 Pharmacist □6 Prophet □7 State clinic □8 State hospital
□9 Chiropractic □10 Physiotherapist □11 Other (specify) _____

73. Which treatment helped or is helping you to get the most relief? (Tick only one block)

□1 General practitioner □2 Herbalist □3 Inyanga □4 Isangoma
□5 Pharmacist □6 Prophet □7 State clinic □8 State hospital
□9 Chiropractic □10 Physiotherapist □10 Other (specify) _____

74. Have you used any of the following for your low back pain? (You may tick more than one block)

□1 Anti-inflammatories □2 Pain relief medication □3 Transact/Voltaren patch □4 Voltaren injections □5 Gels □6 Wheat bag/hot water bottle
□7 Massage oil (arnica) □8 Essential oil (lavender) □9 Back brace
□10 Other (specify) _____

75. Which low back pain medication did you find most helpful?
Specify _____

76. How much do you pay for the medication relating to your low back pain every month?

□1 R1-30 □2 R31-60 □3 R61-80 □4 R81-100 □5 >R100 □6 No cost

77. Excluding the medication for your low back pain, how much does your medical treatment cost you per month? (i.e. Asthma, diabetes, high blood pressure)

□1 R1-30 □2 R31-60 □3 R61-80 □4 R81-100 □5 R101-200
□6 >200 □7 No cost

78. Would you consider going to a Chiropractor for your low back pain?

□1 Yes □0 No

79. Please state why to Q78

_____
_____

Thank you for participating in this study…….

Appendix E: Qualitative interview question guide

QUESTION GUIDE

1. When did your low back pain start?

2. Do you think your work as a waitron made your back pain worse or caused your low back pain?

3. Is the low back pain more severe after working a long shift / how many shifts would make the low back pain worse?

4. Are there any activities at work which cause strain to your lower back or cause you to experience low back pain, and what are these activities?

5. How do you manage your low back pain symptoms? Probe: Have you tried Chiropractic to manage your LBP? (why / why not?)

    5.1 If yes: has Chiropractic treatment helped?

    5.2 Which procedures have you had? (Can ask a bit more about the procedures)

    5.3 If no, have you previously heard about this type of treatment?

    5.3.1 Yes to 5.3. – then probe on why it has not been used as a treatment option.

    5.3.2 No to 5.3 – then explain what Chiropractic treatment is and how it can be used and ask whether they would consider using it

Appendix F: Previously validated questionnaire

Coded questionnaire
The prevalence of and associated risk factors for low back pain in medical outpatients of a selected Umdoni Municipality Health Care Clinic

(Please answer the following questions)

Questionnaire Number _____ Date of interview _____

A. Demographics

1. Age (years) _____

2. Gender

☐1 Female ☐2 Male

3. Height (centimetres) _____

4. Weight (kilograms) _____

5. Race

☐1 Black African ☐2 Coloured ☐3 Indian ☐4 White
☐5 Other (specify) _____

6. Marital status

☐1 Cohabiting ☐2 Divorced ☐3 Married ☐4 Separated ☐5 Single ☐6 Widowed

7. Highest level of education

☐1 No formal education ☐2 Primary school ☐3 High school ☐4 Matriculated
☐5 Tertiary ☐6 Other (specify) _____

8. Present occupational status

☐1 Employed (full time) ☐2 Employed (part-time) ☐3 Self-employed ☐4 Housewife
☐5 Retired ☐6 Student ☐7 Unemployed

9. If unemployed or retired, what occupation were you in for the longest period previously?

☐1 Artisan ☐2 Driver ☐3 Educator ☐4 Farmer ☐5 Housewife ☐6 Managerial
☐7 Nurse ☐8 Salesperson ☐9 Self-employed ☐10 Skilled worker ☐11 Student
☐12 Unskilled worker ☐13 Other (specify) _____

10. What was the duration of the above occupation? (years) _____

11. If employed, what type of work do you do?

☐1 Artisan ☐2 Driver ☐3 Educator ☐4 Farmer ☐5 Housewife ☐6 Managerial
☐7 Nurse ☐8 Salesperson ☐9 Self-employed ☐10 Skilled worker ☐11 Student
☐12 Unskilled worker ☐13 Other (specify) _____

12. For how long have you been in this occupation? (years) _____

13. Total household annual income

☐1 R1-5000 ☐2 R5001-15000 ☐3 R150001-25000 ☐4 R25001-35000
☐5 R35001-45000 ☐6 R45001-55000 ☐7 R55001-65000
☐8 R65001-75000 ☐9 R75001-85000 ☐10 R85001-95000
☐11 N/A

14. Do you have medical aid?

☐1 Yes ☐0 No

15. Do you feel that you have sufficient access to health services?

☐1 Yes ☐0 No

B. Risk factors

16. Number of children _____

17. Number of pregnancies _____

18. Did you have a C-section?

☐1 Yes ☐0 No

19. If yes, how many? _____

20. Did you have an epidural?

☐1 Yes ☐0 No

21. Does your occupation involve any of the following for long periods of time? (You may tick more than one block)

☐1 Lifting heavy objects ☐2 Cause your body to vibrate ☐3 Driving
☐4 Lying on your back ☐5 Sitting ☐6 Standing

22. Do you feel that your job makes you at risk to get low back pain?

□1 Yes □0 No

23. Do you smoke? (if no go to **Q26**)

□1 Yes □0 No

24. If yes, how many cigarettes do you smoke every day?

□1 1-5 □2 6-10 □3 11-15 □4 16-20 □5 21-30 □6 31-40 □7 >40 □8 N/A

25. For how long have you been smoking? (years)

□1 1-5 □2 6-10 □3 11-15 □4 16-20 □5 21-30 □6 >30

26. If you are a former smoker then how many cigarettes did you smoke in the past?

□1 1-5 □2 6-10 □3 11-15 □4 16-20 □5 21-30 □6 31-40 □7 >40 □8 N/A

27. How long ago did you quit? (years)

□1 1-5 □2 6-10 □3 11-15 □4 16-20 □5 21-30 □6 >30

28. For how long did you smoke? (years)

□1 1-5 □2 6-10 □3 11-15 □4 16-20 □5 21-30 □6 31-40
□7 >40

29. Do you presently have a cough?

□1 Yes □0 No

30. For how long have you had it?

□1 0-6 mnths □2 7 mnths-1 yr □3 >1 yr-2 yrs □4 >2 yrs-3 yrs □5 >3 yrs

31. Do you drink alcohol?

□1 Yes □2 No

32. How much do you drink? (units) _____ (per week)

33. Do you perform any chores at home?

□1 Yes □0 No

34. If yes, which of the chores do you perform? (You may tick more than one block)

□1 Cooking □2 Fetching firewood □3 Fetching water □4 Washing
□5 Other (specify) _____

35. Do you have piped water?

□1 Yes □0 No

36. Do you fetch water from a tap or river?

□1 Tap □2 River

37. How far is the tap/ river from your house?

□1 0-2km □2 3-5km □3 6-8km □4 9-11km □5 12-14km □6 >15km

38. Approximately how many litres of water do you carry?

□1 <5 □2 5-10 □3 11-15 □4 16-20 □5 21-25 □6 >25

39. How often do you fetch water in one day?

□1 Once a day □2 Twice a day □3 >Twice a day

40. How many times a week do you have to fetch water? _____

41. How do you carry/ transport the water back home?

□1 Bakkie/ Van □2 Cart □3 Held in hand □4 On head □5 Wheel barrow
□6 Other (specify) _____

42. Do you currently perform any exercise?

□1 Yes □0 No

43. What type of exercise do you do most of the time?

□1 Boxing □2 Dance □3 Karate □4 Netball □5 Running □6 Skipping
□7 Soccer □8 Walking □9 Weight training □10 Other (specify) _____

44. What is the total amount of time spent per day doing exercise/ sport

□1 <1 □2 1-3 □3 4-6 □4 7-9 □5 >10

45. Number of exercise sessions per week/combined if more than one sport is played.

_____ (hours)

46. If you played sport in the past, what sport or form of exercise did you do then?

☐1 Boxing ☐2 Dance ☐3 Karate ☐4 Netball ☐5 Running ☐6 Skipping
☐7 Soccer ☐8 Walking ☐9 Weight training ☐10 Other (specify) _____

47. For how long were you involved in the above sport/s in the past? (years)

☐1 0-1 ☐2 >1-2 ☐3 >2-3 ☐4 >3-4 ☐5 >4-5 ☐6 >5 ☐7 N/A

48. Have you been diagnosed with any of the following? (You may tick more than one block)

☐1 Arthritis ☐2 Depression ☐3 Diabetes Mellitus ☐4 HIV ☐5 Hypertension
☐6 Meningitis ☐7 Tuberculosis ☐8 Other (specify) _____

49. Have you ever experienced low back pain?

☐1 Yes ☐0 No

50. Have you ever experienced any of the following? (you may tick more than one block)

☐1 Accident ☐2 Fall ☐3 Injury to low back ☐4 Surgery ☐5 N/A

51. How did your low back pain start?

_____
_____

C. Clinical
(Only participants with back pain are to answer this section)

52. What was your age when you first experienced low back pain? (years)

☐1 0-10 ☐2 11-15 ☐316-20 ☐4 21-30 ☐5 31-40 ☐6 41-50
☐7 51-60 ☐8 61-70 ☐9 71-80 ☐10 81-90 ☐11 >90

53. Do you presently have low back pain?

☐1 Yes ☐0 No

54. How long have you had the current low back pain?

☐1 0-1 mnth ☐2 >1-2 mnths ☐3 >2-3 mnths ☐4 >3-4 mnths ☐5 >4-5 mnths
☐6 >5-10 mnths ☐7 11-15 mnths ☐8 16-20 mnths ☐9 >20 mnths

55. On a scale of 1-10, how would you rate your pain?

0	1	2	3	4	5	6	7	8	9	10
No pain	Least pain								Worst pain	

56. At what time of the day is the pain at its worst?

□1 Morning □2 Afternoon □3 Evening □4 Night

57. At what time of the day is the pain at its least?

□1 Morning □2 Afternoon □3 Evening □4 Night

58. How often do you experience low back pain?

□1 Every day □2 2-3 times a week □3 Once a week □4 Every second week
□5 Once a month □6 Occasionally

59. How did your low back pain begin?

□1 Gradually without injury □2 Gradually after injury □3 Abruptly without injury
□4 Abruptly after injury

60. Progression of low back pain?

□1 Getting worse □2 Getting better □3 Staying the same

61. Do you experience any difficulty in doing any of the following things as a result of your low back pain? (you may tick more than one block)

□1 Bending □2 Dressing □3 Driving □4 Lifting □5 Sitting □6 Sleeping
□7 Standing □8 Walking □9 Other (specify) _____

62. Describe the impact of your low back pain to your daily life.

□1 Mild □2 Moderate □3 Severe □4 None

63. Have you ever had to stay away from work as a result of low back pain?

□1 Yes □0 No

64. If yes, for how long?

□1 0-1 day □2 2-3 days □3 4-5 days □4 5-6 days □5 7-8 days
□6 9-10 days □7 >10 days

65. Have there been more periods of absence from work due to your low back pain?

□1 Yes □0 No

66. If yes, how many? _____ (days)

67. Have you ever been bed-ridden because of low back pain?

□1 Yes □0 No

68. If yes, for how long? _____ (days)

69. Have you ever had to change your job due to low back pain?

□1 Yes □0 No

70. Have you ever lost your job due to low back pain?

□1 Yes □0 No

71. Were you ever treated for low back pain?

□1 Yes □0 No

72. If yes, how often were you treated?

□1 Every day □2 2-3 times a week □3 Once a week □4 Every second week
□5 Once a month □6 Occasionally

73. Are you presently being treated for low back pain?

□1 Yes □0 No

74. If yes, how often are you being treated?

□1 Every day □2 2-3 times a week □3 Once a week □4 Every second week
□5 Once a month □6 Occasionally

75. Where are/were you treated for low back pain?

□1 General practitioner □2 Herbalist □3 Inyanga □4 Isangoma □5 Pharmacist
□6 Prophet □7 State clinic □8 State hospital
□9 Chiropractic □10 Other (specify) _____

76. For how long have you been receiving treatment for low back pain now?

□1 <1 month □2 1-6 months □3 7-12 months □4 >1 year

77. For how long have you been treated for low back pain in the past?

□1 <1 month □2 1-6 months □3 7-12 months □4 >1 year

78. Which treatment helped or is helping you to get the most relief?

□1 General practitioner □2 Herbalist □3 Inyanga □4 Isangoma □5 Pharmacist
□6 Prophet □7 State clinic □8 State hospital
□9 Chiropractic □10 Other (specify) _____

79. Are you presently on any medication for low back pain?

□1 Yes □0 No

80. Who prescribed the medication?

☐1 General practitioner ☐2 Herbalist ☐3 Inyanga ☐4 Isangoma ☐5 Pharmacist
☐6 Prophet ☐7 State clinic ☐8 State hospital
☐9 Other (specify) _____

81. Is your low back pain medication helpful?

☐1 Yes ☐0 No

82. How much do you pay for the medication every month?

☐1 R1-30 ☐2 R31-60 ☐3 R61-80 ☐4 R81-100 ☐5 >100 ☐6 No cost

83. Excluding the medication how much does your treatment cost you per month?

☐1 R1-30 ☐2 R31-60 ☐3 R61-80 ☐4 R81-100 ☐5 R101-200
☐6 >200 ☐7 No cost

84. Do you know what Chiropractic is?

☐1 Yes ☐0 No

Thank you for participating in this study……

Appendix G: Letter requesting permission to use questionnaire

Miss Alexia Wolff

Durban University of Technology

Dept. of Chiropractic

Durban

15 February 2018

ATT: SEEKING PERMISSION FOR USE OF QUESTIONNAIRE

Dear Khanyi Khumalo,

My name is Alexia Wolff. I am currently a Chiropractic Master's student working on my dissertation: The epidemiology of work-related low back pain in full-time restaurant waitron staff within the eThekwini Municipality.

I am contacting you to seek permission to use your questionnaire on low back pain as part of my research. I may need to change some of the questions for suitability to my population, who are waitron staff.

Would it please be possible to email me a copy of your questionnaire? You will be acknowledged in my dissertation and any other work emanating from this research.

Sincerely,

Alexia Wolff

071-874-5464

alexia.m.wolff@gmail.com

Appendix H: Approval to use questionnaire

Re: Formal Permission Letter

KK khanyie khumalo <khanyie.khumalo@gmail.com>
To Alexia Wolff

Dear Alexia

I hope this e-mail finds you well. I give you permission to use my questionnaire.

Warm regards,
Khanyisile Khumalo

Appendix I: Confidentiality agreement

CONFIDENTIALITY STATEMENT DECLARATION

Important Notice: It is mandatory for every member of the focus group to read and complete all blocks below

1] Confidentiality of all the information within the research documents and any content discussed during the focus group sessions must be made mandatory especially in regard to the information on any research participants

2] The questionnaires must be kept anonymous by coding with no block for identifying data

3] The content discussed within the focus group must not be discussed with any outside party.

4] The content from the focus group will be made public in research journals; however no identifying data will be shared to keep anonymity.

Once read and agreed to, please complete the blocks below and sign to agree to the above terms and conditions.

Member stands for	Member's Name	Signature	Contact Details

Appendix J: Pre-expert group questionnaire

PREFOCUS QUESTIONNAIRE

Coded questionnaire
The epidemiology of work-related low back pain in full-time restaurant waitron staff within the eThekwini Municipality
(Please answer the following questions)
Questionnaire Number _____ Date of interview _____

A. Demographics

1. Age (years) _____
2. Gender

   □1 Female □2 Male
3. Height (centimeters) _____
4. Weight (kilograms) _____
5. Race

   □1 Black African □2 Coloured □3 Indian □4 White
   □5 Other (specify) _____
6. Marital status

   □1 Cohabiting □2 Divorced □3 Married □4 Separated □5 Single □6 Widowed
7. Highest level of education

   □1 No formal education □2 Primary school □3 High school □4 Matriculated
   □5 Tertiary □6 Other (specify) _____
8. Present occupational status

   □1 Employed (full time) □2 Employed (part-time) □3 Self-employed □4 Housewife
   □5 Retired □6 Student □7 Unemployed
9. Do you have medical aid?

   □1 Yes □0 No
10. Do you feel that you have sufficient access to health services?

    □1 Yes □0 No

11. If no, please specify why (i.e. have to walk long distances to the nearest clinic).

_____

B. Risk factors

(If male, proceed to **Q17**)

12. Number of children _____

13. Number of pregnancies _____

14. Did you have a C-section?

☐1 Yes ☐0 No

15. If yes, how many? _____

16. Did you have an epidural?

☐1 Yes ☐0 No

17. Does your occupation involve any of the following for long periods of time? (You may tick more than one block)

☐1 Lifting heavy objects ☐2 Cause your body to vibrate ☐3 Driving
☐4 Sitting ☐5 Standing

18. How long does a single shift at work last?_____(hours)

19. Are you standing or walking throughout your shift?

☐1 Yes ☐0 No

20. How many hours at a time are you usually on your feet (Walking or standing)?

☐1 1-5 ☐2 6-10 ☐3 11-15 ☐4 16-20

21. How many plates at a time do you carry?
☐1 1 ☐2 2 ☐3 3 ☐4 4

22. Do you use a serving tray to carry plates?

☐1 Yes ☐0 No

23. Does carrying more than one plate cause any strain on your back?

☐1 Yes ☐0 No

24. What is the main flooring surface of the restaurant made of?

□1 Concrete □2 Brick □3 Tile □4 Vinyl □5 Wood □6 Carpet

25. Have you ever slipped and fell during your shift?

□1 Yes □0 No

26. Are your shoes comfortable to work in?

□1 Yes □0 No

27. Are you required to wear a certain type of shoe?

□1 Yes □0 No

28. If yes to question 26, what type of shoes are you required to wear?

Female:

□1 High heels □2 Kitten heels □3 Flat pumps □4 Sneakers/trainers □5 Flat boots □6 Heeled boots

Male:

□7 Men's formal shoe □8 Sneakers/trainers □9 Boots □10 Loafers

29. Do you feel that your job makes you at risk to get low back pain?

□1 Yes □0 No

30. Do you smoke?

□1 Yes □0 No (<u>if no, proceed to **Q36**</u>)

31. If yes, how many cigarettes do you smoke every day?

□1 1-5 □2 6-10 □3 11-15 □4 16-20 □5 21-30 □6 31-40 □7 >40

32. For how long have you been smoking? (years)

□1 1-5 □2 6-10 □3 11-15 □4 16-20 □5 21-30 □6 >30

33. If you are a former smoker then how many cigarettes did you smoke in the past?

□1 1-5 □2 6-10 □3 11-15 □4 16-20 □5 21-30 □6 31-40 □7 >40

34. How long ago did you quit? (years)

□1 1-5 □2 6-10 □3 11-15 □4 16-20 □5 21-30 □6 >30

35. For how long did you smoke? (years)

□1 1-5 □2 6-10 □3 11-15 □4 16-20 □5 21-30 □6 31-40
□7 >40

36. Do you presently have a cough?

□1 Yes □0 No

37. For how long have you had the cough?

□1 0-6 mnths □2 7 mnths-1 yr □3 >1 yr-2 yrs □4 >2 yrs-3 yrs □5 >3 yrs

38. Do you drink alcohol?

□1 Yes □2 No

39. How much do you drink? (units) (i.e. 25ml single measure of a spirit, a third of a 500ml beer, or 175ml glass of red wine) _____ (per week)

40. Do you currently perform any form of exercise?

□1 Yes □0 No (If no, proceed to **Q46**)

41. What type of exercise do you do?

□1 Boxing □2 Dance □3 Karate □4 Netball □5 Running □6 Skipping
□7 Soccer □8 Walking □9 Weight training □10 Other (specify) _____

42. What is the total amount of time (hours) spent per day doing exercise/sport

□1 <1 □2 1-3 □3 4-6

43. Number of exercise sessions per week/combined if more than one sport is played.

_____ (hours)

44. If you played sport in the past (as a child or adult), what sport or form of exercise did you do then?

□1 Boxing □2 Dance □3 Karate □4 Netball □5 Running □6 Skipping
□7 Soccer □8 Walking □9 Weight training □10 Other (specify) _____

45. For how long were you involved in the above sport/s in the past? (years)

□1 0-1 □2 >1-2 □3 >2-3 □4 >3-4 □5 >4-5 □6 >5

46. Have you been diagnosed with any of the following? (You may tick more than one block)

□1 Arthritis □2 Depression □3 Diabetes Mellitus □4 HIV □5 Hypertension
□6 Meningitis □7 Tuberculosis □8 Other (specify) _____

47. Have you experienced low back pain in the past year?

□1 Yes □0 No

48. Are you currently experiencing low back pain?

□1 Yes □0 No

49. Have you ever experienced any of the following? (you may tick more than one block)

□1 Accident □2 Fall □3 Injury to low back □4 Surgery □5 N/A

50. How did your low back pain start?

_____

C. Clinical
(Only participants with back pain are to answer this section)

51. What was your age when you first experienced low back pain? (years)

□1 0-10 □2 11-15 □316-20 □4 21-30 □5 31-40 □6 41-50
□7 51-60 □8 61-70 □9 71-80

52. Do you presently have low back pain?

□1 Yes □0 No

53. How long have you had the current low back pain?

□1 0-1 mnth □2 >1-2 mnths □3 >2-3 mnths □4 >3-4 mnths □5 >4-5 mnths
□6 >5-10 mnths □7 11-15 mnths □8 16-20 mnths □9 >20 mnths

54. On a scale of 1-10, how would you rate your pain?

0	1	2	3	4	5	6	7	8	9	10
No pain	Least pain								Worst pain	

55. At what time of the day is the pain at its worst?

□1 Morning □2 Afternoon □3 Evening □4 Night

56. At what time of the day is the pain at its least?

□1 Morning □2 Afternoon □3 Evening □4 Night

57. How often do you experience low back pain?

□1 Every day □2 2-3 times a week □3 Once a week □4 Every second week
□5 Once a month □6 Occasionally

58. How did your low back pain begin?

□1 Gradually without injury □2 Gradually after injury □3 Abruptly without injury
□4 Abruptly after injury

59. Progression of low back pain?

□1 Getting worse □2 Getting better □3 Staying the same

60. Do you experience any difficulty in doing any of the following things as a result of your low back pain? (You may tick more than one block)

□1 Bending □2 Dressing □3 Driving □4 Lifting □5 Sitting □6 Sleeping
□7 Standing □8 Walking □9 Other (specify) _____

61. How would you describe the impact of your low back pain in relation to your work?

□1 Mild □2 Moderate □3 Severe □4 None

62. Have you ever had to stay away from work as a result of your low back pain?

□1 Yes □0 No

63. If yes, for how long?

□1 0-1 day □2 2-3 days □3 4-5 days □4 5-6 days □5 7-8 days
□6 9-10 days □7 >10 days

64. Have there been periods of absence from work due to your low back pain?

□1 Yes □0 No

65. If yes, how many? _____ (days)

66. Have you ever been bed-ridden because of your low back pain?

□1 Yes □0 No

67. If yes, for how long? _____ (days)

68. Have you ever had to change your job due to low back pain?

□1 Yes □0 No

69. Have you ever lost your job due to low back pain?

□1 Yes □0 No

70. Were you ever treated for low back pain?

□1 Yes □0 No

71. If yes, how often were you treated?

□1 Every day □2 2-3 times a week □3 Once a week □4 Every second week
□5 Once a month □6 Occasionally

72. Are you presently being treated for low back pain?

□1 Yes □0 No

73. If yes, how often are you being treated?

□1 Every day □2 2-3 times a week □3 Once a week □4 Every second week
□5 Once a month □6 Occasionally

74. Do you know what Chiropractic is?

□1 Yes □0 No

75. Where are/were you treated for low back pain? (You may tick more than one block)

□1 General practitioner □2 Herbalist □3 Inyanga □4 Isangoma
□5 Pharmacist □6 Prophet □7 State clinic □8 State hospital
□9 Chiropractic □10 Other (specify) _____

76. For how long have you been receiving treatment for low back pain now?

□1 <1 month □2 1-6 months □3 7-12 months □4 >1 year

77. For how long have you been treated for low back pain in the past?

□1 <1 month □2 1-6 months □3 7-12 months □4 >1 year

78. Which treatment helped or is helping you to get the most relief?

□1 General practitioner □2 Herbalist □3 Inyanga □4 Isangoma
□5 Pharmacist □6 Prophet □7 State clinic □8 State hospital
□9 Chiropractic □10 Other (specify)_____

79. Are you presently on any medication for low back pain? (i.e. pain medication, anti-inflammatory)

□1 Yes □0 No

80. Who prescribed the medication?

□1 General practitioner □2 Herbalist □3 Inyanga □4 Isangoma □5 Pharmacist
□6 Prophet □7 State clinic □8 State hospital
□9 Other (specify) _____

81. Is your low back pain medication helpful?

□1 Yes □0 No

82. How much do you pay for the medication relating to your low back pain every month?

□1 R1-30 □2 R31-60 □3 R61-80 □4 R81-100 □5 >R100 □6 No cost

83. Excluding the medication for your low back pain, how much does your treatment cost you per month? (i.e. Asthma, diabetes, high blood pressure)

□1 R1-30 □2 R31-60 □3 R61-80 □4 R81-100 □5 R101-200
□6 >200 □7 No cost

Thank you for participating in this study…….

Appendix K: Ethical approval certificate

Institutional Research Ethics Committee
Research and Postgraduate Support Directorate
2nd Floor, Berwyn Court
Gate 1, Steve Biko Campus
Durban University of Technology

P O Box 1334, Durban, South Africa, 4000

Tel: 031 373 2375
Email: lavishas@dut.ac.za
http://www.dut.ac.za/research/institutional_research_ethics

www.dut.ac.za

20 November 2018

Ms A M Wolff
7 Itendele Road
Kloof
Durban
South Africa

Dear Ms Wolff

The epidemiology of work related low back pain in full-time restaurant waitron staff within the eThekwini Municipality

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

We are pleased to inform you that the data collection tool has been approved. Kindly ensure that participants used for the pilot study are not part of the main study.

In addition, the IREC acknowledges receipt of your gatekeeper permission letter.

Please note that FULL APPROVAL is granted to your research proposal. You may proceed with data collection.

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

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

Yours Sincerely,

Professor J K Adam
Chairperson: IREC

Appendix L: Research proposal

Research Proposal and Ethics Checklist

Faculty	Health Sciences			
Department	Chiropractic and Somatology			
Qualification for which student is registered		MTech : Chiropractic		
Offering type	**Full time registration**	X	**Part time registration**	
Prior qualification		B. Tech : Chiropractic		

Student Surname	Wolff		**Student No.**	21228885
First Names	Alexia Michaela		**Title (Mr, Ms)**	Ms
Postal Address	7 Itendele Road, Kloof, Durban, South Africa			
Tel (W)	**Tel (H)**	**Cell**	**Fax**	**e-Mail**
--	--	071 874 5464	--	alexia.m.wolff@gmail.com

Provisional title of Dissertation/Thesis	The epidemiology of work-related low back pain in full-time restaurant waitron staff within the eThekwini Municipality	**Full**	
		Partial	X
		Dissertation/Thesis	

Ethics Category	**1**	**2**	**3**
		X	

Research will result in a patent	**Yes**		**No**	X	**Unsure**	

Summary of the study (150-200 words)
Low back pain (LBP) has a significant impact on the quality of life, which contributes to a major economic burden in compensation costs and lost wages which often affects the working-age population. The lifetime prevalence of LBP has been estimated to be approximately 5–90% (Dagenais et al. 2008: 8, Bell and Burnett 2009: 8). Roffey et al. (2010: 89) found the annual incidence of LBP within the general population of Manchester, United Kingdom (UK), to be 5%, with a lifetime prevalence of 60%-90%. Dyer (2012: 66) recorded a point prevalence of 34%, and a lifetime prevalence of 48% within the white population in the greater eThekwini metropolitan area. Docrat (1999) recorded the incidence and prevalence of LBP in the Coloured and Indian community, in greater Kwazulu-Natal, as 76.6% and 78.2% respectively. Dempsey and Filiaggi (2006: 93) conducted a study in the United States of America (USA) on task demands and musculoskeletal discomfort among restaurant waitron staff (n=100), which revealed that 42% of participants reported experiencing musculoskeletal symptoms in the past 12 months of which 18% reported LBP. The proposed research will determine the prevalence of LBP in full-time restaurant waitron staff within the eThekwini Municipality. The aim is to identify demographic and occupation

specific risk factors that waitrons are exposed to, and to identify the impact of LBP in these individuals in terms of absenteeism.

The proposed research study will be a mixed method study comprising of qualitative and quantitative designs which will take place within the eThekwini Municipality. Full-time restaurant waitron staff from dining restaurants within the eThekwini Municipality will be selected for this research study. Participants for the quantitative and qualitative component will be recruited from restaurants within the eThekwini Metropolitan area where waitrons will receive a letter of information which will provide all relevant information in terms of the research study. The participants will be required to indicate their consent in order to proceed.

The data obtained for the quantitative component will be presented in the form of text, graphs and tables, and Statistical Package for the Social Sciences (IBM® SPSS® Statistics) Version 25 software will be used to analyse the data. Descriptive methods will be used to contrast and compare results to other available data. Inferential statistics will be utilised to establish if the different scores of the variables are related or not, or whether there are any significant relationships between the variables. A contingency table will be used to evaluate the data and demonstrate the observations from two different related categorical variables. The Pearson's Chi Square Test will be used for ordinal and nominal data. A p-value of <0.05 will be considered statistically significant. If the frequency counts are less than five, the Fisher's Exact Test will be used to analyse the significance of the different relationships. For the qualitative component, qualitative, semi-structured interviews will be conducted using a question guide. Purposive sampling followed by snowball sampling, will be used for the qualitative portion of the study

Supervisor	Prof. F Haffejee			
Position	Senior Lecturer		**Present Qualifications**	PhD
Tel (W)	**Tel (H)**	**Cell**	**Fax**	**e-Mail**
X2395	-	083 291 8796	_	firozah@dut.ac.za
Co-Supervisor	-			
Position	**-**		**Present Qualifications**	**-**
Tel (W)	**Tel (H)**	**Cell**	**Fax**	**e-Mail**
-	-	-	-	-

N.B. Any subsequent change of supervisor/s needs to be approved by the FRC and noted at HDC.

Section A: Budget		**(Motivate below)**	
1.	**Consumable Details** (Motivate)	Letter to restaurant owners: (R0.40 per A4 x 2 pages = R0.80) (R0.80 x 55 copies = R44.00) Letter of information and consent: (R0.40 per A4 x 2 pages = R0.80) (R0.80 x 220 copies = R176.00) Survey: (R0.40 per A4 x 9 pages = R3.60) (R3.60 x 380 copies = R1368.00) Pilot study: Letter of Information and consent: (R0.40 per A4 x 2 pages = R0.80) (R0.80 x 10 copies = R8.00) Survey: (R0.40 per A4 x 9 pages = R3.60)	

		(R3.60 x 10 copies = R36.00) Focus group Letter of confidentiality: (R0.40 per A4 x 1 page = R0.40) (R0.40 x 10 copies = R4.00) Survey: (R0.40 per A4 x 9 pages = R3.60) (R3.60 x 10 copies = R36.00)	**R** 1672.00
2.	**Outside Specialist Services** (Motivate)	Proof reader R2500.00 Statistician R2700.000	**R** 5200.00
3.	**Books/Journal/Documents**		**R** 0.00
4.	**Library Charges**	Inter-Library Loans	**R** 300.00
5.	**Equipment** (Motivate)		**R** 0.00
6.	**Travel Costs** (Motivate)	Travel to restaurants to drop off and collect questionnaires	**R** 500.00
7.	**Other** (Motivate)	Telephone	**R** 328.00
	TOTAL	R 8000-00 will be provided by DUT, additional funding will be sourced	**R** 8000.00

Section B: To be typed in Arial 10-point font in single line spacing (expand sections to fit contents, but keep within the specified maximum lengths.)

1. Field of Research and Provisional Title

Field of Research:
Epidemiology, Low back pain

Title:
The epidemiology of work-related low back pain in restaurant waitron staff within the eThekwini Municipality

2. Context of the Research

The epidemiology of work-related LBP in the developing world is far less well known than it is in the developed world. Low back pain, according to Manchikanti (2000: 167), is an indiscriminate health problem which affects the general population, where multiple possible aetiologies exist for this disorder.

In a study done by Worku (2000: 147) to assess the prevalence of LBP in Lesotho, 58.5 % (n=2340) of (n=4001) mothers experienced LBP. Van Der Meulen (1997) found that the lifetime incidence of LBP in the Black population of Chesterville was 57.6%. Docrat (1999) conducted a study comparing the prevalence of LBP in the Coloured (76.6%) and Indian (78.2%) communities of eThekwini Municipality revealed that LBP

was experienced in more than three quarters of that population study. It has been shown that ethnicity, traditions, socioeconomic status and lifestyles may have an impact on an individual developing LBP, but overall data is sparse (Chopra and Abdel-Nasser 2008: 583). There is paucity in the literature for the demographics; risk factors; work history, as well as the incidence, prevalence and impact of work-related LBP in full-time restaurant waitron staff in South Africa.

In the USA, Dempsey and Filiaggi (2006: 93) conducted a cross sectional study of task demands and musculoskeletal discomfort among (n=100) waitron staff in ten casual dining restaurants, where 42% of waitrons reported experiencing musculoskeletal symptoms in the past year, with the lower back area (18%) and shoulder (11%) being the most frequent symptoms reported in the responses. South Africa is rated as a developing country where labour intensive work is the primary income of many individuals. Many South Africans remain uneducated, and according to a report on the drop out and learner retention strategy by the Department of Basic Education in South Africa, approximately 39% of South African youth obtain a National Senior Certificate – therefore, roughly 60% of youth are left with no qualification at all beyond the Grade 9 level (South Africa. Department of Basic Education 2011: 6). According to Thamm (2002: 51), waitering often becomes a primary source of income. Risk factors such as long working hours, physical exertion and other work stressors can lead to a substantial increase in LBP, injury and absenteeism. A study conducted in New Zealand on men and women suggests that absenteeism from work occurs due to LBP ($p<0.05$) (Widanarko et al. 2012: 727). The role of chiropractic treatment as an intervention for LBP needs to be established as a high prevalence of LBP in this population could therefore impact on chiropractic services that are offered in the region.

3. Research Problem and Aims

Epidemiological studies conducted in various countries around the world suggest that LBP represents a severe health risk, affecting populations all over the world, therefore there is paucity in the literature regarding work related LBP in waitron staff in South Africa. There is a need to establish the occupational risk factors for developing LBP in full time restaurant waitron staff within the eThekwini Municipality.

Aim:
The aim of the study is to determine the epidemiology of LBP amongst full-time restaurant waitron staff within the eThekwini Municipality.

Objectives:

1. To establish the point, three-month period and annual prevalence of LBP amongst waitron staff.
2. To determine the nature, severity and clinical presentation of LBP in the waitron staff and whether this results in absenteeism from work.
3. To ascertain the risk factors for LBP in waitron staff.
4. To determine the impact of LBP on full–time restaurant waitron staff.

4. Literature Review

Low back pain is a major cause of morbidity in high-, middle- and low-income countries (Hoy et al. 2010: 155). It has a complex aetiology which could initially result from injury or irritation of the muscles, ligaments, connective tissues, joints, intervertebral discs or spinal nerve roots (Roffey et al. 2010: 262). Erick and Smith (2011: 260) stated that musculoskeletal disorders (MSD) represent one of the most common and most expensive occupational health problems in both developed and developing countries. MSD are responsible for a substantial impact on the quality of life and can result in a major economic burden in terms of compensation costs and lost wages, which often affects the working-age population (Roffey et al. 2010: 89). Low back pain is a musculoskeletal disorder involving an interaction between anatomical, psychological, socioeconomic, and occupational risk factors that may end in varying degrees of pain and disability (Wai et al. 2010: 76). According to Louw et al. (2007: 105), LBP is the most prevalent musculoskeletal condition and one of the most common causes of disability. LBP affects many people and has a damaging effect on work capacity and the overall well-being of an individual (Manchikanti et al. 2014: 3), as well as being an important clinical, social, economic, and public health problem affecting the population (Manchikanti 2000: 167). Hartvigsen et al. (2018: 1) states that LBP is characterised by psychological, biophysical, and social dimensions with the intention of impairing function, societal involvement, and personal economic prosperity. The author further elaborates that the financial impact of LBP is cross-sectoral as it increases expenses in both health-care and social supports

systems, where the economic impact related to LBP is comparable to other prevalent, high-cost conditions, such as cancer, cardiovascular disease, mental health, and autoimmune diseases.

Manchikanti (2000: 167) found that the incidence of LBP at three, six and 12 months, ranges from 35% to 79%, while the lifetime prevalence of LBP can be up to 90% in some populations (Dagenais et al. 2008: 8, Bell and Burnett 2009: 8). Roffey et al. (2010: 89) reported that the annual incidence of LBP within the general population of Manchester, UK, is 5%, whilst the lifetime prevalence is 60%-90%. According to Alghadir et al. (2015: 1107), who did a study on work-related musculoskeletal disorders (WMSD) among dental professionals in Saudi Arabia, occupations which require prolonged periods of sitting, lifting, stooping, twisting or standing results in an increased likelihood for developing LBP. In a study conducted in Hong Kong relating to WMSD in surgeons by Szeto et al. (2009: 175), it was noted that a high prevalence of work-related musculoskeletal (WMS) symptoms existed mainly in the neck (82.9%), low back (68.1%), shoulder (57.8%) and upper back (52.6%) regions. Within South Africa, Dyer (2012: 66) recorded a point prevalence of 34%, and a lifetime prevalence of 48% within the white population in the greater eThekwini metropolitan area. Docrat (1999) recorded the prevalence of LBP in the Coloured and Indian community, in greater Kwazulu-Natal, as 76.6% and 78.2% respectively, and in a study to determine the prevalence of work-related musculoskeletal disorders (WMSD) in nurses, in an eThekwini District Hospital, Kumalo (2015: 49), found that the lifetime prevalence of LBP in nurses was 77% and the annual prevalence was 67%. The prevalence of LBP was higher than that of other body regions.

Research from studies in developing countries including Tibet (Hoy et al. 2003: 225), Nigeria (Omokhodion 2002: 57), Lesotho (Worku 2000: 147), and South Africa (Van Der Meulen 1997, Docrat 1999) suggest that LBP is as common among these populations as in more developed nations. A study done in Denmark by Jørgensen et al. (2013: 213) identified that musculoskeletal pain is influenced by an array of factors such as socio-economic, genetic, lifestyle and individual perceptions. The study highlights that high physical work demands are largely considered to be one of the chief causes of musculoskeletal pain among workers, and that workers with high physical work demands have the highest prevalence of musculoskeletal pain.

Individuals working in the restaurant industry work roughly 60 to 70 hours per week, where waitrons and managers are on their feet between 12 to 15 hours a day (Kamp 2014). A study conducted on task demands and musculoskeletal discomfort among restaurant waitron staff (n=100), by Dempsey and Filiaggi (2006: 93) in the USA, revealed that 42% of participants reported experiencing musculoskeletal symptoms in the past 12 months of which 18% reported LBP. A study was conducted on working individuals in New Zealand by Widanarko et al. (2011: 561) to determine the prevalence of musculoskeletal symptoms in relation to gender, age, and occupational/industrial group found that the prevalence of musculoskeletal symptoms for any region of the body was 92%, with the highest prevalence being the lower back region at 54%. Widanarko et al. (2012: 727) also noted the prevalence of reduced activities (18%) and absenteeism (9%) due to low back symptoms. A systematic review conducted by Wai et al. (2010: 76) suggested that bending activities involving higher degrees of trunk flexion were associated with disabling types of LBP in certain working populations. Multiple studies have investigated the correlation between physical work demands and musculoskeletal pain, however, several systematic reviews have concluded that the scientific documentation for a causal relation between high physical work demands and musculoskeletal pain is scarce (Jørgensen et al. 2013: 213; Roffey et al. 2010: 262).

According to Manchikanti et al. (2014: 3), evidence shows that there is an increase in awareness, prevalence, chronicity, and perceived severity with resulting disability with regard to LBP, which may lead to significant impairment of physical and psychological health that may result in a decline in the performance of social responsibilities e.g. work and family. The impact of LBP specifically within the waitering profession has not been given sufficient attention in the literature.

Erick and Smith (2014: 359) stated that possible occupational risk factors for LBP among teachers in Botswana include work posture, repetitive movements, physical strain and poor work conditions, and psychosocial risk factors include lack of social support, high quantitative demands, and job dissatisfaction; all of which need investigation in the waitron population group. Possible physical risk factors in developing LBP were found to include awkward posture, prolonged standing and incorrect lifting. Lastly, possible environmental risk factors that may be experienced by the waitron population group are slippery floor surfaces, air drafts, heat, cold, poor quality of internal air and bright lighting (Van Nieuwenhuyse et al. 2006: 45).

The research study aims to determine the epidemiology of LBP amongst full-time restaurant waitron staff within the eThekwini Municipality, as little research has investigated the prevalence of LBP in the waitron profession. Therefore, the purpose of this study is to report on the prevalence of LBP, the associated risk factors, and its impact on the waitron profession.

5. Research Methodology

Study Design:
This study is a mixed methods study comprising of qualitative and quantitative components. A quantitative research approach focuses on counting data (USC 2017: para. 3 line 1), and this method is used when a phenomena is studied in terms of quantity. Kothari (2004: 3) states that this is the best design to evaluate specific answers to specific questions, which in this context consists of the demographics, nature and severity, impact, and the clinical presentation of LBP in full-time restaurant waitron staff within the eThekwini Municipality.

Location of study:
The study will be conducted within the eThekwini Municipality of KwaZulu-Natal, South Africa. The eThekwini Municipality is the largest city within the province and is the third largest city in the country. The total population size consists of 3 442 398 people, as reported per the 2011 Census (Stats SA 2011), with the total land area of the eThekwini Municipality being 2,297 km^2, which is larger than other South African cities (eThekwini Municipality 2011).

Study Population:
The target population will include full-time restaurant waitron staff employed at dining restaurants within the eThekwini Municipality. This population group will be selected to determine the risk factors, nature and severity, and impact of work-related LBP in waitron staff. All genders and race groups will be included, as long as participants qualify according to the inclusion and exclusion criteria. Participation in the study will be voluntary once the participant has agreed and signed the letter of information and consent. No person will be coerced into participation in the study. Participants will not receive remuneration and are free to decline participation or withdraw from the study at their request.

Participant recruitment:
Participants will be recruited by the researcher once permission by the restaurant owner, who will receive a letter of information regarding the research, has been granted (Appendix A). A letter of information and consent regarding the research will be given to participants (Appendix B, Appendix C). After receiving a signed informed consent, the questionnaire (Appendix E) for the quantitative component will be given to the participant. Each participant will be allowed to take the questionnaire away for completion in privacy and placed into a sealed ballot box on returning to work. The researcher will return at an appointed time to collect the completed questionnaires. For the qualitative component, semi-structured interviews will be conducted using a question guide (Appendix F).

Sampling strategy:
A list of restaurants within the eThekwini Municipality will be created that make up the population, and restaurants will be selected randomly by a ballot method to make up the sample size. All full-time waitrons at a restaurant will be included in the sample.

Sample size:
The total population, of 2916 full time waiters was determined by telephonically contacting all dining restaurant managers within the eThekwini Municipality. Using the total population size of 2916 full-time waitron staff, a 6.65 percent margin error and a 95% confidence interval, a sample size of 180 waiters was calculated by a statistician for the quantitative component (Esterhuizen, 2019). For the qualitative component, 8-12 participants will be interviewed. Sample size is guided by saturation and 8-12 interviews is sufficient to reach saturation in a homogenous sample (Guest et al 2006). However, if saturation is not reached, then more than 12 participants will be recruited and interviewed until saturation is reached. Sampling for the qualitative component will be purposive, followed by snowball sampling.

Inclusion criteria:

- The participants must be employed full-time at dining restaurants within the eThekwini Municipality during the time of the study.
- Participants must work a minimum of five shifts a week, resulting in 40 hours a week.
- Participants need to be over the age of 18 years.
- Participants who have read the information form and signed a consent form.

Exclusion Criteria:
- Waitron staff that are not at work on the day of data collection.
- Those who participated in the pilot study.

Research Method:
The research tool for the quantitative component of the study is a self-administered questionnaire. The researcher will drop off the relevant number of questionnaires in accordance to the full-time staff employed at each selected restaurant within the eThekwini Municipality. Those willing to participate will be required to complete the 15-minute questionnaire in their own time. The researcher will monitor the number of questionnaires completed at regular intervals to establish if the target sample size has been achieved.

Questionnaire Development:
The questionnaire that will be used has been modified from a previously validated questionnaire on generalised LBP, used in a study done by a Durban University of Technology student; Khumalo (2017). A formal letter was sent to the student requesting permission to use the questionnaire (Appendix D and Appendix E). The questionnaire was reviewed, and changes were made in order to make it more relevant to the population of current interest. The following changes were made:
Section A – Questions 9, 10, 11, 12, and 13 were omitted.
Section B – Question 21 was altered by omitting point 4. Questions 33-41 were omitted. Question 44 was altered by omitting points 4 and 5.

A focus/expert group discussion comprising of six to ten people will be conducted to determine the validity of the questionnaire (Fowler 1995). The focus group will comprise of the researcher, the supervisor, two waitron staff suffering from LBP, at least one practicing chiropractor, and a other person with research experience. All focus group participants will sign an informed consent form (Appendix C) prior to participating in the focus group discussion. A questionnaire will be handed out to each participant (Appendix E). The focus group discussions will be audio-recorded and all information discussed will be kept confidential. Recommended changes post focus group discussions will be made to the questionnaire.

A group comprising of three to five people will be invited to participate in a pilot study post focus group to validate the questionnaire (Schreiber 2008). Full time waitron staff will be chosen to form the pilot group and will be excluded from the selection process of the main study. A letter of information (Appendix B), consent form (Appendix C), and post focus group questionnaire will be handed out to each pilot group participant.

Different styles of questioning will be used in this study's questionnaire to increase the likelihood of participants accurately answering questions. The types of questions that will be present will vary from open-ended questions, multiple choice questions, dichotomous (yes/no options), and questions that require answers on a Likert scale. This will allow for structured and open-ended questions which will increase the reliability of the questionnaire (Struwig and Stead 2001: 129). The questionnaire will be divided into three sections in order to obtain the desired data for this study. The sections will include demographics (biographical information), risk factors, and clinical characteristics of the LBP. The questions used in the questionnaire will be reviewed by a focus group once ethical approval has been obtained for this study. After completion of the letter of information and the questionnaire, the participant will be required to insert the completed forms into two boxes, box A for the letter of consent, and box B for the questionnaire to ensure confidentiality and anonymity.

Data Analysis:
This research study will make use of primary data obtained from the questionnaire as no similar research has previously been conducted in South Africa. The data obtained from the study will be presented in the form of text, graphs and tables, where appropriate, with regards to the study objectives. Statistical Package for the Social Sciences (IBM® SPSS® Statistics) Version 25 software will be used. Descriptive methods will then be used to further describe the data collected to contrast and compare it to other available data. Inferential statistics will also be utilised to establish if the different scores of the variables are related or not (Lind 2004), or whether there are any significant relationships between the variables. A contingency table will also be used

to evaluate the data and to demonstrate the observations from two different related categorical variables. The Pearson's Chi Square Test will be used to compare ordinal and nominal data. A p-value of <0.05 will be considered as statistically significant. If the frequency counts are less than five, the Fisher's Exact Test will be used to analyse the significance of the different relationships (Singh, 2017).

Limitations:
A possible limitation for this research study may be a low response rate from the target population. Efforts will be made to minimize this limitation by sending two reminders via email/SMS to request participation.

Ethical considerations:

- Ethical approval to conduct this study will be obtained from the IREC at the Durban University of Technology.
- Approval from restaurant owners will be obtained prior to the handing out of questionnaires to the waitron staff.
- Participation in the study is completely voluntary and the prospective study participants will be free to refuse participation therein and may withdraw from the study at any point in time.
- All participants will be treated equally and fairly in respect of justice.
- Participants will indicate consent at the start of the questionnaire to participate in the self-administered questionnaire, in respect of autonomy.
- Study information and letters of consent will be included at the start of the questionnaire.
- Participant's and restaurants' names will not be included in the questionnaire to ensure anonymity and confidentiality.
- Only the researcher, statistician and supervisor will have access to the data obtained from the questionnaire.
- The researcher will analyse and report on the data objectively at all times.
- None of the study participants will receive any form of remuneration.
- The completed questionnaires and signed consent forms will be collected in separate sealed ballot boxes to protect the participants in the form of nonmaleficence.
- When the study is administered to the focus group, the members will be requested to sign a confidentiality letter to ensure the confidentiality of the research study content/questionnaire.
- On conclusion of the study, the results will be made available to the participants and population in the form of a completed dissertation at the Durban University of Technology, in respect of beneficence.

6. Plan of Research Activities

DRC PG1 – Approved 24 April 2017
RHDC PG1 – Approved 7 August 2017

DRC PG2a – Approved April 2018
FRC PG2a – Approved August June 2018
IREC PG2a – Approved November 2018

Data Collection – Completed by December 2019
Write up – Completed by January 2020
Submission for examination – February 2020

7. Structure of Dissertation / Thesis Chapters

Chapter 1 – Introduction to the research, aims and objectives, rational, assumptions, and limitations.
Chapter 2 – Literature review.
Chapter 3 – Methodology and materials implemented in the approach of the study.
Chapter 4 – Results.
Chapter 5 – Analysis and discussion of results.
Chapter 6 – Conclusions and future recommendations.

8. Potential Outputs

- Printed as hard copy dissertation
- Article published in an appropriate journal
- Conference proceedings

9. Key References

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Section C: Ethics **Note:** Ethics requirements are faculty specific. Kindly ensure that you are aware of and have complied with the relevant ethics requirements.							
Tick as appropriate:							
Humans		**Organisations**		**Animals**		**Environment**	
Yes X	**No**	**Yes**	**No X**	**Yes**	**No X**	**Yes**	**No X**
Indicate Category (X)							
1.	**Exempt from Ethics and Biosafety Research Committee Review (straightforward research without ethical problems)**						
2.	**Expedited review (minimal risk to humans, animals or environment)**						**X**
3.	**Full Ethics and Biosafety Research Committee review recommended (possible risk to humans, animals, environment, or a sensitive research area)**						
Attach Addendums (if any)							

Please initial alongside if the project is to be registered as secret	

ETHICAL ISSUES CHECKLIST FOR RESEARCH APPROVAL

To be completed by all people wishing to conduct research under the auspices of Durban University of Technology.

1. Use the Durban University of Technology's Research Ethics Policy and Guidelines to ensure that ethical issues have been identified and addressed in the most appropriate manner, before finalising and submitting your research proposal.

2. Please indicate [by an X as appropriate] which of the following ethical issues could impact on your research.

3. Please type the motivations/further explanations where required in the cell headed COMMENTS.

4. The highlighted response cells indicate those responses which are of particular interest to the Ethics Committee.

NO.	QUESTION	YES	NO	N/A
	DECEPTION			
1.	Is deception of any kind to be used? If so provide a motivation for acceptability.		X	
	COMMENTS: N/A			
NO.	**QUESTION**	**YES**	**NO**	**N/A**
2.	Will the research involve the use of no-treatment or placebo control conditions? If yes, explain how the participant's' interests will be protected.		X	
	COMMENTS: N/A			
	CONFIDENTIALITY			
3.	Does the data collection process involve access to confidential personal data (including access to data for purposes other than this particular research project) without prior consent of participants? If yes, motivate the necessity.		X	
	COMMENTS: N/A			
4.	Will the data be collected and disseminated in a manner that will ensure confidentiality of the data and the identity of the participants? Explain your answer	X		
	COMMENTS: The data will be collected in the following manner: Box A will collect the letter of information/consent from the participants. Box B will collect the questionnaire. Both boxes will be sealed and only opened once data collection is complete. This method of data collection will ensure confidentiality. In addition, the questionnaire will not ask for any names or other identifying information.			
5.	Will the materials obtained be stored and ultimately disposed of in a manner that will ensure confidentiality of the participants? If no, explain. If yes specify how long the confidential data will be retained after the study and how it will be disposed of.	X		
	COMMENTS: The materials obtained will be stored for a minimum period of five years in a locked cupboard at the Chiropractic Department, thereafter the materials will be disposed of by using a paper shredder.			

6.	Will the research involve access to data banks that are subject to privacy legislation? If yes, specify and explain the necessity.		X	
	COMMENTS: N/A			
	RECRUITMENT			
7	Does recruitment involve direct personal approach from the researchers to the potential participants? Explain the recruitment process	X		
	COMMENTS: Yes, recruitment will involve a direct personal approach. The researcher will directly have to approach the restaurant owner to gain consent to distribute questionnaires to the employees in the restaurant. Employees will be approached by the researcher and asked if they would like to participate in the study, thereafter the employees will receive a letter of information and consent to take part in the study. This approach will not involve any forms of coercion of the employees to partake in the study.			
8	Are participants linked to the researcher in a particular relationship, for example employees, students, family? If yes, specify how.		X	
	COMMENTS: N/A			
9	If yes to 8, is there any pressure from researchers or others that might influence the potential participants to enrol? Elaborate.			X
	COMMENTS: N/A			
10	Does recruitment involve the circulation/publication of an advertisement, circular, letter etc.? Specify		X	
	COMMENTS: N/A			
11	Will participants receive any financial or other benefits as a result of participation? If yes, explain the nature of the reward, and safeguards		X	
	COMMENTS: No remuneration will be given to the participants.			
12	Is the research targeting any particular ethnic or community group? If yes, motivate why it is necessary/acceptable. If you have not consulted a representative of this group, give a reason. In addition, explain any consultative processes, identifying participants. Should consultation not take place, give a motivation.		X	
	COMMENTS: N/A			

	INFORMED CONSENT			
13	Does the research fulfil the criteria for informed consent? [See guidelines]. If yes, no further answer is needed. If no, please specify how and why.	X		
	COMMENTS: N/A			
14	Does consent need to be obtained from special and vulnerable groups (see guidelines). If yes, describe the nature of the group and the procedures used to obtain permission.		X	
	COMMENTS: N/A			
15	Will a Letter of Information be provided to the participants and written consent be obtained? If no, explain. If yes, attach copies to proposal. In the case of participants who are not familiar with English (e.g. it is a second language), explain what arrangements will be made to ensure comprehension of the Letter of Information, Informed Consent Form and other questionnaires/documents.	X		
	COMMENTS: N/A			
16	Will results of the study be made available to those interested? If no, explain why. If yes, explain how	X		
	COMMENTS: Once the proposed study has been completed, a printed dissertation will be available from the Durban University of Technology. Participants are welcome to request the results from the study.			
	RISKS TO PARTICIPANTS			
17	Will participants be asked to perform any acts or make statements which might be expected to cause discomfort, compromise them, diminish self-esteem or cause them to experience embarrassment or regret? If yes, explain.		X	
	COMMENTS			
18	Might any aspect of your study reasonably be expected to place the participant at risk of criminal or civil liability? If yes, explain.		X	
	COMMENTS: N/A			
19	Might any aspect of your study reasonably be expected to place the participant at risk of damage to their financial standing or social standing or employability? If yes, explain.		X	
	COMMENTS: N/A			

20	Does the protocol require any physically invasive, or potentially harmful procedures [e.g. drug administration, needle insertion, rectal probe, pharyngeal foreign body, electrical or electromagnetic stimulation, etc.?] If yes, please outline below the procedures and what safety precautions will be used.		X	
	COMMENTS: N/A			
21	Will any treatment be used with potentially unpleasant or harmful side effects? If yes, explain the nature of the side-effects and how they will be minimised.		X	
	COMMENTS: N/A			
22	Does the research involve any questions, stimuli, tasks, investigations or procedures which may be experienced by participants as stressful, anxiety producing, noxious, aversive or unpleasant during or after the research procedures? If yes, explain.		X	
	COMMENTS: N/A			
23	Will any samples of body fluid or body tissues be required specifically for the research which would not be required in the case of ordinary treatment? If yes, explain and list such procedures and techniques.		X	
	COMMENTS: N/A			
24	Are any drugs/devices to be administered? If yes, list any drugs/devices to be used and their approved status.		X	
	COMMENTS: N/A			
	GENETIC CONSIDERATIONS			
25	Will participants be fingerprinted or DNA "fingerprinted"? If yes, motivate why necessary and state how such is to be managed and controlled.		X	
	COMMENTS: N/A			
26	Does the project involve genetic research e.g. somatic cell gene therapy, DNA techniques etc.? If yes, list the procedures involved		X	
	COMMENTS: N/A			
	BENEFITS			
27	Is this research expected to benefit the participants directly or indirectly? Explain any such benefits.	X		
	COMMENTS: The findings may indicate better ergonomics to prevent LBP			

28	Does the researcher expect to obtain any direct or indirect financial or other benefits (not including a qualification) from conducting the research? If yes, explain.		X	
	COMMENTS: N/A			
	SPONSORS: INTERESTS AND INDEMNITY			
29	Will this research be undertaken on the behalf of or at the request of a pharmaceutical company, or other commercial entity or any other sponsor? If yes, identify the entity.		X	
	COMMENTS: N/A			
30	If yes to 29, will that entity undertake in writing to abide by Durban University of Technology's Research Committees Research Ethics Policy and Guidelines? If yes, do not explain further. If no, explain.			X
	COMMENTS: N/A			
31	If yes to 30, will that entity undertake in writing to indemnify the institution and the researchers? If yes, do not explain further. If no, explain.			X
	COMMENTS			
32	Does permission need to be obtained in terms of the location of the study? If yes, indicate how permission is to be obtained.	X		
	COMMENTS: The restaurant owner will be approached directly and be presented with a letter of information regarding the proposed study. Once consent has been gained, only then may the researcher be allowed to recruit participants.			
33	Does the researcher have indemnity cover relating to research activities? If yes, specify. If no, explain why not.	X		
	COMMENTS: The researcher is a registered student at DUT.			
34	Does the researcher have any affiliation with, or financial involvement in, any organisation or entity with direct or indirect interests in the subject matter or materials of this research? If yes, specify.		X	
	COMMENTS: N/A			

N.B. For ethical clearance for categories 2 and 3, kindly refer to the IREC web page: http://www.dut.ac.za/research/institutional_research_ethics.

Please ensure that you have completed, in every respect, all of the following prior to submission of your Research Proposal. Students are advised to use the electronic version of the PG 2a form which is available from the DUT website or from the Faculty Officer.

Please complete **ALL SECTIONS**, using Arial 10-point font, single line spacing in MS Word. Where sections are not applicable please adapt the form accordingly.

1. Proof-read your hard copy, ensure correct referencing, edit rigorously and then submit to your Supervisor(s).
2. Number all pages and show correct author source references both in the text proper and in the References at the end using the Harvard referencing method (IEEE for Engineering students).
3. Complete the Ethics Section, the Work Plan and the Budget correctly in every respect and again engage in a thorough spell check prior to submission to your Supervisor/Co-Supervisor(s).
4. Please note carefully the closing dates, as outlined in the Academic Calendar, contained in the Rule Book for Students, the registration dates as well the expected duration for the completion of the project.
5. It is imperative that you adhere to your specified guidelines for completion of your research and institutional/faculty deadlines as published on the DUT website.

D**eclarations**

Student Declaration

I, the undersigned, certify that:

- I am familiar with the rules regulating higher qualifications at Durban University of Technology and understand the seriousness with which DUT will deal with violations of ethical practice in my research.
- Where I have used the work of others this has been correctly referenced in the proposal and again referenced in the bibliography. Any research of a similar nature that has been used in the development of my research project is also referenced.
- This project has not been submitted to any other educational institution for the purpose of a qualification.
- All subsidy-earning outputs (artefacts and publications) from postgraduate studies will be in accordance with the Intellectual Property Policy of the Durban University of Technology.
- Where patents are developed under the supervision of the Durban University of Technology involving institutional expenditure, such patents will be regarded as joint property entitling the Durban University of Technology to its share, subject to the Durban University of Technology's policy on the Management and Commercialisation of Intellectual Property.
- I understand that I am expected to publish an article based on my research results.
- I understand that plagiarism is wrong and incurs severe penalties.

I HEREBY DECLARE THAT THE ABOVE FACTS ARE CORRECT.

Signed: _____ **Date:** _____
(Student)

Supervisor Declaration

(a) I approve the student's provisional title of research project.
(b) I acknowledge that the topic is researchable, and the student has the potential to complete the dissertation in the suggested time frame allowed.
(c) I am satisfied with and approve the research proposal;
(d) *I approve of the Co-Supervisor(s) proposed by the HoD and student.
(e) I have checked that the student has complied with all the instructions outlined in the Postgraduate Student Guidelines and those appended to the Research Proposal and confirm that the Research Proposal is ready for submission to the FRC.
(f) I accept responsibility to advise and guide the student.
(g) I accept the appointment of Supervisor.

**delete and sign alongside if not applicable*

Signed: _____ Date: _____

(Supervisor)

Signed: _____ Date: _____

(Co-Supervisor)

Head of Department Declaration
I, _____ (Full name of Head of Department), have read the research proposal and I hereby submit it to the FRC for approval. **Signed:** _____ **Date:** _____ (HoD)
The abovementioned proposal (including the ethical considerations) has been considered and approved by the Faculty Research Committee. **Signed:** _____ **Date:** _____ (Chairperson: Faculty Research Committee)

N.B. The attached checklist (Checklist and Evaluation of Research Proposal) must be completed and signed by the departmental reviewer(s) and HoD before the proposal is approved by the FRC.

Checklist and Evaluation of Research Proposal			
Reviewer / Review Panel Chair		**Title**	

Tel (W)	Tel (H)	Cell	Fax	e-Mail

		Yes	No	Unclear	Comment
1.	**Research Topic**				
1.1	Is the research problem/question clearly stated?				
1.2	Is the problem/question researchable?				
1.3	Is the topic relevant?				
1.4	Is the scope appropriate for the qualification?				
1.5	Is the research appropriately delimited?				
1.6	Are the research aims clear?				
1.7	Are the assumptions stated (if any)?				
1.8	Is the terminology adequately defined?				
2.	**Literature**				
2.1	Is the literature relevant to the problem?				
2.2	Has an adequate conceptual framework been developed?				
2.3	Is the literature current, apart from seminal works in the field?				
2.4	Has the relationship between the research topic and previous research been outlined?				
2.5	Are textual referencing and bibliographic citation correct and consistent?				
3.	**Methodology**				
3.1	Does the research design address the research problems/questions?				
3.2	Are the data collection/production methods appropriate?				
3.3	Are the data analysis methods appropriate?				
3.4	Have ethical considerations been addressed? [1]				
4.	**General**				
4.1	Is the proposal generally free of language/typographical errors?				
4.2	Is the proposal free of plagiarism? [2]				
4.3	Is the research manageable in terms of timeframe?				
4.4	Is the budget allocated realistic?				
5.	**Funding**				
5.1	Is the proposal financially viable?				

[1] Indicate whether ethical clearance through a research ethics committee is required.
[2] In the case of plagiarism, the proposal should be returned to the candidate with a warning. The candidate will need to re-submit (see Policy on Plagiarism).

Recommendations	

Signed (Reviewer):_____ **Date:** _____

Signed (HoD):_____ **Date:** _____

Date of Approval by FRC	

Routing	Student		Supervisor/s		HoD		FRC	