

**An Investigation Into Factors Associated With The
Development Of Lower Back Pain In Nurses In The Durban
Metropolitan Area; With Particular Reference To Manual Work**

BY

ROZANNE DASAPPA

*Dissertation submitted to the faculty of Health Sciences at the Durban
University of Technology in partial compliance with the requirements for a
Master's Degree in Technology: Chiropractic.*

“I, Rozanne Dasappa, declare that this dissertation is representative of my
own work, both in conception and execution”.

Rozanne Dasappa

Date

Approved for examination

Dr T MacDougall
M.Tech: Chiropractic

Date

Dedication

This dissertation is dedicated to my incredible husband, Gershon and my baby girl, Hannah. Thank you so much for all you have done for me over the years. Your Love and support and sacrifice helped me achieve this. I am so blessed to have you. You are the best.

I Love You Two!

Acknowledgements

To my mum, dad, my sister and brother and my extended family. I thank each of you for your continued support and prayer through the many years.

To Dr MacDougall, Thank you for supervising me through this research. Thank you for your patience and help whenever it was needed.

Dr Korporaal, Thank you for always being willing to offer help and advice and thank you for all your hard work.

To my friends I've made over the years and my classmates, Thank you for your friendship, only you know the experience.

Thank you to the clinicians and staff for all your work.

To Dr Yin Bing Yip, Thank you for making your questionnaire available to me without hesitation.

To Sr Van der Linde, Matron Ngidi, Matron Dwarukpersad, Susan West and Chatsmed Candlelight School of Nursing, Thank you for all your help in getting this research done.

To all the nurses who participated in this research, Thank you for your time. You made this possible.

And most importantly, To My Heavenly Father. Thank you for the numerous blessings. Thank you for making this possible.

Abstract

The objectives of this study were:

- To determine how the frequency of manual work contributes to low back pain in nurses in state versus private hospitals in the Durban area.
- To determine how the frequency of manual work contributes to low back pain in nurses in state versus private hospitals in the Durban area.

Hospital nurses have a high prevalence of low back pain (LBP) (Smedley *et al.*, 2003). It has been found that nursing personnel ranked fifth in occupations claiming worker compensation for low back injuries (Owen and Garg, 1994). A number of studies have also indicated a strong association between musculoskeletal disorders and work related factors (Maul, 2002). An epidemiological study by Smedley *et al* (1997) has suggested that repetitive lifting, frequent bending and twisting play a role in the development of LBP, and that heavy physical workload has played a major role in the development of LBP in nurses.

LBP is therefore a serious problem in the nursing field with a relatively high prevalence worldwide. It causes increased absenteeism from work and could impact on patient care.

This study was a survey, which was quantitative in nature. Data was collected by means of a questionnaire. The questionnaires were handed out in randomly selected hospitals in the Durban Metropolitan area. The names of all state and private hospitals in the Durban Metropolitan area were put into two boxes and three names were picked from each box. A letter requesting permission to carry out this research was sent out to each hospital and a positive response was received from one state hospital, R.K Khan Hospital and two private hospitals, Westville and Entabeni hospitals.

Questionnaires were handed out to the nurses by the researcher, as requested by the hospitals, and collected at a later time by the researcher. Questionnaires were handed out at each ward in the hospitals to nurses who met the criteria for the study and agreed to participate in this study. Questionnaires were also handed out to nurses in the nurses lounge during lunch breaks.

The questionnaire was developed as combination of; a pre-validated questionnaire made available by Yip (2001), questions on socio-demographic data, work history, patient handling activities and LBP. The compiled questionnaire was tested for face and construct validity through a focus group, and piloted before being used in the study.

A total of 500 questionnaires were handed, 250 to state hospitals and 250 to private hospitals. Participants consisted of nurses (registered, enrolled and student) between the ages of 18 and 45 years, both male and female. Nurses from all hospital wards were allowed to participate in this study.

A total of 124 questionnaires were received back, (50 from private hospitals and 74 from the state hospital), from the nurses in all the hospitals. Data was then collected from these questionnaires and was analysed using the statistical package SPSS version 13 (SPSS Inc. Chicago, Illinois, USA). A p value of <0.05 was considered as significant.

The data collected from the questionnaires was analysed and the results obtained were as follows:

The prevalence of work related LBP in this study was 59.7%. Of the 74 nurses with LBP, only 7 (9.5%) reported having LBP before working as a nurse. 35.1% of participants reported that they experienced pain on a daily basis while 62.2% described their LBP as moderate and 27% described their pain as severe. The median duration of LBP was 3.5hours per episode. Of all the participants in this study, 64,9% had needed bed rest due to their LBP with 43.2% having taken sick leave from work for LBP. Back pain in nurses has been found to be a major cause of days lost due to sickness (French *et al.*, 1997).

The majority of nurses (93.2%) reported lifting to be the cause of their LBP, standing and bending were also found to be important causes. Low Back injury was reported in 31.1% of participants with up to 51.4% receiving treatment for their injuries, the main choice of treatment was from a hospital or General practitioner.

With regards to the frequency of manual work on LBP, there was found to be a slight tendency toward LBP with more frequent manual activity, however this was

found to be non significant. In those respondents with LBP, the activity associated with the most intense LBP was carrying or lifting patients. Time spent; standing, holding up hands and bending were found to be higher in the group which reported LBP. Having 1-2 children was also associated with increased LBP.

The prevalence of LBP was found to be higher in the state hospital (67.6%) than in the private hospitals (48%).

The aim of this study was to determine the association between frequency and intensity of manual work on LBP in nurses. The results showed that frequently performed manual activities were associated with LBP but not significantly. In terms of intensity of manual work, carrying or lifting patients was found to be most associated with LBP, standing and bending were also significantly associated with LBP. This study also aimed to determine any difference in LBP between state and private hospitals and a significant difference in LBP prevalence was noted between state and private hospitals.

The findings of this study suggest that LBP is a common problem among hospital nurses. The results of this study were also found to be within the same prevalence rates of international studies, which ranged from 35.9% in New Zealand to 66.8% in the Netherlands (Nelson *et al.*, 2003). As was found in the literature (French *et al.*, 1997 and Smedley *et al.*, 1997), lifting was reported to be a major cause of LBP.

TABLE OF CONTENTS

Dedication	ii
Acknowledgements	iii
Abstract	v
List of Charts	xii
List of Tables	xiii
Definitions	xiv

Chapter One

1.1	The Problem	1
1.2	Aims of the Study	3
1.3	Rationale for the Study	5
1.4	Study Limitations	6

Chapter Two

2.1	Introduction	7
2.2	Anatomy of the Lumbar-Sacral Spine	10
2.3	Biomechanics of the Lumbar Spine	16
2.4	Low Back Pain	20
2.5	Incidence and Prevalence of Low Back Pain	22
2.5.1	Incidence and Prevalence of Low Back Pain in Nurses	23

2.6	Risk Factors for Low Back Pain	25
2.6.1	Age	25
2.6.2	Gender	26
2.6.3	Physical Exercise	26
2.6.4	Smoking	27
2.6.5	Occupational Activities	28
2.7	Impact of Low Back Pain on Nurses	29
2.8	Conclusion	29

Chapter Three

3.1	Introduction	30
3.2	Study Design	30
3.2.1	Sample Size	30
3.2.2	Selection Procedure	31
3.2.3	Inclusion and Exclusion Criteria	33
3.2.4	Questionnaire Background	33
3.3	Data Collection	35
3.4	Statistical Methodology	37

Chapter Four

4.1	Introduction	38
4.2	Demographics	38
4.3	Prevalence of Low Back Pain	42

4.3.1	Characteristics of LBP	42
4.3.2	The association between frequency and intensity of manual work and current work-related LBP	46
4.4	The Association Between Other Factors and LBP	51
4.4.1	State vs. Private Hospitals	51
4.4.2	Other Factors Associated with LBP	51
4.5	Summary	54
4.6	Study Limitations	60

Chapter Five

5.1	Conclusion	61
5.2	Recommendations	63

References	64
-------------------	----

List of Appendices	72
---------------------------	----

List of Charts

Figure 1: Bar chart showing age distribution of participants (n=124)	39
Figure 2: Pie chart showing ethnicity distribution of participants (n=124)	40
Figure 3: Bar chart showing parity of study participants (n=115)	41
Figure 4: Bar chart showing percentage of responses to how frequent LBP was in the past year (n=74)	43
Figure 5: Pie chart showing severity of LBP in 74 affected participants	44
Figure 6: Bar chart showing reported cases of LBP in 74 cases	45
Figure 7: Bar chart showing median frequency of time spent in Various postures by presence of LBP	48
Figure 8: Bar chart showing median response to intensity of pain Caused by various manual activities in LBP participants (n=74)	50

List of Tables

Table 1: Marital status of study participants (n=124)	41
Table 2: Responses to how LBP began in participants with LBP (n=124)	43
Table 3: Mann-Whitney tests to compare frequency of performing manual Activities between those with and without LBP	47
Table 4: Mann-Whitney tests to compare frequency of time spent in Various postures between those with and without LBP	49
Table 5: Crosstab of type of hospital by work related LBP	51
Table 6: Logistic regression analysis of risk factors for current work-Related LBP	53

DEFINITIONS

Prevalence: is defined as a measure of the number of people in a given population who have a symptom or disease at a particular time (Borenstein *et al.*, 1995:22)

Low Back Pain: In this study it has been defined as pain occurring between the lower costal margins and gluteal folds, with or without radiation into the leg to below the knee, of at least one-day duration in the past 12 months.

Registered Nurse: A graduate trained nurse who has been licensed by a state authority after qualifying for registration (Merriam-Webster Online Dictionary 2006).

Durban Metropolitan Area: This area has been highlighted in the map provided Appendix N (SA Venues online. 2006).

CHAPTER ONE

INTRODUCTION

1.1 THE PROBLEM

Low back pain (LBP) is an important clinical and public health problem (Papageorgiou *et al.* 1995). It is a major cause of morbidity, disability, limitation of activity and economic loss (Jayson 1992: 539). It has been found that 60% to 80% of the population will suffer from LBP at some time in their lives and that 20% to 30% suffer from it at any given time (Burton *et al.* 1995 and Waddell 2004: 74).

According to Manga *et al.* (1993), disability caused by LBP has increased dramatically over the past two decades (prior to their study), and health economists have shown that LBP is amongst the most costly of health problems as it accounts for the single largest percentage of workers' compensation benefit payment for illness and injury.

According to Maul (2002), studies performed in various occupational settings, indicate a strong association between musculoskeletal disorders and work related factors. Direct patient contact activities such as lifting and transferring patients are

most frequently mentioned as causes of occupational back pain and these two tasks account for 79% of LBP in nurses (French *et al.* 1997).

The prevalence of work related back injuries in nursing are amongst the highest of any profession internationally. Annual prevalence rates of nursing related back pain range from 35.9% in New Zealand to 66.8% in the Netherlands (Nelson *et al.* 2003). It has been found that nursing personnel ranked fifth in occupations claiming worker compensation for low back injuries (Owen and Garg. 1994); therefore LBP remains a common problem within the nursing profession.

The literature above indicates a high prevalence of LBP in nurses internationally. The purpose of this study is to determine the association between frequency and intensity of manual work on the development of LBP in nurses in the Durban area in State versus Private hospitals. The results from this study should provide valuable information on the prevalence and risks for LBP in nurses.

1.2 AIM OF THE STUDY

The aim of this study was to determine how the frequency and intensity of manual work contributes to the development of LBP in nurses, in State versus Private hospitals in the Durban Metropolitan area.

1.2.1 Objective One

The first objective was to collect data on nurses, which included:

- Participant Demographics
- Lifestyle factors relating to LBP:
 - ∞ Exercise
 - ∞ Smoking
- Work history:
 - ∞ Length of time as a nurse
 - ∞ Hours worked
 - ∞ Training received
- Work activities
 - ∞ Activities performed
 - ∞ LBP associated with activities
- History of Low Back Pain
 - ∞ Previous LBP
 - ∞ Severity of LBP
 - ∞ Absenteeism from work due to LBP
 - ∞ LBP related to work
 - ∞ Treatment received

1.2.2 Objective Two

The second objective was to interpret the data obtained and identify the relationships documented in the first objective, as well as to compare the activities between the LBP group and the non-LBP group.

The hypotheses of this study are:

- That increased frequency and intensity of manual work should contribute to increased low back pain in nurses.
- The prevalence of low back pain between institutions differs due to different working conditions (Vasiliadou *et al.* 1995). Thus the prevalence rates between state and private hospitals in Durban should differ

1.3 Rationale for the study

1. Nurses believe that transferring and lifting patients without assistance are the two main factors contributing to LBP (French *et al.* 1997). This study will establish the association between frequency and intensity of manual work with the development of LBP in nurses in the Durban Metropolitan Area.
2. Hospital nurses have a high prevalence of LBP (Smedley *et al.* 2003). This study will also determine the prevalence of LBP in nurses in the Durban Metropolitan area, as no information is available at present.
3. This study will establish any difference in LBP between nurses in state and private hospitals.
4. The results from this study will also be compared with those from other countries.

The results from this study will contribute more information on the problem of LBP in nurses. The following chapters contain literature related to this topic; methodology used in this study and discusses the results of this study.

1.4 Study Limitations

Due to the nature of nursing work, it was not always possible to have the participants complete the questionnaires immediately. This resulted in a poor response as most questionnaires had to be handed out and collected at a later time

.

Only three of the six hospitals which were selected agreed to participate in this study. Thus the number of possible participants was greatly limited.

The questionnaire could also be refined in future studies. Other factors such as work stress or home situation should be taken into consideration.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

This chapter is concerned with reviewing literature of studies on LBP in nurses. The literature will be presented as follows:

- Introduction
- Anatomy of the Lumbar-Sacral Spine
- Biomechanics of the Lumbar Spine
- Low Back Pain
- Incidence and Prevalence of LBP
- Incidence and Prevalence of LBP in Nurses
- Risk Factors for LBP

2.1 Introduction

LBP is a major cause of suffering, disability and social costs. LBP is the leading cause of disability in people younger than 45 years of age (Thomas. 2005). It is the second most frequent symptomatic reason for patient visits to primary care physicians in the USA and is the second leading cause of work days lost after the common cold (Carey *et al.* 1996). Research has found that 60% to 80% of the population will suffer from LBP at some time in their lives and that 20% to 30% suffer from it at any given time (Burton *et al.* 1995).

In the UK, it has been found that LBP was the second most common cause of physical disability after cardiovascular disease and in Russia it is the second cause of absenteeism from work after upper respiratory tract infection (Toroitsova *et al.* 1995). Moreover, LBP is increasing faster than any other form of chronic disability (Urli., 1995). And according to Mikheev (1993) (as cited by Urli. 1995), the World Health Organisation has described occupational LBP in the industrialized world as an epidemic.

According to Toroitsova *et al* (1995), an increase in absenteeism from work because of LBP symptoms have been found to be associated with six factors, viz;

- 1) Physically heavy work,
- 2) Static work posture,
- 3) Frequent bending and twisting,
- 4) Lifting and forceful movements,
- 5) Repetitive work and
- 6) Vibration.

In another study conducted by Hoogendoorn *et al* (2002), revealed an increase in absenteeism associated with an increase in; trunk flexion, trunk rotation and lifting.

According to Smedley *et al* (1997), nurses frequently perform; heavy physical work, bending, twisting and lifting. Back pain in nurses has been found to be a major cause of absenteeism from work, accounting to 16.2% of all sick leaves (French *et al.* 1997).

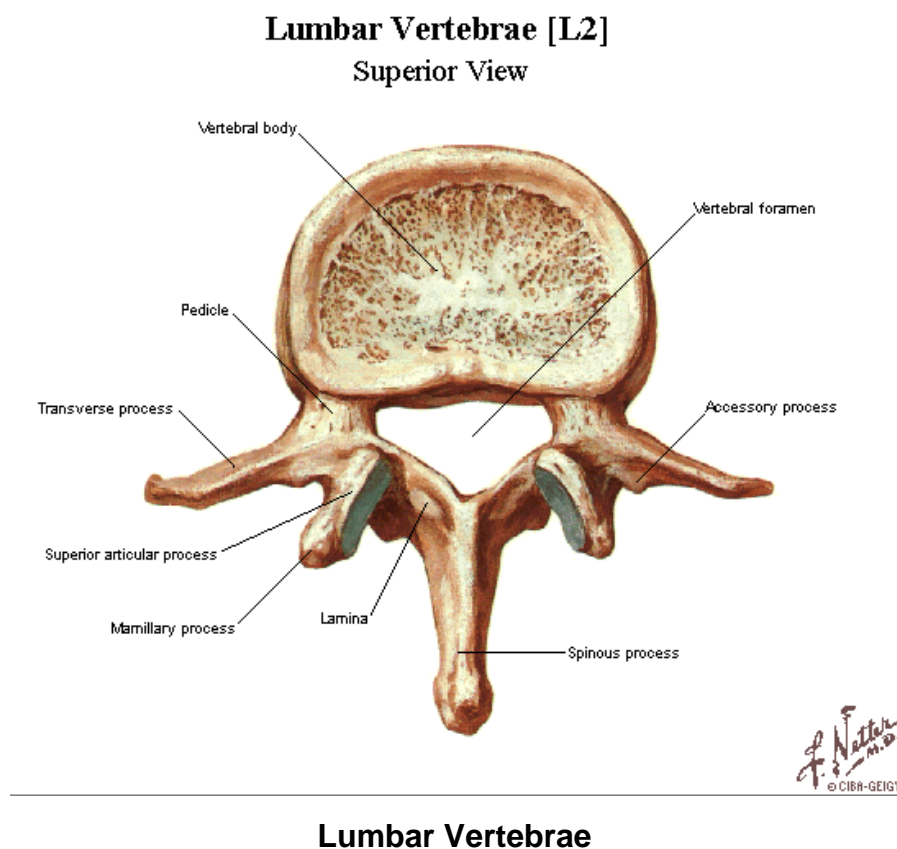
LBP cannot fully be accounted for by anatomical changes related to the ageing process, as work factors also constitute a risk (Yip, 2001). Work requiring frequent postural changes, lifting of heavy objects or bending at the waist usually is more likely to cause injury to the lumbar area due to the body's imbalance and the pressure put on the lumbar area (Chiou *et al.* 1994 and Smith *et al* 2003).

An epidemiological study conducted by Smedley *et al* (1997), has suggested that repetitive lifting, frequent bending and twisting play a role in the development of LBP, and that heavy physical workload has played a major role in the development of LBP among nurses. Manually handling patients has been found to be a major risk factor for LBP and with the repetition of daily physical activities, biomechanical strain towards the back gradually develops (Yip. 2001). LBP is more common in heavy manual workers, and nurses perform tasks similar to persons handling heavy objects in industry (Jayson 1992: 538).

Studies have also found that nurses believe that transferring and lifting patients without assistance are the two main factors contributing to LBP (French *et al.* 1997). The results of a Hong Kong study (Yip. 2001) found that the risk of LBP increased with the frequency of work activities, which involved lifting patients.

2.2 Anatomy of the Lumbar-Sacral Spine

Intense research efforts have been made to understand the complex structure of the spine, with its unique structures such as the intervertebral discs, spinal ligaments and muscles (Renkawitz *et al.* 2006). The lumbar vertebra (shown below), is a large and heavy kidney shaped structure. The size of the vertebral bodies increases from L1 to L5 due to increasing loads that each body has to carry. These vertebral bodies are the main load bearing structures of the spine (Kirkaldy-Willis and Burton. 1992: 7). The vertebrae consist of: A Vertebral body, a spinous process, a vertebral foramen, 2 transverse processes, and 2 pedicles, 2 superior and 2 inferior articular processes (Moore. 1992: 330).



Available at <http://www.ma.psu.edu/~pt/384/vert.gif>.(2006)

The facet joints are synovial joints between the inferior articular process of a superior vertebrae and the superior articular process of an inferior vertebrae. The articulating surfaces are covered with hyaline cartilage. Each joint is surrounded by a thick, fibrous capsule. These joints help control flexion, extension and rotation of adjacent vertebrae (Moore. 1992: 347). Facet or zygapophysial joints of the spine are well innervated by branches of the dorsal rami and these joints have been shown to be capable of causing pain. Facet joints have been implicated in causing chronic spinal pain in 15%-45% of patients with chronic LBP (Manchikanti *et al.* 2004).

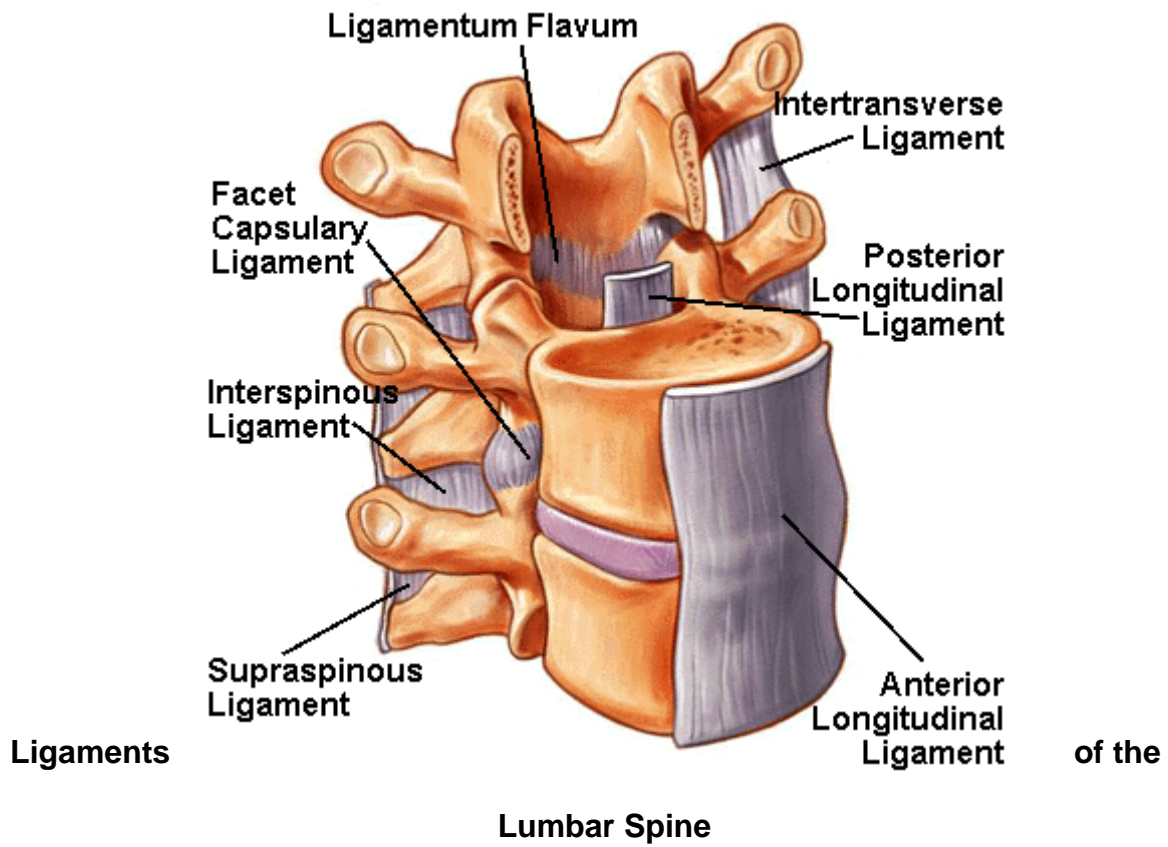
The sacrum is a narrow wedge shaped structure, made up of five fused vertebrae. It articulates with the L5 vertebral body proximally, the ilium laterally (the sacro-iliac joints) and the coccyx distally (Kirkaldy-Willis and Burton. 1992: 8). The sacrum provides strength and stability to the pelvis and transmits the weight of the body to the pelvic girdle through the sacroiliac joints (Moore. 1992: 332).

The intervertebral discs provide the strongest attachment between vertebral bodies and are thickest in the lumbar region. These discs are fibrocartilage and play a role in weight bearing. They consist of two components (Moore. 1992: 342);

- 1) An external annulus fibrosis which surrounds
- 2) An internal nucleus pulposus.

Movement of the lumbar spine is restricted by the following **ligaments**:

- The Anterior and Posterior longitudinal ligaments, which cover the anterior and posterior aspects of the vertebral bodies respectively. They help prevent hyperextension and hyper flexion respectively (Moore. 1992: 342).
- Ligamentum Flavum, attaches from the anterior surface of the lamina above to the posterior surface of the lamina below. Fibres contribute to the posterior boundary of the intervertebral foramen. This ligament helps preserve the normal curvature of the vertebral column (Moore. 1992: 348).
- Interspinous ligaments and Supraspinous ligaments, join adjacent spinous processes (Moore. 1992: 348).
- Intertransverse Ligaments connect adjacent transverse processes (Moore. 1992: 348).
- Capsular ligaments attach to adjacent articular processes; they are well developed in the lumbar spine (Kirkaldy-Willis and Burton. 1992: 12).



Available at

http://www.spineuniverse.com/displaygraphic.php/138/dp_ligaments-BB.gif

(2006)

Muscles of the Lumbar spine consist of:

The Extensors:

1. Sacrospinalis (Erector Spinae): The most superficial layer of the extensors, ascends from the iliac crest, the sacral crest, sacroiliac ligaments, spinous processes of the sacrum to the lumbar spine. It begins as a single layer and divides into three distinct columns in the upper lumbar spine to form (from lateral to medial) the iliocostalis, longissimus and spinalis (Kirkaldy-Willis and Burton. 1992: 21). The erector spinae muscles are the chief extensors of the spinal column (Moore. 1992: 351).
2. The Transversospinal Muscle: Just beneath the superficial layer lies the multifidus and rotators muscles, fibers run from transverse processes to spinous processes of the vertebrae (Moore. 1992: 355). Multifidus acts as both an extensor and a rotator (Kirkaldy-Willis and Burton. 1992: 22). A study conducted by Hides *et al* (2006) found that patients with chronic LBP had significantly smaller multifidus muscles than asymptomatic subjects at the lowest two vertebral levels (these results supported the findings of previous studies).
3. The Deep Layer: Is made up of small muscles, the interspinalis and Intertransversarius muscles. These muscles attach between adjacent spinous processes and transverse processes respectively (Kirkaldy-Willis and Burton. 1992: 22). The interspinales help extend the vertebral column and the inter transversarius helps lateral flexion of superior vertebrae and extension of the vertebral column (Moore. 1992: 355).

The Flexors:

1. Extrinsic group: Iliothoracic muscles made up of abdominal wall muscles, the rectus abdominus, internal and external obliques and intertransversarius (Kirkaldy-Willis and Burton. 1992: 22).
2. Intrinsic group: Femorospinalis group made up of Psoas major and iliacus muscles (Kirkaldy-Willis and Burton 1992: 22).

Lateral Flexors: Made up of quadrates lumborum and psoas major muscles (Moore. 1992: 229).

Spinal muscles provide stability and muscle recruitment patterns significantly affect loading on the intervertebral joints. Imbalanced muscle activation can therefore theoretically load the spine incorrectly and induce LBP and musculoskeletal injury (Renkawitz *et al.* 2006).

2.3 Biomechanics of the Lumbar Spine

LBP is a complex disorder, which is influenced by many physical and non-physical work factors that impact on multiple biological functions in the human body (Yeung *et al.*, 2003).

The largest motions of the lumbar spine are forward bending/flexion and backward bending/extension. Other important movements are twisting/axial rotation and lateral bending.

A **motion segment** consists of anterior and posterior elements (Kirkaldy-Willis and Burton. 1992: 27):

Anterior elements include; vertebral body, disc, anterior and posterior longitudinal ligaments which provide stability and shock absorption.

Posterior elements include; pedicles, facet joints, posterior ligaments and posterior muscles which control spinal movements.

Load bearing in the lumbar spine is shared between the discs and facet joints or the three joint complex. LBP can occur through the following:

- During flexion, extension and lateral bending, axial compression occurs on the disc resulting in increased intra-discal pressure. This is counteracted by tension in the disc and annular fibres causing some bulging and disc space narrowing. In axial rotation, annular fibres are stretched in one direction and shortened on the opposite side; this is a common site for disc herniation (Kirkaldy-Willis and Burton. 1992: 29).

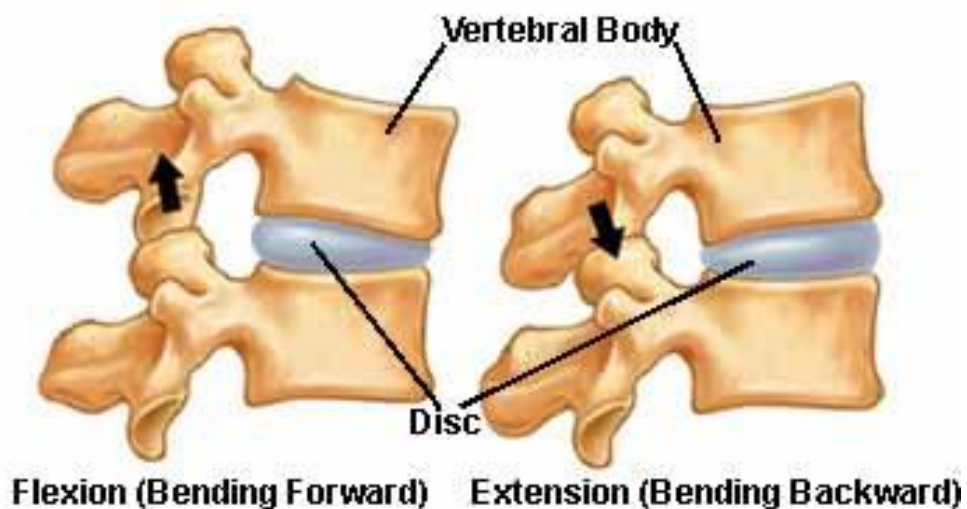
- Another area of the lumbar spine that can be affected are the muscles and ligaments. During flexion, the posterior ligaments are stretched and during extension, the anterior ligaments are stretched. Overstretching may cause rupture of ligament fibres or the whole ligament resulting in sprain (Kirkaldy-Willis and Burton. 1992: 32).

With repetitive use muscle fatigue and overuse occurs, this can lead to muscle spasm and restricted movement (Kirkaldy-Willis and Burton. 1992: 32).

- The posterior elements and facets are another area that may become involved. The pars interarticularis (where the lamina originate from the pedicle), is a weak area and a common site of fatigue fracture or spondylolysis. Excessive loading of the spine during extension can lead to spondylolysis. These fractures heal with fibrous tissue causing weakening of the motion segment, which can lead to the slip of one vertebra on the other (Spondylolisthesis) (Kirkaldy-Willis and Burton. 1992: 28).
- Posterior Facet Syndrome: Also called the stage of dysfunction which implies that at one anatomical level, the three components of the joint are not functioning normally. It usually presents as; rotational or compressive strain (due to minor or major trauma), pain after unusual activity for the patient or recurrence of pain with a minor trauma.

Trauma (rotational or compressive trauma) → results in posterior joint (and annular) strain → This causes small capsular tears → resulting in a small degree of joint subluxation → The posterior joint synovium is injured → Synovitis (pain) → Posterior segmental muscles protect the joint by sustained hypertonic contraction → Muscle becomes ischaemic causing more pain → Altered muscle metabolism further aggravates pain and sustains hypertonic contraction (Kirkaldy-Willis and Burton. 1992: 105).

Facet Joints in Motion



Available from

http://www.spineuniverse.com/displaygraphic.php/146/facetjoints2_250BBjpg

(2006)

Sacroiliac Syndrome: The sacroiliac joint is lined by a synovial membrane on the sacral side and a thin fibro cartilage layer on the iliac side. Degeneration of the iliac cartilage occurs from around the third decade of life in men and the fifth decade in women. Minor dysfunction in this joint can lead to pain. (Kirkaldy-Willis and Burton.1992: 123). Pain from the sacro-iliac joint can result from inflammation, major trauma, stress fracture or mechanical stresses. Pain can also be referred from the Lumbar spine (Speed. 2005).

2.4 Low Back Pain

Current understanding of the biomechanical pathogenesis of LBP is still incomplete (Renkawitz *et al.* 2006). LBP has many causes; it may be due to disease or injury at one or more sites within the spine or it might be a feature of systemic disease, sepsis or malignancy (Speed. 2005). Mechanical disorders are the cause in 90% of cases of LBP, with the remaining 10% being due to manifestation of a systemic illness (Diamond and Borenstein. 2006).

Mechanical LBP can result from problems with various spinal structures including; ligaments, facet joints, periosteum, the paravertebral musculature and fascia, blood vessels, the annulus fibrosis and spinal nerve roots. However, in most cases, the exact disorder causing the symptoms is unidentified (Diamond and Borenstein. 2006).

Causes of LPB include (Speed. 2004):

- **Structural:**

- Mechanical or non-specific

- Facet joint arthritis or dysfunction

- Prolapsed intervertebral disc

- Annular tear

- Spondylolysis or spondylolisthesis

- Spinal stenosis

- **Neoplasm:**

- Primary or secondary

- **Referred pain to spine:**

From major viscera, retroperitoneal structures, urogenital system, aorta or hip

- **Infection:**

Discitis

Ostoemyelitis

Paraspinal abscess

- **Inflammation:**

Spondyloarthropathies

Sacroilitis or sacroiliac dysfunction

- **Metabolic:**

Osteoporotic vertebral collapse

Paget's disease

Osteomalacia

Hyperparathyroidism.

2.5 The Incidence and Prevalence of Low Back Pain

Approximately 60 to 80% of the population report having LBP at some point in their life (Wadell 2004: 74, Diamond. 2006 and Hart *et al.* 1995) and it is the most common musculoskeletal reason for seeking medical care (Hazard *et al.* 1996). Up to 50% of working adults have back pain each year (Rives and Douglass. 2004). Research has shown that more than 60% of medical hospitalizations for back complaints are for low back problems (Cherkin and Deyo. 1993). Both the rate and the degree of disability occurring from LBP are increasing worldwide (Feyer *et al.* 2000).

Papageorgiou *et al* (1995) found in their study that 39% of respondents experienced LBP for one day or longer in the month before completion of their questionnaire. The results were consistently higher in women than men at all ages above 30 years (31.2% in males and 41.7% in females), however the prevalence rates in the 18 to 29 year age group was virtually identical.

A review of literature by Toroptsova *et al* (1995) of populations in Europe and the USA revealed a life time prevalence of LBP ranging from 23% to 69.9% and a point prevalence ranging from 12% to 31%.

Two epidemiological studies conducted in South Africa by van der Meulen (1997) and Docrat (1999) revealed the following respectively: The lifetime incidence of LBP among Black South Africans was 57,6%, among Indians was 78,2% and Coloureds was 76.6%. These results reveal that LBP is a common problem in South Africa.

2.5.1 The Incidence and Prevalence of Low Back Pain In Nurses

Several studies have indicated an unusually high prevalence of back disorders in nurses (Smedley *et al.* 1995 and Yip. 2003) and nurses have ranked fifth in occupations claiming worker compensation for low back injuries (Owen and Garg. 1994). Nurses are in an occupational group which experience more serious back injuries and occupational back pain than most other professions (French *et al.* 1997).

The frequency of reported disability from back injuries in nurses is among the highest of all worker groups, [Jensen (1987) as cited by Yip (2001)]. This is widely attributed to the manual handling that the job entails. Nurses are frequently required to undertake heavy lifting, often with a bent or twisted posture, and biomechanical investigations have confirmed that such tasks generate high spinal stresses (Smedley *et al.* 1995). Nurses are required to undertake manual handling tasks, which no other section of the working population would tolerate for a moment (Lumm *et al.* 1989: 110). Common activities in nursing work, heavy manual transferring, frequent twisting and bending have been identified as important physical risk factors for LBP (Smedley *et al.* 1997).

Annual prevalence rates of nursing related back pain range from 35.9% in New Zealand to 47% in the United States to 66.8% in the Netherlands (Nelson *et al.* 2003). In a Southampton study, the lifetime prevalence of back pain in nurses was 60% where 10% of the sample had been absent from work (due to back pain) for a cumulative period exceeding 4 weeks in one year (Smedley *et al.* 1995).

A study conducted by Vasiliadou *et al* (1995) in a Greek Hospital found that 67% of nurses reported LBP in the period 6 months prior to their study and that 77% reported back pain in the period 2 weeks prior to the study. A comparative study conducted by Smith *et al* (2003) recorded results from various other studies on LBP in nurses, results were; British hospitals-38%, Japanese hospitals-54.7% and Swedish hospitals-56%. Another study conducted by Yip (2001) on nurses in Hong Kong found that the annual prevalence of LBP ranged from 43.1% to 69.7%, and the incidence of acute low back pain (2 week duration) was 94%.

2.6 Risk Factors For Low Back Pain

Most people will experience LBP at some point in their lives (Feyer *et al.* 2000). The potential risk factors for back pain chronicity, encompass a broad array of demographic, behavioural and social risks. Factors range from smoking and obesity to occupations requiring manual labour, to job dissatisfaction (Atkinson. 2004). Some of the risks are discussed below:

2.6.1 Age

According to Manga *et al* (1993), LBP is most common between the ages of 25 and 55. LBP has also been found to be the number one cause of disability in people under 45 years of age and the third leading cause of disability in those older than 45 years (Gatchel *et al.* 1995 and Thomas. 2005). LBP tends to begin in the third decade, reach its maximal frequency during middle age and tends to be less frequent in the elderly, except in some woman due to the effect of osteoporosis (Kirkaldy-Willis and Burton. 1992; 4).

This age trend is due to the aging process and is also a result of sedentary life styles with too little exercise. As people age, bone strength, muscle elasticity and tone decrease, intervertebral discs loose fluid and flexibility which decreases their ability to cushion the vertebrae. (Low back pain fact sheet, 2006).

2.6.2 Gender

Earlier studies showed that the incidence and prevalence of LBP was higher in men than women, however this had changed with the increased number of women in the workforce (Manga *et al.* 1993). Other studies have showed a slightly higher prevalence of LBP in women than men (Carey *et al.* 1995, Toroptsova *et al.* 1995 and Skovron *et al.* 1994). Papageorgiou *et al.* (1995) found in their research that the rates of LBP were consistently higher in women than men in all ages above 30 years. An increase in LBP in females has been noted with childbirth (French *et al.* 1997) and menstruation (Kirkaldy-Willis and Burton 1992: 4). It has also been noted that males undergo operations for disc herniation twice as often as females; this finding probably reflected the need for men to return to work more quickly (Kirkaldy-Willis and Burton. 1992: 4).

In this regard, it has been found that males and females report LBP with approximately the same frequency although some variation occurs from one study to another and from one group to another (Jayson. 1992: 538).

2.6.3 Physical Exercise

According to Yip (2003), it has been suggested that 30 cumulative minutes or more of moderately intense physical activity on most days of the week may prevent LBP by enhancing the end-plate permeability of vertebral discs (i.e. improving the end-

plate blood supply, which may eliminate accumulated irritating tissue fluids and inflammation).

There is also some evidence that exercise designed to strengthen the muscles of the back are successful in reducing the prevalence of back pain to some degree (Lumm, *et al.* 1989: 111).

2.6.4 Smoking

Daily smoking has been identified as a risk factor for both development of LBP and prolapsed intervertebral disc in the lumbar spine (Kirkaldy-Willis and Burton. 1992; 4). Various theories have been put forward to associate smoking to increased LBP, these include:

- Smoking reduces vertebral blood flow, which can lead to intervertebral disc degeneration (Boshuizen *et al.* 1992).
- Smoking has also been linked with anxiety and depression, which are found to exacerbate back pain (Boshuizen *et al.* 1992).
- Smoking produces a chronic cough; this gives rise to increased intra-abdominal and intra-discal pressure, putting increased mechanical stress on the lumbar discs (Kirkaldy-Willis and Burton. 1992; 4).

2.6.5 Occupational Activities

Certain occupations and work tasks seem to have a higher risk of LBP (Feyer *et al.* 2000). Nurses are in an occupational group that experience more serious back injury and occupational back pain than most other professions (French *et al.* 1997). In nurses, manual handling and transferring of patients have been found to be associated with LBP (Ando *et al.* 2000). Eriksen *et al.* (2004) explored the relationship between work factors and LBP, in nursing personnel and found that heavy lifting, frequent twisting and bending, have been consistently associated with the risk of LBP.

With regard to occupational activities studied; manually moving patients, transferring patients and lifting patients were associated with increased risk of back pain. Nurses frequently undertake heavy lifting, often in a bent or twisted posture; biomechanical investigations have confirmed that such tasks generate high spinal stress. (Smedley *et al.* 1995).

Toroptsova *et al.* (1995) researched LBP among industrial workers in Russia, their study revealed a high prevalence rate of 48.2% as compared to the general population. Workers in industry are shown to also perform heavy physical work, repetitive work, lifting and forceful movements and are exposed to body vibration, all of which are risk factors for LBP.

2.7 The Impact of Low Back Pain on Nurses

Nurses have been found to experience more serious back pain than most other professions. Back pain was also found to be a major cause of days lost due to sickness (French *et al.* 1997). LBP therefore has an impact on the health care industry in that it causes financial loss due to sick leave. This study aims to determine the prevalence of LBP in nurses in the Durban Metropolitan area and factors associated with it. The information gained from this study is hoped to provide more insight into the problem of LBP in nurse

2.8 Conclusion

Nurses are at a great risk of developing LBP due to occupational activities, such as lifting and carrying patients, frequent bending and twisting. Nurses also work long shifts, most of which is spent standing. A review of the literature has also revealed that LBP is a serious problem in nurses throughout the world. Research will help in identifying the association between frequency and intensity of manual work and LBP. This research also aims to determine the prevalence of LBP in nurses in the Durban Metropolitan area as well as compare state and private hospitals as this information is not available. Identifying these could provide insight into solutions to this problem.

CHAPTER THREE

MATERIALS AND METHODS

3.1 Introduction

This chapter includes the methodology used to conduct this study. It also includes the statistical procedures utilised.

3.2 Study Design

This was a cross-sectional study of nurses in the Durban Metropolitan Area employed, by both state and private hospitals. The study was quantitative in nature and a questionnaire was used to collect data.

3.2.1 Sample Size

According to the 2005/2006 statistics available from the department of health, there were a total of 23 500 nurses employed in the province of Kwa-Zulu Natal as at 1 April 2005 (Human Resource Management: Oversight Report 2006) (Appendix D). Exact figures for the Durban Metropolitan area (Appendix N) were not available. The 23 500 nurses consisted of; 9 475 Professional Nurses, 5 896 Nursing assistants

and 8 129 Staff and Student Nurses, again figures for the Durban Metropolitan area were not available.

As a result of figures not being available, the sample for this study consisted of 500 nurses: 250 from a state and 250 from a private hospital. In order to ensure a number of nurses in each hospital setting allowed for comparison between the groups.

3.2.2 Selection Procedure

The names of all state and private hospitals in the Durban Metropolitan area were put into a 2 boxes. Three names were then picked from each box ensuring that the selection of the hospitals was random. The researcher then contacted each hospital requesting to send a letter of request to each hospital manager. The researcher then hand delivered a letter of request to conduct research as well as a letter giving a brief explanation to each of the six selected hospitals.

Permission to conduct this research was granted by three hospitals, one state hospital, R.K Khan Hospital (Appendix E) and two private hospitals, Entabeni Hospital (Appendix F) and Westville Hospital (Appendix G).

Two hundred and fifty full-time nurses were then randomly selected from each hospital (500 in total). Nurses were chosen according to availability on a particular shift and the inclusion and exclusion criteria. The researcher;

- a) Attended a hospital unit managers meeting and addressed matrons in charge of all the hospital wards on the research. These matrons took the questionnaires back to their nurses, had the questionnaires filled in and returned them to the head sister who corresponded with the researcher.
- b) The researcher went through each ward at the hospital and handed out questionnaires to nurses who met the criteria for this research and were willing to participate in this study. Due to their limited time while on duty, questionnaires were left with the nurses and collected after a short while.
- c) The researcher also sat in the nurses' lounge and handed out questionnaires to nurses during their tea and lunch breaks.

Each nurse was given a Letter of Information (Appendix B) on the study and a Letter of Consent (Appendix C) to sign. The questionnaire (Appendix A), was then completed by the participant and collected. The following were also available if needed: Zulu Questionnaire (Appendix L), Letter of Information in Zulu (Appendix M).

No names or other form of identification were present on the questionnaires as to ensure confidentiality and anonymity of the participants.

3.2.3 Inclusion and Exclusion Criteria

Inclusion Criteria

1. Nurses in full-time employment and working in the same ward for at least one month.
2. Nurses between the ages of 18 and 45 were randomly selected depending on their availability on a particular shift when the questionnaires were handed out. (Nurses were not always able to fill in questionnaires due to work demands).
3. Nurses with or without LBP were included in this study.
4. The study was open to both male and female nurses.

Exclusion Criteria

1. Any nurse who did not fall within the age range was excluded from the study.
2. Any nurse not in full-time employment was also excluded from the study.
3. Any questionnaire that was inadequately completed was excluded from the study.

3.2.4 Questionnaire Background

Before beginning this research, a questionnaire was compiled, which was a combination of:

1. A pre-validated questionnaire by Yip (2001) (made up of questions on work history, patient handling activities and socio-demographic data.).

2. Several LBP questionnaires by French (1997), Yip (2001) and Smith (2004).

A focus group was then set up in order to establish face validity of the compiled questionnaire. The group consisted of several participants:

1. 12 Nurses
2. 1 Chiropractor
3. The Researcher

The nurses who participated in the focus group were all enlisted from Chatsmed Candle Light Nursing School. The focus group consisted of 12 participants. Before commencing the actual focus group, each participant was required to read a Letter of Information (Appendix H), sign a Confidentiality Statement (Appendix J), sign an Informed Consent Form (Appendix I) and sign a Code of Conduct Form (Appendix K). Each participant was then given a copy of the questionnaire to read over and comment on how the questionnaire could be modified in order to make it more specific to nurses.

The questionnaire was discussed in sequential order, if any problems were found or changes proposed, a unanimous vote (75%) was required to institute a change. At the end, time was given for discussion or comments on the questionnaire. Any suggested change was analysed and were made to the questionnaire resulting in the version used in this study

A video of the focus group proceedings was made and is available as evidence of the individuals involved as well as any discussion had.

3.3 Data Collection:

Data was collected from randomly selected hospitals, both state and private, in the Durban area by the researcher. Data was collected by means of a developed and validated questionnaire. Questionnaires are a good source of information, provided that the questionnaire had been proven reliable and valid (Mouton. 1996). According to Bernard (2000) as cited by Vlok (2005), Validity refers to the accuracy and trustworthiness of instruments, data and findings in research, thereby ensuring that future research utilizing the particular tool is valid.

The questionnaire (Appendix A) was made available to all hospital nurses who fell within the restricted age group and were willing to participate in this study. Nurses received a copy of the questionnaire, were given a letter of information on the study (Appendix B), and were given a letter of informed consent (Appendix C) to read and sign.

The validated questionnaire (Appendix A) was made up of questions on:

- Participants' socio-demographic information, including gender, age, ethnicity and education.
- Exercise and smoking
- Work history
- Frequency of work activity per shift
- Intensity of manual work
- Low back pain history.

The researcher then collected the completed questionnaires; data from each questionnaire was then entered into a spread sheet. A comparison was then made between the LBP versus the non-LBP group.

Questionnaires not adequately completed were excluded from the study.

Anonymity was maintained in regards to the questionnaires, as no names or other forms of identification were entered on them. Also, no participant names were revealed in the data analysis information or results.

3.4 Statistical Methodology

SPSS version 13 (SPSS Inc., Chicago, Illinois, USA) was used to analyse the questionnaire data. A p value of <0.05 was considered as statistically significant.

To examine associations between categorical variables, chi square analysis or Fisher's exact tests were used as appropriate. Mann-Whitney tests were used to compare ordinal variables between two independent groups. Logistic regression analysis was used to control for confounding effects of other variables on the risk of LBP. This was achieved by backward elimination based on likelihood ratios with entry and exit probabilities set to 0.05 and 0.10 respectively.

CHAPTER FOUR

RESULTS

4.1 Introduction

This chapter presents and explains the results of this study.

4.2 Demographics

One hundred and twenty-four nurses participated in this study, this was a response rate of 24.8%. Of these participants, 50 (40.3%) were from private hospitals and 74 (59.7%) were from state hospitals. This was made up of 87 professional nurses, 9 nursing assistants and 28 student and staff nurses.

According to the Kwa-zulu Natal department of health (Appendix N) there were 23 500 nurses in the province as at April 2005. This number was made up of 9 475 professional nurses, 5 896 nursing assistants and 8 129 staff and student nurses. This figure does not reflect the number of nurses in the Durban Metropolitan area (Appendix D)

The majority (92.7%) were female and there were only 9 male nurses who participated. This response is in keeping with international findings where the number of female nurses ranged 85.9% (Yip. 2001) to 97% (Smedley *et al.* 1995).

The age distribution is shown in Figure 1. The highest proportion of participants was in the 36 to 45 year category (39.5%). This age distribution was also consistent with international studies where the majority of respondents were in the 30-39year group (Yip. 2001 and Smedley *et al.* 2002).

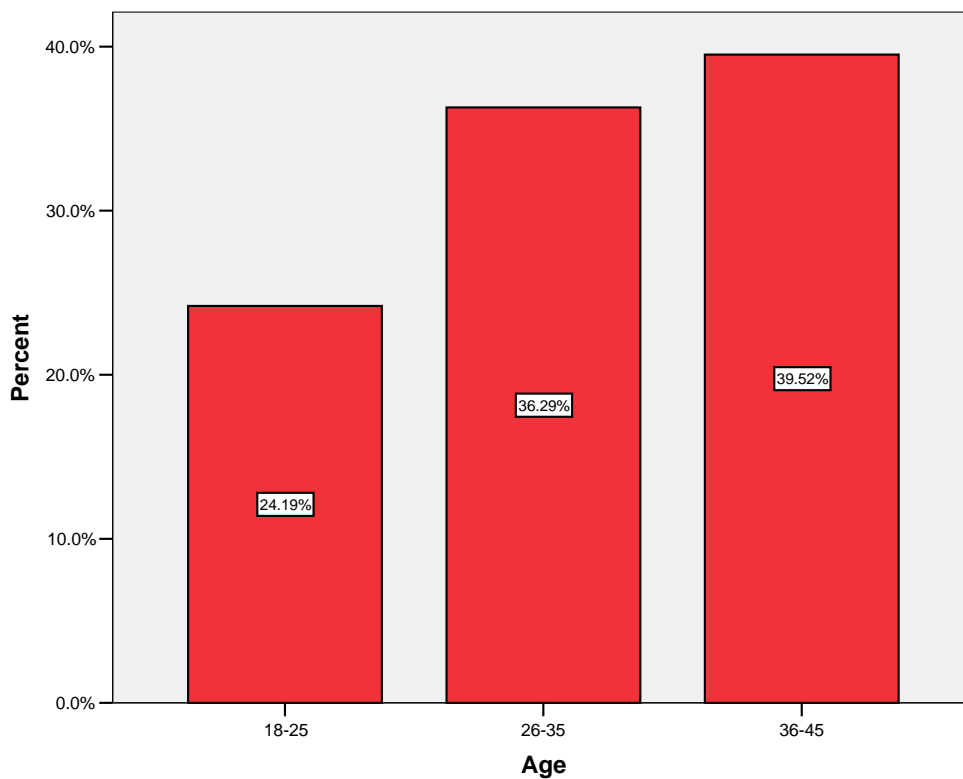


Figure 1: Bar chart showing age distribution of participants (n=124)

The ethnicity distribution of participants is shown in Figure 2. The majority were Indian (n=71, 57.3%), while 33 (26.6%) were Black and 15 (12.1%) were White. The Coloured participants made up only 4% (n=5).

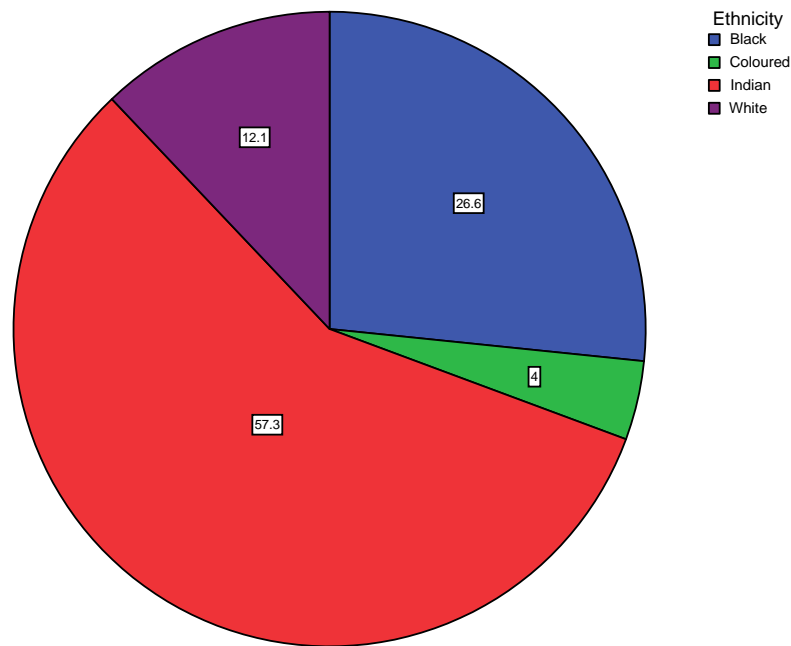


Figure 2: Pie chart showing ethnicity distribution of participants (n=124)

There was an almost equal distribution of education levels in the study participants, with 58 (49.2%) having high school education, and 60 (50.8%) having tertiary qualifications.

Table 1 shows their marital status. The majority were married (53.2%) while 37.9% were single.

Table 1: Marital status of study participants (n=124)

	Frequency	Percent
Married	66	53.2
Separated	6	4.8
Widowed	5	4.0
Single	47	37.9
Total	124	100.0

Although the majority were married, the majority had no children (48.4% - See Figure 3). There were 45 participants (36.3%) with 1 to 2 children, and 15 (12.1%) with 3 to 4 children, while only 4 (3.2%) had 5 or more children.

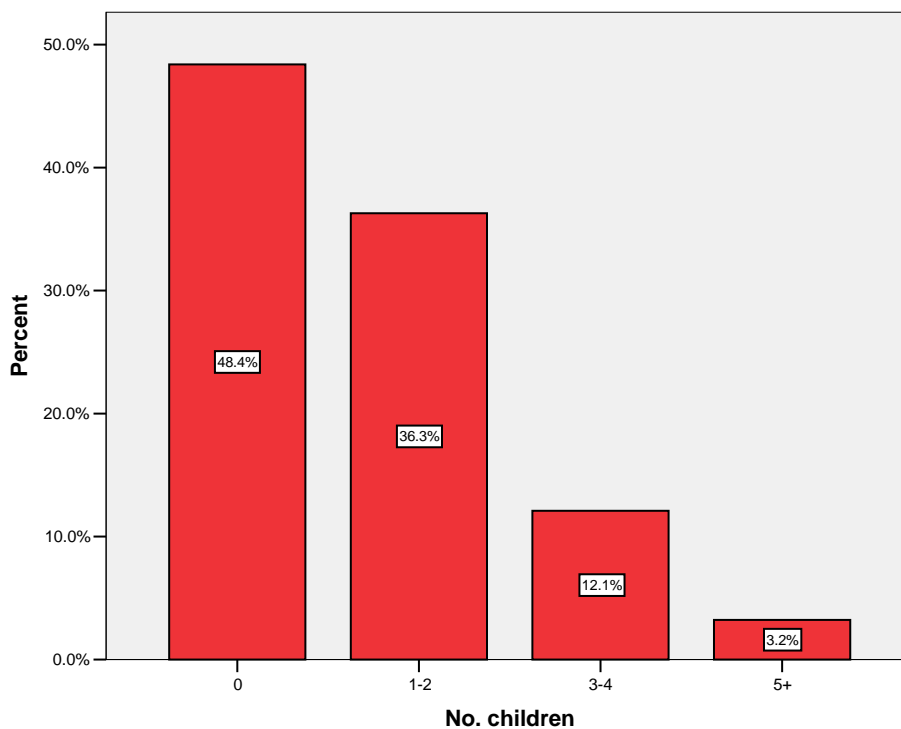


Figure 3: Parity of study participants (n=124)

4.3 Prevalence of LBP

Prevalence of self reported LBP was assessed using three key questions in the questionnaire. Participants were asked if they suffer from LBP; if they are currently suffering from LBP; and if they feel their LBP is related to work. Since LBP is a common condition, the analysis needed to classify work-related LBP from non work related LBP and current LBP from past LBP. Thus the case definition for this study for work related current LBP was a positive answer to the question on current LBP and a positive answer to the question on work-relatedness of their LBP. Thus participants had to have current work related LBP to be classified as a case in this study.

The prevalence of self reported current work-related LBP was 59.7% (95% CI 50.5% to 68.3%). Seventy-four of the total of 124 participants fulfilled the case definition criteria outlined above. Current work-related LBP is prevalent amongst nurses. The results of this study revealed that 59.7% of participants reported having LBP. This prevalence rate compares with the rates found in international studies, prevalence rates of nursing related back pain range from 35.9% in New Zealand to 47% in the United States to 66.8% in the Netherlands (Nelson *et al.* 2003).

4.3.1 Characteristics of LBP

Of the 74 participants with current, work –related LBP, only 7 (9.5%) had the LBP before they started nursing. This is significant as it lends credibility to the possibility that working as a nurse caused LBP in the majority of participants.

The majority reported that their LBP began gradually (80%).

This is shown in Table 2.

Table 2: Responses to how the LBP began in participants with LBP (n=74)

	Frequency	Percent
Gradually	59	79.7
Suddenly	15	20.3
Total	74	100.0

Figure 4 shows that the majority of affected participants were in pain daily (35.1%, n=26). The participants who did not have daily episodes, had very infrequent episodes, mainly 6-10 episodes in the last year (28.4%, n=21).

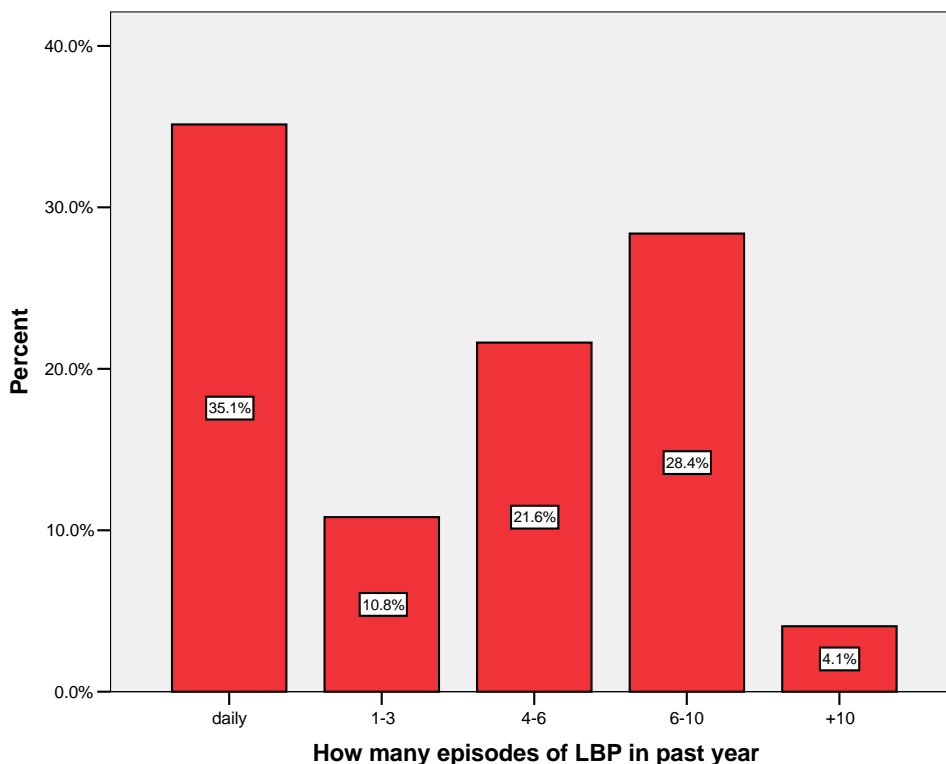


Figure 4: Percentage of responses to how frequent the LBP was in the past year (n=74)

Figure 5 shows that 62.2% of cases were mildly severe (n=46), while 20 cases (27%) classified themselves as severe. Studies have revealed that a number of nurses continue to work despite their discomfort (French *et al.* 1997).

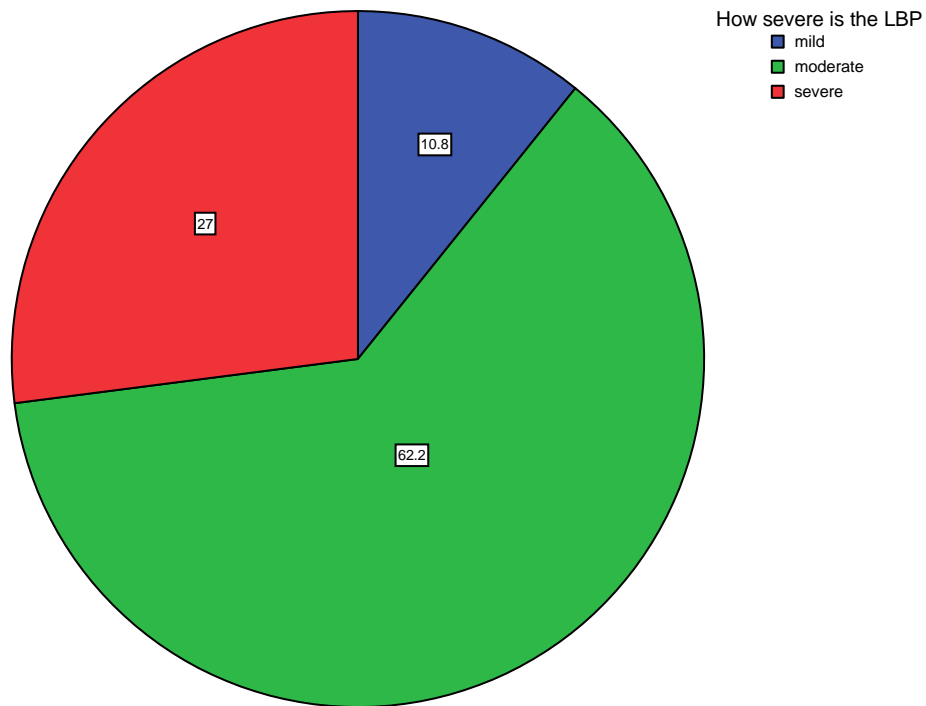


Figure 5: Severity of LBP in 74 affected participants

The median duration of the episodes of LBP was 3.5 hours (range 1 hour to 5 days). 64.9% (n=48) had ever needed bed rest for LBP, and 43.2% (n=32) had taken sick leave from work for LBP. This correlates with the research conducted by French *et al* (1997) which found that back pain in nurses was a major cause of days lost due to sickness.

The reported causes of LBP are shown in Figure 6. Several combinations of causes were reported, making the total percentage greater than 100%. The majority reported lifting to be a cause of their LBP (93.2%). Standing and bending were also reported as important causes, and twisting was less commonly reported. Lifting or carrying patients has been mentioned most frequently as causing occupational LBP in nurses (French *et al.* 1997 and Yip. 2003).

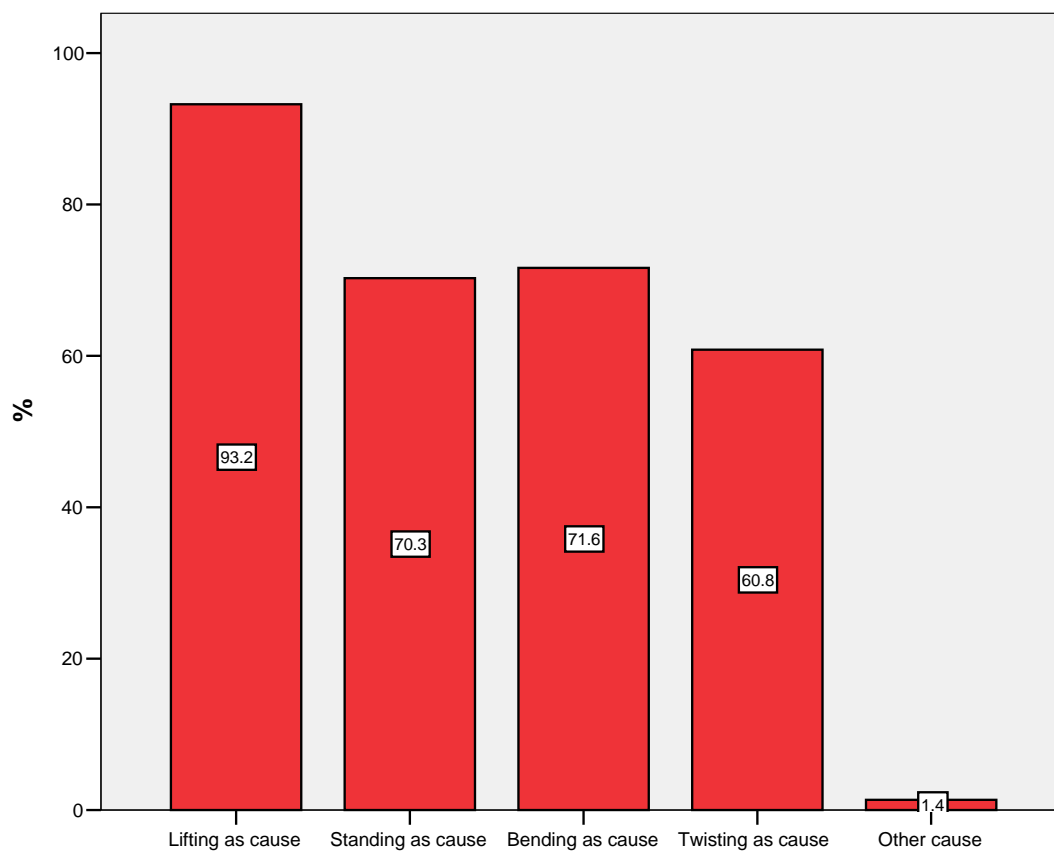


Figure 6: Reported causes of LBP in 74 cases

Low back injury was reported in 31.1% of cases (n=23). These included;” muscle injuries, a slipped disc, strain and soft tissue injury”. These types of injuries are consistent with the type of work activities performed by nurses as discussed in the literature review.

Thirty eight cases had received treatment for their condition (51.4%). The treatment was mainly from a General Practitioner or hospital with only one participant going to a chiropractor.

There were 14 cases (18.9%) who reported another condition which could have caused back pain. Only 6 of them specified that condition which was pregnancy in 5 and gynaecological in 1 participant.

4.3.2 The association between frequency and intensity of manual work and current work-related LBP

Frequency of performing different types of manual activity was assessed in the questionnaire. These were measured on an ordinal scale and compared between the groups with and without current work-related LBP using Mann-Whitney tests. The median response in both groups to these question was “1” indicating 0-10 times, except for bending and twisting of the waist where the median score was “2” indicating 11-20 times in the group with LBP and “1” in the group without LBP.

There were no significant differences between the frequency scores of the groups with LBP and without LBP. The results of the Mann-Whitney tests are shown in Table 3. For most activities, the mean rank of the group with LBP was higher than that of the group without LBP, indicating a non significant trend towards higher scores (more frequent manual activity) in the LBP group than in the non LBP group.

Table 3: Mann- Whitney tests to compare frequency of performing manual activities between those with and without LBP

	Work related LBP	N	Mean Rank	Sum of Ranks	p value
Assist patient to/from toilet	Yes	72	61.92	4458.50	0.415
	No	48	58.36	2801.50	
	Total	120			
Transfer patient between chair and bed	Yes	73	63.09	4605.50	0.291
	No	48	57.82	2775.50	
	Total	121			
Transfer patient in bed	Yes	71	63.94	4539.50	0.080
	No	48	54.18	2600.50	
	Total	119			
Transfer patient to trolley	Yes	68	61.64	4191.50	0.061
	No	47	52.73	2478.50	
	Total	115			
Manual transfer of patient in/out of bath	Yes	68	59.01	4013.00	0.337
	No	46	55.26	2542.00	
	Total	114			
Assist patient in walking	Yes	72	60.33	4344.00	0.935
	No	48	60.75	2916.00	
	Total	120			
Move furniture/instruments	Yes	72	60.90	4385.00	0.965
	No	49	61.14	2996.00	
	Total	121			
Move bed	Yes	73	62.68	4575.50	0.457
	No	48	58.45	2805.50	
	Total	121			
Carry or lift patients	Yes	74	64.95	4806.00	0.129
	No	48	56.19	2697.00	
	Total	122			
Bending/twisting of waist	Yes	72	64.46	4641.00	0.230
	No	50	57.24	2862.00	
	Total	122			

Participants were also asked the frequency of time spent in various postures, this was compared on an ordinal scale between the groups with LBP and without LBP. The median responses are shown in Figure 7. Apart from walking and sitting, the LBP group showed higher median responses than the non LBP group, indicating more time spent in the activities of standing, bending and holding up hands.

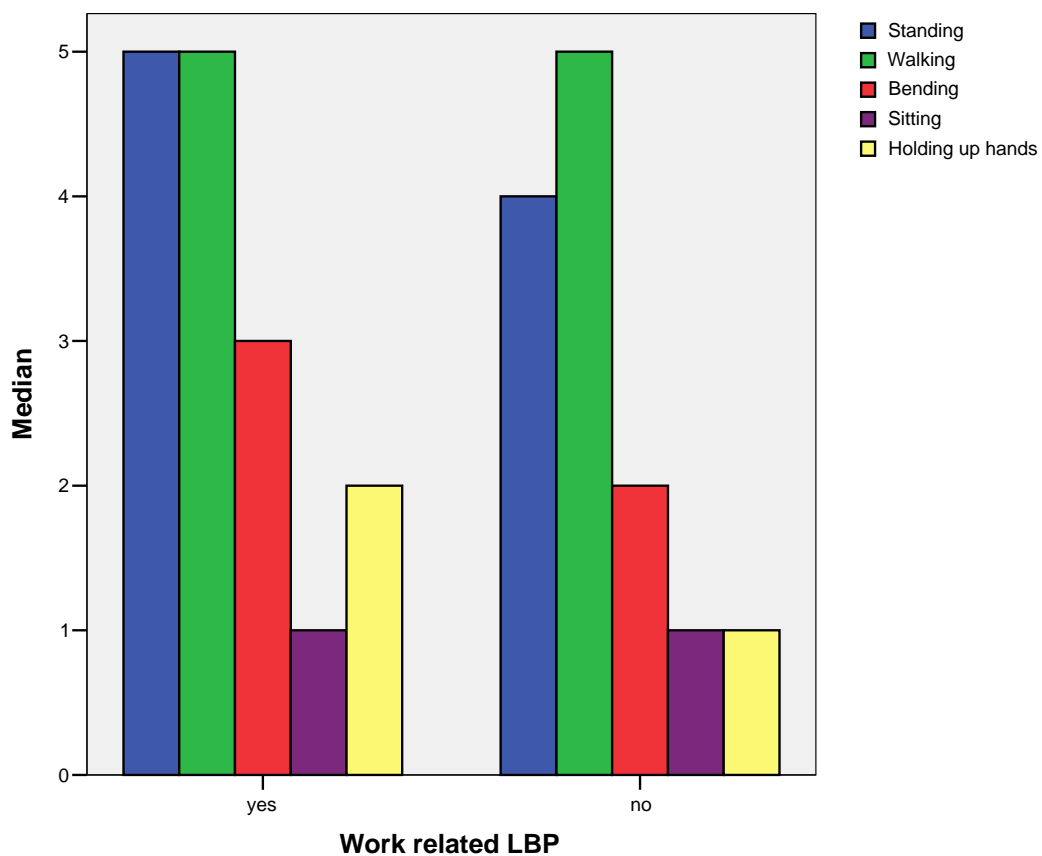


Figure 7: Median frequency of time spent in various postures by presence of LBP

Table 4 shows the statistical comparison of the time spent in the various postures by LBP group. There was a significant difference in time spent standing ($p=0.020$) and holding up hands ($p<0.001$), which was higher in the LBP group than in the non LBP group. Bending was marginally non- significantly higher in the LBP group than in the non LBP group ($p=0.054$), while walking and sitting were not significantly different between the two groups.

Table 4: Mann- Whitney tests to compare frequency of time spent in various postures between those with and without LBP

	Work related LBP	N	Mean Rank	Sum of Ranks	p value
Standing	Yes	74	67.91	5025.50	0.020
	No	50	54.49	2724.50	
	Total	124			
Walking	Yes	74	65.43	4841.50	0.125
	No	49	56.83	2784.50	
	Total	123			
Bending	Yes	74	65.18	4823.00	0.054
	No	46	52.98	2437.00	
	Total	120			
Sitting	Yes	74	60.81	4500.00	0.448
	No	49	63.80	3126.00	
	Total	123			
Holding up hands	Yes	73	72.36	5282.00	<0.001
	No	50	46.88	2344.00	
	Total	123			

Figure 8 shows that in the patients who were classified as having current work related LBP, the activity associated with the most intense pain was carrying or lifting patients (median score of 3, indicating severe LBP). The other activities were mostly rated as 2 indicating moderate LBP, while assisting patients to walk to the bathroom scored a median of 1, indicating mild pain.

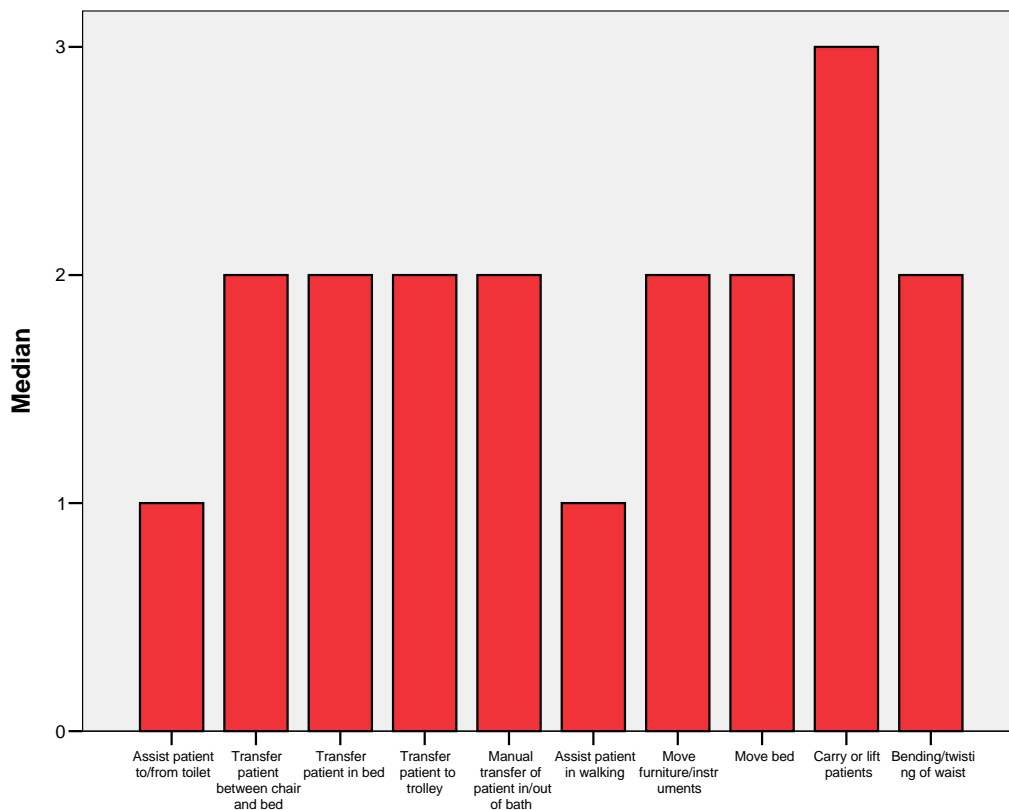


Figure 8: Median response to intensity of pain caused by various manual activities in LBP participants (n=74).

Previous studies have also revealed that nurses believe that lifting patients was one of the most important factors contributing to their LBP (French *et al.* 1997 and Yip. 2001).

4.4 The association between other factors and LBP

4.4.1 State vs. private hospitals

Table 5 shows that there was a significant association between the type of hospital (state or private) and the presence of LBP ($p=0.029$). The prevalence was higher in the state hospitals (67.6%) than in the private hospitals (48%).

Table 5: Crosstab of type of hospital by work related LBP

			Work related LBP		Total
			Yes	no	
Hospital	Private	Count	24	26	50
		Row %	48.0%	52.0%	100.0%
	State	Count	50	24	74
		Row %	67.6%	32.4%	100.0%
Total		Count	74	50	124
		Row %	59.7%	40.3%	100.0%

Pearson chi square 4.75, $p=0.029$

4.4.2 Other factors associated with LBP

Since confounding could have influenced any of the associations reported, logistic regression analysis was performed in order to assess the independent effects of several risk factors for LBP. Table 6 shows the final step (step 23) in the backward elimination process. Ninety-nine observations were included in the analysis due to

missing data in some of the variables included. The first step included 26 independent variables, shown under Table 6. The variables remaining in the model are those which have contributed significantly to the fit of the model based on their likelihood ratios, even if they are not individually statistically significant risk factors for LBP. These are:

Frequency of standing: the risk of LBP increased non-significantly by 1.539 times ($p=0.066$) as the frequency of standing score increased by 1 unit (e.g. from 0-2 hours to 3-4 hours).

Frequency of holding up hands: the risk of LBP increased significantly 3.4 times ($p=0.002$) as the frequency of holding hand above the head increased by one unit.

Hours per shift: the risk of LBP decreased significantly by 63.7% ($p=0.012$) for a one unit increase in hours per shift (i.e. from 8-12 hours to 12 hours). This may be due to reverse causality, i.e. the presence of LBP led to necessity for shorter working hours, and not the shorter working hours causing LBP.

Number of children: Having 1-2 children compared to none was a significant 3.8 fold risk for LBP ($p=0.015$). But having >3 children was not a significant risk when compared with having no children ($p=0.889$). Studies have found a marked increase in back pain with number of childbirths (French *et al*, 1997).

Therefore the frequency of certain postures like holding hands above the head and standing were independent risk factors for LBP, as was having 1-2 children.

However, working shorter shifts was associated with LBP, probably due to reverse causality due to the cross-sectional design of this study.

Table 6: Logistic regression analysis of risk factors for current work-related LBP

		Wald	df	P value	OR	95.0% C.I. for OR	
						Lower	Upper
Step 23(a)	Frequency of standing	3.391	1	0.066	1.539	.973	2.434
	Frequency of holding up hands	9.961	1	0.002	3.398	1.590	7.262
	Hours per shift	6.346	1	0.012	.363	.165	.799
	Number of children (baseline = 0)	6.449	2	0.040			
	1-2 children	5.863	1	0.015	3.806	1.290	11.229
	>=3 children	.020	1	0.889	.895	.189	4.244
	Constant	3.819	1	0.051	.135		

a Variable(s) entered on step 1: Sex, Age, Ethnicity, Education, Exercise, Smoking, Current ward, Work duration, Injury prevention training, Low back injury prevention, Standing, Walking, Bending, Holding up hands, Hrs per shift, 2.6.1, 2.6.2, 2.6.3, 2.6.4, 2.6.5, 2.6.6, 2.6.7, 2.6.8, 2.6.9, 2.6.10, number of children, state vs. private hospital.

4.5 Summary

The aim of this study was to determine the association between frequency and intensity of manual work with the development of LBP in nurses, in State versus Private hospitals in the Durban Metropolitan area.

4.5.1 Objective One

The first objective was to collect data on nurses, which included:

- Participant Demographics
- Lifestyle factors relating to LBP:
 - ∞ Exercise
 - ∞ Smoking
- Work history:
 - ∞ Length of time as a nurse
 - ∞ Hours worked
 - ∞ Training received
- Work activities
 - ∞ Activities performed
 - ∞ LBP associated with activities
- History of Low Back Pain
 - ∞ Previous LBP
 - ∞ Severity of LBP
 - ∞ Absenteeism from work due to LBP
 - ∞ LBP related to work
 - ∞ Treatment received

4.5.2 Objective Two

The second objective was to interpret the data obtained and identify the relationships documented in the first objective. As well as to compare the activities performed between nurses with LBP and those without LBP.

The hypotheses of this study were:

- That increased frequency and intensity of manual work should contribute to increased low back pain in nurses.
- The prevalence of low back pain between institutions differ due to different working conditions (Vasiliadou *et al.* 1995). Thus the prevalence rates between state and private hospitals in Durban should differ.

The results showed the following:

Demographics: 124 nurses participated in this study, 50 from private hospitals and 74 from state hospitals. Of these, 70.1% of participants were professional nurses indicating longer work experience and 92.7% of participants were females.

Of all the participants, 53.2% of participants were married. There is some evidence to support that being separated, divorced or widowed is associated with LBP (Manga *et al.* 1993).

One of the significant risk factors for LBP identified in this study was that having 1-2 children compared to none increased the risk of LBP by 3.8 times. However having 3 or more children did not increase the risk of LBP. Literature suggests that the risk of back pain increases with number of births (French *et al.* 1997).

Age: the highest proportion of participants were in the 36-45year group (39.5%), indicating that the higher portion of participants worked for many years as nurses. The prevalence of LBP has been found to increase in with age until 45years (Papageorgiou *et al.* 1995).

Prevalence of LBP: Of the 124 participants, 74 (59.7%) reported having current work-related LBP. This prevalence rate was comparable with findings of international studies where prevalence rates were indicated as:

35.9% in New Zealand,

47% in the USA,

66.8% in the Netherlands,

67% in Greece and

54.7% in Japan (Nelson *et al.* 2003, *Vasiliadou et al.* 1995 and Yip. 2001).

The prevalence in Durban hospitals is relatively higher than those found in some other countries. This is most likely due to differing working conditions between different countries (*Vasiliadou et al.* 1995).

A significant finding was that only 9.5% of participants reported having LBP before working as a nurse indicating a strong possibility that working as a nurse was the cause of LBP. The majority of participants also thought that their work was the cause of their LBP.

Incidence of LBP: A high percentage of participants (35.1%) reported having LBP on a daily basis and 28.4% reported experiencing 6-10 episodes a year. When

compared to the general population, 35.1% of participants suffering LBP on a daily basis is significantly high (Papageorgiou *et al.* 1995).

A total of 43.2% of participants had taken sick leave from work due to their LBP while 64.9% of participants had needed bed rest for their LBP. These findings are similar to that of another study (Yip. 2001). This could have a significant economic effect on the health care industry.

Frequency: The frequency of performing activities was assessed using a table, Table 3 (page 56). Participants were asked to enter how frequently they performed ten different, commonly performed nursing tasks during one shift. Participants entered either;

0-10 times, 11-20 times, 21-30 times or +30 times.

Results revealed that in the group with LBP, participants spent more time bending, twisting and carrying patients which was consistent with international findings (French *et al.* 1997, Smedley *et al.* 1997 and Smith *et al.* 2004). There was also a slightly greater tendency toward LBP with a higher frequency of manual activities.

Participants were also asked to indicate the amount of time spent in the following activities; standing, walking, bending, sitting and holding hands above the head. The LBP group indicated more time standing, bending and holding hands above the head as compared to the non-LBP group. Standing and holding hands above the head were identified as independent risk factors for LBP.

Intensity: Intensity of LBP caused by manual activities was assessed using the same table as for frequency (with the same activities). However, participants were asked to indicate the type of LBP caused by each activity, either; mild, moderate or severe. The activity associated with the most severe LBP was lifting or carrying patients, this is one of the most commonly reported activities for causing LBP (French *et al.* 1997). Transferring patients, moving furniture and bending all caused moderate LBP. Thus the hypothesis that increased frequency and intensity of manual activities contributes LBP in nurses is accepted.

State versus Private hospitals: a higher prevalence, 67.6%, was found in state hospitals as compared to 48% in private hospitals. This was quite a significant difference and a relatively high prevalence in state hospitals when compared to the literature. Thus the second hypothesis that the prevalence rates between state and private hospitals differs is accepted.

As a result of the findings of this study, the following hypotheses are accepted:

- Increased frequency and intensity of manual work should contribute to increase LBP in nurses.
- The prevalence of low back pain between institutions differs due to different working conditions (Vasiliadou *et al.* 1995). As was evident in this study, the prevalence of LBP differed greatly between state and private hospitals. However the results may have been affected by the small sample size due to the difficulty of getting return questionnaires. This study does however does provide an important contribution to the

body of knowledge of low back pain in nurses as well as providing good South African statistics.

4.6 Study Limitations

Time was a very big limitation in this study as nurses worked long shifts, were tired and had very little time available, while at work, to complete the questionnaires. Because of this, questionnaires were handed out and collected at a later time resulting in a poor response.

Nurses in certain wards were also much busier than in other wards. There was a lower response rate from these wards. The nurses working in the busier wards could also possibly have had a greater work load, this could have impacted on the result of this study.

This study was also limited in that participants' home situations, other daily activities, stress, work satisfaction and other psychological factors which could contribute to the development of LBP, were not included in the questionnaire

CHAPTER FIVE

CONCLUSION

5.1 Conclusion

Current work-related LBP is prevalent amongst nurses. The results of this study revealed that 59.7% of participants reported having LBP. This prevalence rate compares with the rates found in international studies, where prevalence rates of nursing related back pain range from 35.9% in New Zealand to 47% in the United States to 66.8% in the Netherlands (Nelson *et al.* 2003).

There are many factors which are significantly associated with LBP. The purpose of this study was to determine the association between frequency and intensity of manual work and LBP. Results revealed that the frequency of standing and holding hands above the head were important factors which increased the risk of LBP. There was also a slightly greater tendency toward LBP with a higher frequency of manual activities particularly carrying patients, twisting and bending.

In terms of the intensity of manual work and LBP, nurses reported that carrying or lifting patients caused the most intense pain. Transferring patients, moving equipment and bending caused moderate LBP. These findings are in line with previous studies (Yip. 2003 and French *et al.* 1997).

Another purpose of this study was to compare the prevalence of LBP between state and private hospitals as it has been found that conditions which constitute risk factors differ, not only between countries but also between institutions in the same country (Vasiliadou *et al.* 1995). In this study it was found that state hospitals were a risk factor for LBP compared to private hospitals as the prevalence of LBP in state hospitals was significantly higher.

Earlier studies have found a marked increase in back pain with number of childbirths (French *et al.* 1997). Having had up to 2 children was found to significantly increase the risk of LBP compared to having no children. Surprisingly the duration of the shift worked was significantly protective for LBP. Cases with LBP might have self selected to work shorter shifts because of their LBP.

From the above results, the first hypothesis of this study that an increased frequency and intensity of manual work should contribute to increase LBP in nurses is accepted.

The second hypothesis, that the prevalence of low back pain between institutions differ due to different working conditions (Vasiliadou *et al.* 1995). Thus the prevalence rates between state and private hospitals in Durban should differ is also accepted.

5.2 Recommendations

In future studies into this topic, it is recommended that a bigger sample size be used in order to get a better insight into this problem of LBP in nurses.

A study investigating other risk factors, including; Home situation, stress, job satisfaction and psychological factors, should also be carried out to determine the role of these factors in LBP in nurses.

This study revealed that of the 74 participants with LBP, only 1 nurse sought treatment from a chiropractor. Chiropractic is a successful form of treatment for LBP and the nursing community needs to be made aware of this.

It will also be beneficial to nurses to have an exercise programme introduced to them which would not only strengthen their backs but also aid in preventing low back injuries and pain.

REFERENCES

- Ando, S. Ono, Y. Shimaoka, M. Hiruta, S. Hattori, Y. Hori, F and Yasuhira, T. 2000. Associations of Self Estimated Workloads with Musculoskeletal Symptoms Among Hospital Nurses. Occup Environ Med. **57** (3), 211-216.
- Atkinson, J. H. 2005. Chronic Back Pain: Searching for Causes and Cures. [online]. Available from: <http://www.jhatkinson@ucsd.edu>. [Accessed 3 March 2007]
- Borenstein, D.G. Boden, S.D. and Wiesel, S.W. 1995. Epidemiology of Low Back Pain and Sciatica. 2nd. Edit. pp22-27. Philadelphia: W.B. Saunders Company. pp. 22. ISBN 0-7216-5411-8.
- Boshuizen, H. Verbeek, J. Weel, A. 1992. Do Smokers Get More Back Pain? Spine. **18**. 35-40.
- Burton, A.K., Hollis, S., Main, C.J. and Tillotson, K.M., 1995. Psychosocial Predictors of Outcomes In Acute and Sub Chronic Low Back Trouble. Spine. **20** (6), 722-728.
- Carey. T, S. Evans. A,T. Hadler. N.M. Lieberman. G. Kalsbeek, W.D. Jackman. A, M. Fryer. J, G. McNutt. R, A. 1996. Acute Severe Low Back Pain. A Population-Based Study of Prevalence and Care-seeking. Spine. **21** (3), 339-344.
- Cherkin, D.C. and Deyo, R.A. 1993. Nonsurgical Hospitalization for Low Back Pain. Is it Necessary? Spine. **18** (13), 1728-1735.

Chiou, W., Wong, M. and Lee, Y. 1994. Epidemiology of Low Back Pain in Chinese Nurses. International Journal of Nursing Studies. **31** (4), 361-368.

Diamond, S. Borenstein, D. 2006. Chronic Low Back Pain in a Working-age Adult. Best Practice and Research Clinical Rheumatology. **20** (4), 707-720.

Docrat, A. 1999. A Comparison of the Epidemiology of Low Back Pain In the Indian and Coloured Communities in South Africa. Masters Degree in Technology: Chiropractic. Dissertation. Durban Institute of Technology, Berea, Durban, South Africa.

Eriksen, W. Bruusgaard, D and Knardahl, S. 2004. Work Factors as Predictors of Intense or Disabling Low Back Pain; A Prospective Study of Nurses' Aides. Occup Environ Med. **61** (5), 398-404.

Feyer, A. Herbison, P. Williamson, A. De Silva, I. Mandryk, J Hendrie, L. Hely, M. 2000. The Role of Physical and Psychological Factors in Occupational Low Back Pain: A Prospective Cohort Study. Occup Environ Med. **57**, 116-120.

French, P. Lee, F. Liu, S. Luk, K.B. Wong, H. 1997. The Prevalence and Cause of Occupational Back Pain In Hong Kong Registered Nurses. Journal of Advanced Nursing Studies. **26**, 380-388.

Facet joints. 2006. Spine universe. [online]. Available from http://www.spineuniverse.com/displaygraphic.php/146/facetjoints2_250-BBjpg.

Gatchel, J. Polatin, P. Mayer, T. 1995. The Dominant Role of Psychosocial Risk Factors in the Development of Chronic Low Back Pain Disability. Spine. **20**. 2702-2709.

Hart, L.G. Deyo, R.A. Cherkin, D.C. 1995. Physician Office Visits for Low Back Pain. Frequency, Clinical Evaluation and Treatment Patterns From a U.S National Survey. Spine. **20** (1), 11-19.

Hazard, R.G. Haugh, L.D. Reid, S. Preble, J.B. MacDonald, L. 1996. Early Prediction of Chronic Disability after Occupational Low Back Injury. Spine. **21** (8), 945-951.

Hides, J. Gilmore, C. Stanton, W. Bohlscheid, E. 2006. Multifidus Size and Symmetry Among Chronic LBP and Healthy Asymptomatic Subjects. Manual Therapy. [online], **7**. Available from: doi:10.1016/j.math.2006.07.017. [Accessed 2 March 2007]

Hoogendoorn, W. Bongers, P. de Wet, H. Ariens, G. van Mechelen, W. Bouter, L. 2002. High Physical Work Load and Low Job Satisfaction Increase the Risk of Sickness Absence Due to Low Back Pain: Results of a Prospective Cohort Study. Occup Environ Med. **59**, 323-328.

Jayson, M.I.V, (Ed) 1992. The Lumbar Spine and Back Pain. 4th Ed. United Kingdom: Churchill Livingstone. pp.537-539. ISBN 0-443-04189-x.

Kirkaldy-Willis, W. H. and Burton, C, V. 1992. Managing Low Back Pain. 3rd edition. USA. Churchill Livingstone. pp. 4-123. ISBN 0-443-08789-x.

Kwa-Zulu Natal Department of Health Annual Report 2005/2006. Part C. Human Resource Management: Oversight Report. [Online]. Available from <http://www.kznhealth.gov.za/ar0506/partc.pdf>. [Accessed 26 December 2006].

Ligaments of the Lumbar spine. 2006. Spine Universe. [online]. Available from http://www.spineuniverse.com/displaygraphic.php/138/dp_ligaments-BB.gif. [Accessed 26 December 2006].

Low Back Pain Fact Sheet. 2007. National Library. [online]. Available from www.ninds.nih.gov/disorders/backpain/detail_backpain.htm. [Accessed 26 December 2006].

Lumbar Vertebrae. 2006. PSU Edu. [online]. Available from <http://www.ma.psu.edu/~pt/384/vert.gif>. [Accessed 26 December 2006].

Lumm, J.A and Waldron, H.A. 1989. Concerning the Careers: Occupational Health for Health Care Workers. Pp110-111. Great Britain: Reed International Books.

Manchikanti, L. Boswell, M.V. Singh, V. Pampati, V. Damron, K.S, Beyer, C.D. 2004. Prevalence of Facet Joint Pain in Chronic Spinal Pain of Cervical, Thoracic, and Lumbar Regions. BMC Musculoskeletal Disorders. [online], 5 (15). Available from: <http://www.biomedcentral.com/1471-2474/5/15>. [Accessed 3 March 2007]

_Manga, P. Angus, D.E. and Swan, W.S. 1993. Effective Management of Low Back Pain: It's Time to Accept the Evidence. Journal of the Canadian Chiropractic Association. **37** (4), 221-229.

Map of Durban Metropolitan Area. 2007. SA Venues. [online]. Available from <http://www.sa-venues.com/maps/images/dbn-metro-blue-dot.gif>. [Accessed 26 December 2006].

Maul, I. 2002. Course of Low Back Pain Among Nurses: A Longitudinal Study Across Eight Years. Available from <http://oem.bmj.com/cgi/reprint/60/7/497>. [Accessed 3 May 2006].

Merriam-Webster online dictionary. 2006. Available from <http://www.m-w.com/dictionary/registered+nurse>. [Accessed 25 July 2006].

Moore, K.L. 1992. Clinically Orientated Anatomy. 3rd edition. Baltimore USA. Lippincott Williams & Wilkins. pp. 229-355. ISBN 0-683-06133-X

Mouton,J. 1996. Understanding Social Research. pp110. South Africa: Van Struik. ISBN 0-627-02163-

Nelson, A. Fragala, G. and Menzel, N. 2003. Myths and Facts About Back Injuries in Nursing. American Journal of Nursing. **103** (2) 32-40.

Owen, B.D., and Garg, A. 1994. Reducing Back Stress Through an Ergonomic Approach: Weighing a Patient. International Journal of Nursing Studies. **31** (6) 511-519.

Papageorgiou, A.C. Croft, P.R. Ferry, S. Jayson, M. Silman, A, J. 1995. Estimating the Prevalence of Low Back Pain in the General Population. Spine. **20**, (17) 1889-1894.

Renkawitz, T. Boluki, D. Grifka, J. 2006. The Association of Low Back Pain, Neuromuscular Imbalance, and Trunk Extension Strength in Athletes. Spine. **6**, 673-683.

Rives, P. A. Douglass, A. B. 2004. Evaluation and Treatment of Low Back Pain in Family Practice. J Am Board Fam Pract. **17**, S23-31.

Skovron, M. Szpalski, M. Nordin, M. Melot, C. Cukier, D. 1994. Sociocultural Factors and Back Pain. A Population-Based Study in Belgian Adults. Spine. **19**, (2), 129-137.

Smedley, J. Egger, P. Cooper, C. Coggon, D. 1995. Manual Handling Activities and Risk of Low Back Pain in Nurses. Occup Environ Med. **52**, 160-163.

Smedley, J. Egger, P. Cooper, C. Coggon, D. 1997. Prospective Cohort Study of Predictors of Incident of Low Back Pain in Nurses. British Medical Journal. **314**, 1225-1228.

Smedley, J. Inskip, H. Trevelyan, F. Buckle, P. Cooper, C. Coogan, D. 2003. Risk Factors for Incident Neck and Shoulder Pain in Hospital Nurses. Occupa Environ Med. **60**, 864-869.

Smith, D, Sato, M. Miyajima, T. Mizutani, T. Yamagata, Z. 2003. Musculoskeletal Disorders Self-Reported by Female Nursing Students in Central Japan: A Complete Cross-Sectional Survey. International Journal of Nursing Studies. **40**, 725-729.

Speed, C. 2004. Low Back Pain. British Medical Journal. **328**, 1119-1121.

Thomas, S. 2005. Zygapophysial Joints and Low Back Pain. Available from. <http://www.spineuniverse.com/displayarticle.php/article1898.html>. Accessed November 2005

Toroptsova, N. Benevolenskaya, L. Karyakin, A. Sergeev, I. Erdesz, S. 1995. "Cross Sectional" Study of Low Back Pain Among Workers at an Industrial Enterprise in Russia. Spine. **20** (3), 328-332.

Urli, E.K, 1995. A Study of the Effectiveness of Chiropractic Spinal Manipulation on its Own Versus Chiropractic Spinal Manipulation Combined with Other Treatment Modalities Used in a Chiropractic Practice, in the Management of Mechanical Low Back Pain in Nurses. Masters Degree in Technology: Chiropractic. Dissertation. Durban Institute of Technology, Durban, South Africa.

Van der Meulen, A.G. 1997. An Epidemiological Investigation of Low Back Pain in a Formal Black South African Township. Masters Degree in Technology: Chiropractic. Dissertation. Durban Institute of Technology, Durban, South Africa.

Vasiliadou, A. Karvountzis, G.G. Soumilas, A. Roumeliotis, D. Theodosopoulou, E. 1995. Occupational Low-Back Pain in Nursing Staff in a Greek Hospital. Journal of Advanced Nursing. **21**, 125-130.

Vlok, J. 2005. An Investigation into the Prevalence and Occupational Risk Factors of Low Back Pain in Emergency Medical Services Personnel. Masters Degree in Technology: Chiropractic, Durban Institute of Technology. Durban, South Africa.

Waddell, G. 2004. The Back Pain Revolution. 2nd Ed. London: Churchill Livingstone. pp. 74. ISBN 0-4430-7227-2.

Yeung, S. Genaidy, A. Deddens, J. Shoaf, C. Lueng, P. 2003. A Participatory Approach to the Study Of Lifting Demands and Musculoskeletal Symptoms Among Hong Kong Workers. Occup Environ Med. **60**, 730-738.

Yip, Y.B. 2001. A Study of Work Stress, Patient Handling Activities and the Risk of Low Back Pain Among Nurses in Hong Kong. Journal of Advanced Nursing. **36** (6), 794-804.

Yip, Y.B. 2003. New Low Back Pain in Nurses: Work Activities, Work Stress and Sedentary Lifestyle. Journal of Advanced Nursing. **46** (4), 430-440.

List of Appendices

Appendix A: Nurses Low Back Pain Research Questionnaire	73
Appendix B: Letter of Information for Questionnaire	78
Appendix C: Informed Consent Form for Questionnaire	80
Appendix D: Number of Nurses in Kwa-Zulu Natal according to 2005/2006 Department of Health Figures.	81
Appendix E: Letter of Permission from R. K. Khan Hospital (State hospital).	82
Appendix F: Letter of Permission from Entabeni Hospital (Private hospital).	83
Appendix G: Letter of Permission from Westville Hospital (Private hospital).	83
Appendix H: Focus Group Letter of Information	84
Appendix I: Focus Group Informed Consent Form	85
Appendix J: Focus Group Confidentiality Statement	86
Appendix K: Focus Group Code of Conduct Form	87

Appendix L: Questionnaire in Zulu	88
Appendix M: Letter of Information in Zulu	94
Appendix N: Map Durban Metropolitan Area	96

Appendix A

Investigation of Lower Back Pain in Nurses

Reference No: _____

Date _____

Section One:

- 1.1. Sex 1=Female
 2=Male
- 1.2. Age (in years) 1=18-25
 2=26-35
 3=36-45
- 1.3. Ethnicity (For statistical purpose only) 1=Black
 2=Coloured
 3=Indian
 4=White
- 1.4. Highest education achieved 1=High School Education
 2=Tertiary Education
- 1.5. Marital Status 1=Married
 2=Separated
 4=Widowed
 5=Single
- 1.6. Number of Children 1=0
 2=1-2
 3=3-4
 4=5+
- 1.7. Do you exercise? 1=Yes
 2=No
- 1.7.1. If yes, how many hours a week do you exercise? 1=0-1 hour
 2=1-3 hours
 3=4-7 hours
 4=8-10 hours
 5= +10 hours

1.7.2. Please indicate what type of exercise you do:

- 1.8. Do you smoke? 1=Yes
 2=No

Section Two:

2.1. Current Post? (please specify)_____

- 2.2. Current working ward? 1=Medical
 2=Surgical
 3=Maternity
 4=other_____

- 2.3. How long have you been working as a nurse? 1=0-1 year
 2=2-5 years
 3=6-10 years
 4=11-15 years
 5=16-20 years
 6=21-27 years

- 2.4. How many hours do you work per shift? 1=8-12 hours
 2=12 hours
 3=>12 hours

- 2.4.1. How many hours do you work a week on average? 1= - 48 hours
 2=48-60 hours
 3=61-72 hours
 4=73-84 hours
 5= +84 hours

2.5. Is any of the following training provided in your work place?

2.5(a). Injury prevention training. (eg. Sharp injury prevention, fall prevention)

- 1=Yes 2= No

2.5(b) Prevention of lower back injury training. (Including videos, newspaper cuttings or pamphlets)

1=Yes 2= No

2.6. How many times do you perform the following activities in a shift (on average)?

Type of Activity	0-10times	11-20times	21-30times	+30times
1. Assist patient to/from toilet/bathroom				
2. Transfer patient between chair/wheel chair and bed				
3. Transfer patient in bed (eg. Making bed)				
4. Transfer patient to trolley (eg. X-ray)				
5. Manual transfer of patient in/out of bathtub				
6. Assist patient in walking				
7. Move furniture/instrument (eg. ECG monitor)				
8. Move bed				
9. Carrying or lifting patients				
10. Bending/twisting at the waist				

2.7. Please indicate the type of low back pain caused by the following activities (where applicable)

Type of Activity	Mild	Moderate	Severe	N/A
1. Assist patient to/from toilet/bathroom				
2. Transfer patient between chair/wheel chair and bed				
3. Transfer patient in bed (eg. Making bed)				
4. Transfer patient to trolley (eg. X-ray)				
5. Manual transfer of patient in/out of bathtub				
6. Assist patient in walking				
7. Move furniture/instrument (eg. ECG monitor)				
8. Move bed				
9. Carrying or lifting patients				
10. Bending/twisting at the waist				

2.8. How long have you spent in the following postures in each shift?

Type of Activity	0-2hours	3-4hours	5-6hours	7-8hours	+8hours
Standing					
Walking					
Bending					
Sitting					
Holding up hands (above shoulders)					

eg. Hanging up I.V					
--------------------	--	--	--	--	--

Section Three:

- 3.1. Do you suffer from low back pain?
(Pain between the lower costal margins
and the gluteal folds) 1=Yes
 2=No
- 3.2. Did you suffer from low back pain before
working as a nurse? 1=Yes
 2=No
- 3.3. How did your low back pain begin? 1=Gradually/Over time
 2=Suddenly
- 3.4. Are you currently suffering from low back pain? 1=Yes
 2=No
- 3.5. Approximately how many episodes of low back pain have you experienced in the
past year? 1=Daily
 2= 1-3
 3= 4-6
 4= 6-10
 5= _____
- 3.6. How severe is your low back pain? 1=Mild
 2=Moderate
 3=Severe
- 3.7. What is the duration of your low back pain? _____hours/days
- 3.8. Have you ever needed bed-rest for your low
back pain? 1=Yes
 2=No
- 3.9. Have you ever been absent from work due to
your low back pain (in the past 12 months)? 1=Yes
 2=No
- 3.9.1. If yes, how many times(in the past 12 months) 1=0-1 time
 2=2-5 times
 3=6-10 times
 4=11-20 times
 5= +20 times

- 3.10. Do you believe your low back pain is related to your work? 1= Yes
 2= No
- 3.11. What do you think is the cause of your low back pain? (indicate as many as needed) 1=Lifting patients
 2=Standing
 3=Bending
 4=Twisting
 5=All of the above
 6=Other _____
- 3.12. Have you ever injured your low back while on duty? 1=Yes
 2=No
- 3.12.1. If yes, please indicate the injury

- 3.13. Have you ever received treatment for your low back pain? 1=Yes
 2=No
- 3.13.1. Please indicate where you received treatment:

- 3.14. Do you have any other conditions which would cause you low back pain? 1=Yes
 1=No
(E.g. Previous back surgery, cancer, pregnancy, gynaecological problems)

Appendix B

Letter of Information

Title of study:

An Investigation into the Factors Associated with the Development of Lower Back Pain in Nurses in the Durban Metropolitan Area, with Particular Reference to Manual Work.

Supervisor: Dr. T. MacDougall (031-2042205)

Research student: Rozanne Dasappa (031-2042205)

Institution: Durban Institute of Technology

Dear Sir/Madam,

Welcome to my research project. You have been selected to take part in a study on the relationship between manual work and low back pain in nurses in the Durban area.

Participation is voluntary and refusal to participate will not result in adverse consequences of any kind. You may drop out of the study at any stage, without fear of negative consequences.

The results of this study will be made available in the Durban Institute of Technology library in the form of a mini-dissertation.

Procedures:

Five hundred nurses from state and private hospitals around the Durban area will be chosen through a systemic random sampling procedure. The selected nurses will be eligible to take part in the study. Each nurse will be given a letter of information and should he/she agree to take part in the study, will complete a letter of informed consent. This will be followed by completion of the research questionnaire. The researcher will be available for the entire duration 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 confidential.

You will be required to complete a 5 page questionnaire on work activity and low back pain. All answers are strictly confidential and you are therefore required to be honest and answer all questions to the best of your knowledge.

Please don't hesitate to ask any questions on any aspect of this study. Your full co-operation will assist the chiropractic profession in expanding its knowledge of low back pain.

You are free to withdraw from the study at any time without giving a reason.

Confidentiality:

All information is confidential and the results will be used for research purposes only. Please note that you are not required to put your name down on the questionnaire and you are ensured of complete confidentiality.

Risks/Discomfort and Cost:

There are no risks/discomfort or cost involved from your 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 Institute of Technology Research and Ethics Committee.

Thank you.

Rozanne Dasappa
(Chiropractic intern)

Dr T. MacDougall
(Supervisor)

APPENDIX C

INFORMED CONSENT FORM

DATE:

TITLE OF RESEARCH PROJECT : An Investigation into the Factors Associated with the Development of Lower Back Pain in Nurses in the Durban Metropolitan Area, with Particular Reference to Manual Work.

NAME OF SUPERVISOR: Dr T. MacDougall (031-2042205)

NAME OF RESEARCH STUDENT: Rozanne Dasappa (031-2042205)

Please circle the appropriate answer

	YES /NO	
1. Have you read the research information sheet?	Yes	No
2. Have you had an opportunity to ask questions regarding this study?	Yes	No
3. Have you received satisfactory answers to your questions?	Yes	No
4. Have you had an opportunity to discuss this study?	Yes	No
5. Have you received enough information about this study?	Yes	No
6. Do you understand the implications of your involvement in this study?	Yes	No
7. Do you understand that you are free to		
a) withdraw from this study at any time ?	Yes	No
b) withdraw from the study at any time, without reasons given	Yes	No
c) withdraw from the study at any time without affecting your future health care or relationship with the Chiropractic day clinic at the Durban Institute of Technology.	Yes	No
8. Do you agree to voluntarily participate in this study	Yes	No
9. Who have you spoken to regarding this study?		

If you have answered NO to any of the above, please obtain the necessary information from the researcher and / or supervisor before signing. Thank You.

Please Print in block letters:

Participant's Name : _____ Signature: _____

Witness Name: _____ Signature: _____

Researcher's Name: _____ Signature: _____

APPENDIX D

KwaZulu-Natal Department of Health Annual Report 2005/2006

Occupation	Employees as at 1 April 2005	Promotions to another salary level	Salary level promotions as a % of employees by occupation	Progressions to another notch within a salary level	Notch progressions as a % of employees by occupation
Dental Practitioners	62	1	1.6	9	14.5
Dental Specialists	3	0	0	0	0
Dieticians and nutritionists	55	1	1.8	16	29.1
Emergency Services Related	4	2	50	0	0
Medical Practitioners	2113	275	13	217	10.3
Medical Research and Related Professional	2	0	0	0	0
Medical Specialists	545	52	9.5	60	11
Medical Technicians/Technologists	465	28	6	339	72.9
Nursing Assistant	5896	95	1.6	2752	46.7
Occupational Therapists	96	2	2.1	36	37.5
Oral Hygienists	18	0	0	12	66.7
Pharmacists	366	80	21.9	102	27.9
Physicians	5	0	0	1	20
Physiotherapists	194	17	8.8	79	40.7
Professional Nurses	9475	1732	18.3	6609	69.8
Psychologists and Vocational Counselors	67	1	1.5	15	22.4
Radiographers	393	33	8.4	192	48.9
Speech Therapists and Audiologist	65	1	1.5	18	27.7
Staff Nurses and Pupil Nurses	8129	281	3.5	5317	65.4
Supplementary Diagnostic Radiographers	11	1	9.1	8	72.7
Total	27964	2602	9.3	15782	56.4

APPENDIX E

Appendix F

Hi Rozanne

RESEARCH: LOWER BACK PAIN IN NURSES IN THE DURBAN AREA

Permission is hereby granted for you to conduct the above research project at Entabeni Hospital. We appreciate that you respect the confidentiality of the interviewees and the Company.

I look forward to seeing the assignment on completion.

From : Mrs Anne Williamson

Nursing Manager

Appendix G

I confirm that our Nursing Manager, Mrs Reinecke, has agreed that you may do your research here. Please contact us before you come into the hospital.
Thanks

Bev Clarke

Nursing Manager Secretary (Westville Hospital)

Tel : +27 031 2650911

Fax : +27 031 2650952

Mobile : +27 083 5223164

Email : Bev.Clarke@lifehealthcare.co.za

Website: www.lifehealthcare.co.za

Appendix H

LETTER OF INFORMATION **(Focus Group)**

Dear Participant,

Welcome to the focus group of my study. Thank you for your interest.

The title of my research project is: The prevalence and risk factors for occupational low back pain in South African nurses.

Name of Supervisor: Dr. T. MacDougall (031-202 8991)

Name of Researcher: Rozanne Dasappa (084-682 7779)

Name of Institution: Durban Institute of Technology.

The purpose of this focus group is to validate the Low Back Pain and Risk Factors Questionnaire in terms of gathering information from the nursing population. The discussions will focus on the changes that are necessary in order to alter the Questionnaire into a nurse specific context.

Your participation is much appreciated and it is assured that your comments and contributions will remain confidential. You are at any point permitted to disagree, however if this is the case, please state your reasons for this, as it will assist in the research process. The results of the focus group will only be used for research purposes.

Thank you for your participation,

Yours sincerely,

Rozanne Dasappa
(Chiropractic Intern)

Dr. T. MacDougall
(Supervisor)

APPENDIX I

INFORMED CONSENT FORM

(TO BE COMPLETED BY THE PARTICIPANTS OF THE FOCUS GROUP)

DATE: _____

TITLE OF RESEARCH PROJECT : The prevalence and risk factors for occupational low back pain in south African nurses

NAME OF SUPERVISOR: Dr T. MacDougall

NAME OF RESEARCH STUDENT: Rozanne Dasappa

Please circle the appropriate answer

YES /NO

- | | | |
|--|-----|-----|
| 1. Have you read the research information sheet? | Yes | No |
| 2. Have you had an opportunity to ask questions regarding this study? | Yes | No |
| 3. Have you received satisfactory answers to your questions? | Yes | No |
| 4. Have you had an opportunity to discuss this study? | Yes | No |
| 5. Have you received enough information about this study? | Yes | No |
| 6. Do you understand the implications of your involvement in this study? | Yes | No |
| 7. Do you understand that you are free to | | |
| a) withdraw from this study at any time ? | Yes | No |
| b) withdraw from the study at any time, without reasons given | Yes | No |
| c) withdraw from the study at any time without affecting your future health care or relationship with the Chiropractic day clinic at the Durban Institute of Technology. | | Yes |
| No | | |
| 8. Do you agree to voluntarily participate in this study | Yes | No |
| 9. Who have you spoken to regarding this study? | | |

If you have answered NO to any of the above, please obtain the necessary information from the researcher and / or supervisor before signing. Thank You.

Please Print in block letters:

Focus Group Member : _____ Signature: _____

Witness Name: _____ Signature: _____

Researcher's Name: _____ Signature: _____

Supervisor's/ Co- supervisor,s Name: _____
Signature: _____

APPENDIX J

IMPORTANT NOTICE: THIS FORM IS TO BE READ AND FILLED IN BY EVERY MEMBER PARTICIPATING IN THE FOCUS GROUP, BEFORE THE FOCUS GROUP MEETING CONVENES.

**CONFIDENTIALITY STATEMENT – FOCUS GROUP
DECLARATION**

1. All information contained in the research documents and any information discussed during the focus group meeting will be kept private and confidential. This is especially binding to any information that may identify any of the participants in the research process.
2. The returned questionnaires will be coded and kept anonymous in the research process.
3. None of the information shall be communicated to any other individual or organisation outside of this specific focus group as to the decisions of this focus group.
4. The information from this focus group will be made public in terms of a journal publication, which will in no way identify any participants of this research.

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

Please Print in block letters:

Focus Group Member: _____ Signature: _____

Witness Name: _____ Signature: _____

Researcher's Name: _____ Signature: _____

Supervisor's /
Co-supervisor's Name: _____ Signature: _____

APPENDIX K

CODE OF CONDUCT

This form needs to be completed by every member of the Focus Group prior to the commencement of the focus group meeting.

As a member of this committee I agree to abide by the following conditions:

1. All information contained in the research documents and any information discussed during the focus group meeting will be kept private and confidential. This is especially binding to any information that may identify any of the participants in the research process.
2. None of the information shall be communicated to any other individual or organisation outside of this specific focus group as to the decisions of this focus group.
3. The information from this focus group will be made public in terms of a journal publication, which will in no way identify any participants of this research.

Member represents	Member's Name	Signature	Contact Details

Appendix L

Investigation of Lower Back Pain in Nurses

Reference No: _____

Date _____

Isigaba 1:

- 1.1. Ubulili 1= Owesilisa
 2= Owesifazane
- 1.2. Imifyaka yakho 1=18-25 iminyaka
 2=26-35 iminyaka
 3=36-45 iminyaka
- 1.3. Izinga lemfundo 1=Okumnyama
 2=Okumpofana
 3=Okumhlophe
 4=Okunye
- 1.4. Imbandle _____
- 1.5. Ngishadile 1=Ngishadile
 2=Sehlukana
 4=Ngingumfelokazi
 5=Angikashadi
- 1.6. Zingaki izingane 1=0
 2=1-2
 3=3-4
 4=5+
- 1.7. Ingabe uyawelula umzimba na? 1=Yebo
 2=Cha
- 1.7.1. U yawu vocavoca yina umzimba? 1=0-1 wamahora
 2=1-3 wamahora
 3=4-7 wamahora
 4=8-10wamahora
 5= +10wamahora

1.7.2. Hlobo luni lokuzivocavoca/ukunyakazisa umzimba olwenzayo?

- 1.8. Ingabe uyabhema? 1=Yebo
 2=Cha

Isigaba 2:

2.1. Hlobo luni lomsebenzi owenzayo? (sicela ucacise ngokusobala)_____

- 2.2. Usebenze kuyiphi iwadi? 1=usebenze ngemithi
 2=usika abantu
 3=usebenze ngabantu abadala
 4=omunye umesebenzi owenzayo_____

- 2.3. Ususebenze isikathe esingakanani? 1=0-1 iminyaka
 2=2-5 iminyaka
 3=6-10 iminyaka
 4=11-15 iminyaka
 5=16-20 iminyaka
 6=21-27 iminyaka

- 2.4. Usebenza ama awa amangaki ngeviki? 1=8-12 wamahora
 2=12 wamahora
 3=+12 wamahora

- 2.4.1. Mangaki amahora owasebenza ngeviki? 1= - 48 wamahora
 2=48-60 wamahora
 3=61-72 wamahora
 4=73-84 wamahora
 5= +84 wamahora

2.5. Zikhona yini izifundo ngezinto ezilandelayo emesebenzi wakho?

2.5(a). Izifundo ngokuvikela ukulimala njenje ku vikela ukuwa noma ukuzihlaba nokuzisika Ngento ebukhali

- 1=Yebo
 2=Cha

2.5(b) Izifundo zoku vikela ukulimaza iqolo

- 1=Yebo
- 2= Cha

2.6. Uma impendulo ingu yebo, Uzenze kangaki izinto eziland

Izinto Onokuzenza	0-10kangaki	11-20kangaki	21-30kangaki	+30
1. Ukusiyisa endlini yokugezela				
2. Ukususa isiguli esihlalweni usifake embhedeni				
3. Ukususa isiguli embhedeni				
4. Ukushintshela isigulu enqoleni				
5. Ukusisusa noma ukusifaka ebhavini				
6. Ukusisiza ngokuhamba				
7. Ukufuqa inqola yemithi noma umashini wokuhola				
8. Ukusuduza umbhede				
9. Ukuphakamisa isiguli				
10. Ukugoba nama ukukhothama				

2.7. Sicela usho ukuthi uluphi uhlobo lweqolo elibuhungu elibangelwa ilokhu okulandelayo (lapho kungenzeka khona)

Izinto Onokuzenza	Kancane	Lisemaphakatini	Kakulu	Cha
1. Ukusiyisa endlini yokugezela				
2. Ukususa isiguli esihlalweni usifake embhedeni				
3. Ukususa isiguli embhedeni				
4. Ukushintshela isigulu enqoleni				
5. Ukusisusa noma ukusifaka ebhavini				
6. Ukusisiza ngokuhamba				
7. Ukufuqa inqola yemithi noma umashini wokuhola				
8. Ukusuduza umbhede				
9. Ukuphakamisa isiguli				
10. Ukugoba nama ukukhothama				

2.8. Uchithe isikhathi esinganani wenza lezizinto na?

Izinto Onokuzenza	0- 2wamahora	3- 4wamahora	5- 6wamahora	7- 8wamahora	+8wamahora
Umile					
Uhamba					
Ugobile					
Uhlezi					
Uphakamisa izandla phezukwamahlombe					

Isigaba 3:

- 3.1. Like likuphathe yini iqolo? 1=Yebo
 2=Cha
- 3.2. Like lakuphatha ngaphambili na? 1=Yebo
 2=Cha
- 3.3. Laqala kanjani ukubabuhlungu na? 1=Kancane/ukusebenza
isikhathi esedlulele
 2=Lavele lababuhlungu
kakhulu liqala
- 3.4. Likuphethe yini manje? 1=Yebo
 2=Cha
- 3.5. Iqolo likuphathe kangaki ngonyaka odlule? 1=Nsukuzonke
 2= 1-3
 3= 4-6
 4= 6-10
 5= _____
- 3.6. Isilinganiso sobuhlungu beqolo? 1=Kancane
 2=Lisemaphakathini
 3=Kakhulu
- 3.7. Libabuhlungu isikhathi esinganani? _____ izinsuku/ noma
ama awa

- 3.8. Sikhona yini isikhathi lapho wadinga ukulala ukuze uphumuze iqolo elibuhlungu? 1=Yebo
 2=Cha
- 3.9. Uke walova emsebenzini ngenxa yobuhlungu beqolo na? 1=Yebo
 2=Cha
- 3.9.1. Uma uke waphutha, mangaki amalanga/izikhathi (ezinyangeni ezingu-12 ezedlule)
- 1=0-1 kangaki
 2=2-5 kangaki
 3=6-10 kangaki
 4=11-20 kangaki
 5= +20 kangaki
- 3.10. Ingabe ubuhlungu benziwa ngumsebenzi wakho na? 1= Yebo
 2= Cha
- 3.11. Ucabanga ukuthi yiziphi izinto ezikuphathisa ngeqolo? (ungakhetha noma okungaki) 1=Ukuphakamisa iziguli
 2=Yikuma isikhathi eside
 3=Ukugoba noma ukukhothama
 4=Ukubheka nganxanye
 5=Yikho konke okubhalwe ngaphezulu
 6=Okunye _____
- 3.12. Uke walimala iqolo usemsebenzini na? 1=Yebo
 2=Cha
- 3.12.1. Uma uthe yebo (kulombuzo ongaphezulu), chaza ngokulimala kwakho.
- _____
- 3.13. Uke wathola ukwelashwa ngenxa yobuhlungu Beqolo na? 1=Yebo
 2=Cha
- 3.13.1. Hlobo luni lokwelashwa:
- _____

- 3.14. Ingabe zikhona yini ezinye izinto ezibangela lobubuhlungu ezike zakuvelela njengo kusikwa emhlane ikensa, ukuzithwala noma uke waphathwa yisibeletho. 1=Yebo
 1=Cha

Appendix M

ISAPHLUKO 3 **INCWADI YESAZISO**

Isihlolelo socwaningo:

Ubudlelwane phakathi kwezinga leqolo elibuhlungu, nomsebenzi owenziwa ngonesi ezibhedlela zikahulumeni nezizimele Ethekwini.

Owengamele:
2042205)

Dr. T. MacDougall (031-

Umfundi ocwaningayo:

Rozanne Dasappa (031-2042205)

Isikhungo:

Durban Institute of Technology

Ngiyakubinbelela,

Ngiyakwamukela kulolucwaningo. Ukhethiwe ukuba uzibandakanye kulolucwaningo oluphathelele nobudlelwane phakathi kwezinga leqolo elibuhlungu, nomsebenzi owenziwa ngonesi ezibhedlela zikahulumeni Ethekwini. Awuphoqiwe ukuthi uzibandakanye kulolucwaningo kanti futhi nokungazibandakanyi kwakho angeke kukufake enkingeni nakancane. Ungayekela noma kunini, ngale kokwesaba imiphumela engemihle.

Imiphumela yalolucwaningo izoba khona emtapweni wolwazi e-Durban Institute of Technology emqulwini obhaliwe.

Inqubo:

Onesi abandamakhulu amane ezibhedlela zikahulumeni nezizimele eThekwini bazokhethwa ngoluhla oluthile. Onesi abakhethiwe bazowazi ukuzibandakanya kulolucwaningo. Unesi ngamunye uzonikezwa incwadi yesaziso bese kuthi uma evuma ukuzibandakanya kulolucwaningo, agcwalise incwadi yemveme. Emva kwalokho ebese ephendula imibuzo ebhaliwa yocwaningo. Ngaso sonke lesisikhathi umfundi ocwaningayo uzobe ekhona ukuze assize uma kunemibuzo ethize. Ukugcwalisa lamapheshana kuzothatha imizuzu engu-15 kanthi futhi zonke izimpendulo ziyimvihlo.

Uzocelwa ukuba ugcwalise amakhasi angu-3 emibuzo ephathelene nomsebenzi kanye neqolo elibuhlungu. Zonke izimpendulo ziyimvihlo kungakhoke sicela ukuba uphendule ngeqiniso elimsulwa.

Ngicela ukuba ungangabazi ukubuza imibuzo ephathelene nalolucwaningo. Ukuzibandakanya kwakho kuzosiza i-Chiropractic ekwandiseni ulwazi mayelana neqolo elibuhlungu.

Uvumelekile ukuba ungangabazi lolucwaningo noma kunini kokunikeza izizathu

Imfihlo:

Lonke ulwazi luyimfihlo kanti futhi imiphumela izosetshenziselwa ucwaningo kuphela.

Ukuhlukumezeka nokukhokha:

Akukho ukuhlukumezeka kanti nokuzibandakanya kumahala.

Abantu ongathintana nabo uma unemibuzo / izinkinga

Uma unemibuzo edinga izimpendulo, ungaxhumana nowengamele kulenombolo engaphezulu. Uma ungenelisekile nganoma ingani ephathelene naloucwaningo, unelungelo lokudlulisa izikhalo zakho ekomitini elengamele ucwaningo, unelungelo lokudlulisa izikhalo zakho okomitini elengamele ucwaningo e-Durban Institute of Technology.

Ngiyabonga

Rozanne Dasappa
(Umfundi ocwaningayo)

Dr. T. MacDougall
(Owengamele)

Appendix N

Map of Durban Metropolitan Area

