Lower respiratory tract disorders and thoracic spine pain and dysfunction in subjects presenting to the Durban Institute of Technology Chiropractic Day Clinic; a retrospective clinical survey.

BY

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Dissertation submitted to the Faculty of Health in partial compliance with the requirements for the Master's Degree in Technology: Chiropractic at the Durban Institute of Technology.

I, Brett Edmunds, do hereby declare that this dissertation represents my own work in both conception and execution.

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DEDICATION:

I would like to dedicate this work in

loving memory of my

late mother Yvonne Edmunds.

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ABSTRACT

Anecdotal evidence and some developmental theory suggest that lower respiratory tract pathologies may be associated with thoracic spine pain and dysfunction. This hypothetical association may be better described either as respiratory conditions occurring as a result of musculoskeletal dysfunction of the thoracic spine, or as respiratory conditions causing thoracic musculoskeletal dysfunction.

Optimal function of the lungs and the process of ventilation is dependant on the normal function of the thoracic spine and the rib cage. Disturbances of the musculoskeletal components of the thoracic spine may lead to increased respiratory efforts, decreased lung function and in turn affect bronchopulmonary function. Obstructive respiratory diseases such as asthma, bronchitis and emphysema place an increased demand on the musculoskeletal components involved in expiration, as air has to be forcefully expired.

The purpose of this quantitative, non- experimental, demographic retrospective clinical survey was to retrospectively describe lower respiratory tract disorders and thoracic spine pain and dysfunction in subjects presenting to the Durban Institute of Technology Chiropractic Day Clinic, in terms of the prevalence of lower respiratory tract disorders as well as any association between the presenting respiratory conditions and their vertebral distribution in the thoracic spine.

Using retrospective file selection from 30th October 2002, data from 850 patient files (n = 850) contained at the Durban Institute of Technology Chiropractic Day Clinic was included in the survey. Only files of patients presenting with thoracic pain or dysfunction were included in the study. The data recorded included demographic details as well as thoracic diagnoses vertebral levels of involvement and any respiratory conditions present.

This survey showed that only 66 of the 850 (7.76 %) patient files examined contained reference to a lower respiratory tract disorder, a significantly lower prevalence than reported by health surveys conducted in Southern Africa. This suggests that in the study sample there was no positive association between thoracic spine dysfunction and lower respiratory tract pathology.

Comparison between the patient files without any presenting lower respiratory tract pathology (n = 784) and the patient files containing lower respiratory tract pathology (n = 66) showed no association between the thoracic level of involvement and the presence or absence of lower respiratory tract pathology.

Analysis of the patient files containing lower respiratory tract pathology (n = 66) showed that asthma was the most commonly occurring pathology (n = 50), followed by bronchitis (n = 15) and emphysema (n = 1).

Despite evidence in the literature suggesting an association between thoracic spine pain or dysfunction and respiratory conditions, this survey indicates that there is no positive association between thoracic spine pain and dysfunction and lower respiratory tract pathology in the sample population studied. This survey also found no significant association between the thoracic vertebral level of involvement and any presenting respiratory condition.

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CHAPTER I INTRODUCTION:

1.1 BACKGROUND TO THE PROBLEM

Chiropractic research from the last three decades has shown mixed results in the treatment of respiratory disorders, ranging from favourable patient subjective findings to statistically insignificant spirometry readings. The osteopathic profession also believes that manipulation in the region of the first four thoracic vertebrae improves asthma and removes restricted motion of the vertebrae.

Dysfunction of the thoracic spine could initiate somato- visceral reflexes that may mimic or ultimately bring about respiratory system conditions (Wiles 1990, Schafer 1991). Mechanical restriction (e.g. muscle spasm, joint fixation) of the thoracic spine and the ribs directly affects the proper functioning of normal respiration by restricting the normal expansion and contraction of the rig cage (Hoag 1972, Allen and Kelso 1980). Viscerosomatic reflexes initiated in the target organs of the thorax such as the lungs could produce thoracic musculoskeletal pain and dysfunction (Lane & Lane 1991, Gatterman & Panzer 1990, Wiles 1990, Hoag 1972).

Despite the presence of anecdotal evidence, more scientific knowledge is needed regarding the prevalence of respiratory conditions in patients with thoracic spine pain and dysfunction (Allen & Kelso 1980). Whether the impaired function of the respiratory system is of biomechanical (e.g. vertebral subluxations) or organic (e.g. asthma) origins, much anecdotal evidence remains as to the benefit of manipulative treatment on certain respiratory conditions. It remains to be seen though if there is a correlation between thoracic pain and dysfunction and respiratory system complaints.

1.2 STATEMENT OF THE PROBLEM

The purpose of this quantitative, non- experimental, demographic retrospective survey of 850 patient files was to retrospectively describe lower respiratory tract disorders and thoracic spine pain and dysfunction in subjects presenting to the Durban Institute of Technology Chiropractic Day Clinic.

The first sub- problem of this study was to assess the prevalence of lower respiratory tract disorders in subjects with thoracic spine pain and dysfunction presenting to the Durban Institute of Technology Chiropractic Day Clinic.

The second sub- problem was to assess any association between the level of thoracic spine involvement and the presenting respiratory disorders.

This survey was based on two main hypotheses:

- There would be an increased prevalence of lower respiratory tract disorders in patients who presented with thoracic spine pain and dysfunction.

- Based on neurophysiological mechanisms, specific levels of thoracic spine involvement would be found to be associated with specific lower respiratory tract disorders.

This survey had two main objectives:

- To retrospectively assess the prevalence of lower respiratory tract disorders in subjects with thoracic spine pain and dysfunction presenting to the Durban Institute of Technology Chiropractic Day Clinic.
- To assess any association between the levels of thoracic spine involvement and the presenting respiratory disorders.

This was done in terms of objective clinical findings in order to determine whether patients with thoracic spine pain or dysfunction had co- existing lower respiratory tract disorders, which lower respiratory tract disorders they were and which thoracic segmental level was most associated with the respiratory disorders. The objective data collected from 850 patient files from the Durban Institute of Technology Chiropractic Day Clinic included demographic data of age, sex and race as well as data regarding the thoracic diagnosis or complaint, the thoracic segmental level of involvement and any lower respiratory tract disorders present at the time of the patient history being taken.

CHAPTER 2 LITERATURE REVIEW:

2.1 INTRODUCTION

Asthma is a disease with its roots in human history where the Greeks first used the word to describe breathlessness, and in addition the Chinese some 3000 years ago provided references to the disease. References to the treatment of asthma with herbs, acupuncture and yoga, can be found in Indian writings dating back as far as 450 AD, while recommendations to a drier climate being more beneficial to the asthma sufferer are found in a book by a Jewish physician in 1190 AD (Hunt 2001).

Anecdotal evidence and some developmental theory (Schafer 1991: 249-254) suggest that respiratory pathologies may be associated with thoracic spine pain and dysfunction. There is however still a lack of rigorous scientific knowledge as to whether a positive association does exist.

Normal function of the thoracic spine and ribs is integral to optimal function of the lungs (Allen & Kelso 1980). Primary disturbances of the musculoskeletal components of the thoracic spine could result in increased respiratory efforts (Allen & Kelso 1980) and have other direct detrimental effects on bronchopulmonary function (Hoag 1972). Hoag (1972) suggests that primary disturbances of the respiratory system, such as asthma, bronchitis and pneumonia, may influence the musculoskeletal system, which could in turn impair bronchopulmonary function.

Obstructive respiratory diseases such as asthma, bronchitis and emphysema place an increased demand on the musculoskeletal components involved in expiration, as air has to be forcefully expired. Restrictive disorders such as pneumonia and pulmonary fibrosis, on the other hand, place an increased demand on the musculoskeletal components involved in inspiration, as air has to be forcibly drawn into the lung (Hoag 1972, Wiles 1990: 390).

2.2 EPIDEMIOLOGY

The World Health Organization estimates that between 100 and 150 million people suffer from asthma globally, with global deaths from the disease reaching around 180 000 annually (WHO 2000).

1999 saw an estimated 10.5 million Americans have an episode of asthma or an asthma attack in the year. Asthma in the United States accounted for 12.7 billion dollars in direct healthcare and indirect costs attributed to 3 million lost workdays by people over the age of 18 (American Lung Organization 2002[1]).

The United Kingdom reported that 5 million people in the United Kingdom received treatment for asthma in 2001 with the total costs incurred by asthma at 2.237 billion pounds (National Asthma Campaign 2001).

The South African Department of Health estimates 7% and 9% of males and females respectively over the age of 15 have asthma (SADHS 1998[1]). The figures follow a demographic health survey conducted in 1998 where 13 827 adults were interviewed regarding health and demographic matters (SADHS 1998[2]).

For the provinces of South Africa it was demonstrated that the Northern Cape with 10.3% and KwaZulu Natal with 10% were the worst affected for males, while KwaZulu Natal with 13.5% and the Northern Cape with 9.1 % were the worst affected provinces for females. Overall it can be deduced that according to the survey 1 in 15 men and 1 in 12 women in South Africa suffer from asthma (SADHS 1998[3]).

Chronic Obstructive Pulmonary Disease (COPD) is characterized by obstruction to airflow in and out of the lungs in which between 80% and 90% of cases are caused by smoking. COPD is the fourth ranking cause of death in the United States of America with the health care and indirect costs from COPD reaching in the region of 30.4 billion dollars. Of the nearly 16 million Americans suffering from some form of COPD about 14 million suffer from chronic bronchitis, making it the ninth ranking chronic condition in the United States, with approximately 8.8 million people diagnosed in 1999. About 2 million people in the Untied States suffer from emphysema (American Lung Organization 2000, American Lung Organization 2002[2]).

Two percent of South African adult males and 3% of South African adult females have been reported to be suffering from chronic bronchitis, with the Northern Cape being the worst affected province for males and KwaZulu Natal being the worst affected province for females (SADHS 1998[3]).

2.3 THE RESPIRATORY SYSTEM

2.3.1 Introduction

Respiration in man may be defined as the processes concerned with gaseous exchange between man and the environment, starting with the inhalation of oxygen (0^2) and ending with the exhalation of Carbon Dioxide ($C0^2$). The respiratory system is comprised of the lungs, the central nervous system (CNS), the chest wall (including the intercostal muscles and the diaphragm) and the pulmonary circulation. Four intimately related processes bring about the function of respiration or gaseous exchange, being ventilation, diffusion of gasses, pulmonary capillary blood flow and the carriage of the gases by the blood. Successful respiration is achieved through the symbiotic relationship of all the processes and components of the respiratory system, and changes in the individual components or the relationships between the different components can lead to impaired respiratory function (Moxham & Costello 1994: 444, Weinberger & Drazen 1994: 1152).

2.3.2 Anatomy

The lungs of the average adult male weigh in the region of 1kg that is comprised approximately half of blood. The main airway to the lungs is the trachea which has a cross sectional area of 2.5cm^2 and begins the branching of the airways into the lungs at the carina where cartilaginous bronchi are formed. From the bronchi membranous bronchioles less than or equal to 1 mm in diameter are formed which then go on to divide into the terminal respiratory units, the alveolar ducts or respiratory bronchioles. At the terminal respiratory units, the cross sectional area of the airways has increased to 11 000 to 12 000cm^2 and causes the airflow to slow to allow for diffusion to take place. Due to the large increase m the cross sectional area of the airways at the periphery of the bronchial tree, small amounts of damage are inconsequential to respiratory function and a great deal of damage has to occur before respiratory symptoms are produced (Rees 1995: 266).

2.3.3 Function

Ventilation, or the cyclic movement of air into and out of the lungs is achieved by the diaphragm in association with the muscles of respiration acting as a pump on the chest wall, and is under the control of the CNS. Ventilation includes the mixing of the air within the lungs as well as the distribution of the air throughout the lungs. The contraction and relaxation of the respiratory muscles together with the elastic recoil of the lungs bring about the cyclic nature of ventilation (Weinberger & Drazen 1994:1152, Moxham & Costello 1994: 444).

The muscles of respiration may be broken down into two groups according to the role they play in respiration, namely inspiratory muscles and expiratory muscles, with further division into primary and accessory muscles. The primary muscles of inspiration include the diaphragm and the external intercostal muscles. The accessory muscles include the sternocleidomastoid, scalenius anterior, scalenius medius, scalenius posterior, serratus anterior, serratus posterior, latissimus dorsi, pectoralis major, pectoralis minor and the superior fibres of the iliocostalis muscles. The primary muscles of expiration include the internal intercostals and diaphragm while the accessory muscles include the external abdominal oblique, internal abdominal oblique, transverse abdominal, latissimus dorsi, lowest fibres of the iliocostalis, longissimus dorsi, serratus posterior inferior and the quadratus lumborum muscles (Gatterman & Panzer 1990: 179, Solomon *et al.* 1990, 839 - 841, Hoag 1972).

Table 2.1: The innervation and actions of the respiratory muscles

ACTION	MUSCLES INVOLVED	INNERVATIONS
Inspiration	External intercostals	1 - 11 intercostals (nr levels)
	Transverse thoracis (sternocostalis)	1 – 11 intercostals (levels)
	Diaphragm	Phrenic (C3, C4, C5)
	Sternocleidomastoid	Accessory (C2, C3)
	Scalenus anterior	C4 - C6
	Scalenus medius	C3 - C8
	Scalenus posterior	C6 - C8
	Pectoralis major	Lateral pectoral (C5 - C6) Medial pectoral (C7 - C8, T1)
	Pectoralis minor	Lateral pectoral (C6 - C7) Medial pectoral (C7 - C8)
	Serratus anterior	Medial pectoral (C7 - C8)
	Serratus posterior superior	Thoracodorsal (C6 - C8)
	Latissimus dorsi	Long thoracic (C5 - C7)
	Iliocostalis thoracis	T1 - T12
Expiration	Internal intercostals	1 - 11 intercostals
	Rectus abdominus	T6 - T12
	External abdominal oblique	T7 - T12
	Internal abdominal oblique	T7 - T12, L1
	Iliocostalis lumborum	L1 - L3
	Longissimus	T1 - L3
	Serratus posterior inferior	T9 - T12
	Quadratus lumborum	T12, L1 - L4

Taken from table 7-2 in Magee, D. 1992:235

Abnormal respiratory function may be broken down into obstructive and restrictive patterns, with a further division of restrictive patterns into pulmonary parenchymal and extraparenchymal patterns. Inspiratory or expiratory muscle weaknesses or a deformed, abnormally rigid chest wall typically characterizes extraparenchymal patterns of restrictive pulmonary function (Weinberger & Drazen 1994: 1154, Hoag 1972).

Ventilation is brought about by the movement of the diaphragm and the combined movement of the ribs to increase the internal volume of the thoracic cavity. The individual ribs act as levers where small movements at the vertebral end produce large movements at the anterior aspect of the rib shafts so that during inspiration the ribs move forward and elevate while the lateral portions of the rib shaft elevate increasing the transverse diameter of the rib cage. The transverse diameter of the rib cage is increased mainly by the 7th to 10th ribs moving medially, upwards and backwards in what is known as a bucket handle movement. This action is also maintained by the upper ribs but to a lesser extent due to their smaller size. The 8th to 12th ribs moving laterally cause a calliper movement increasing the lateral diameter of the rib cage (Gatterman & Panzer 1990: 185, Magee 1992: 218).

2.3.4 Nervous Control

The respiratory centre in the Medulla, consisting of dorsal and ventral groups of neurons, controls spontaneous respiration. Efferent fibres from the respiratory centre pass in the ventral and lateral parts of the spinal cord to the motor neurons that control the respiratory muscles. The Vagus nerve (10th Cranial Nerve) is also important in supplying the accessory muscles involved in respiration as well as the smooth muscle of the airway. The muscles involved with inspiration and expiration are reciprocally innervated. Descending pathways to the inspiratory muscles inhibit the expiratory muscles via inhibitory interneurons in the brain stem preventing the muscles from contracting and conflicting with the inspiratory muscles. The converse occurs when the expiratory muscles become active. An indication that higher centres of the brain have an influence on the medullary centres controlling respiration can be demonstrated through the fact that emotional factors as well as pain have an influence on respiration (Rang & Dale 1991: 399 - 400).

2.4 THE AUTONOMIC NERVOUS SYSTEM

2.4.1 Anatomy

Automatic control of most of the systems of the body is accomplished by negative feedback pathways produced by the two anatomical divisions of the autonomic nervous system, the sympathetic and parasympathetic nervous systems. The sympathetic nerves leave the spinal cord from the vertebral levels of T1 to L3 and synapse in the paravertebral or prevertebral ganglia and plexuses in the abdominal cavity. Postganglionic fibres innervate most of the organs of the body and produce their effects on α (alpha), β_1 (Beta 1) and β_2 (Beta 2) adrenoceptors via noradrenalin as the neurotransmitter (Neal 1992: 20, Rang & Dale 1991: 128).

The parasympathetic outflow to the body is via the Oculomotor (CN III), Facial (CN VII), Glossopharyngeal (CN IX), Vagus (CN X) and third and fourth sacral spinal nerves (Neal 1992: 21, Rang & Dale 1991: 129). The parasympathetic nervous system produces its effects on nicotinic or muscarinic receptors via acetylcholine as the neurotransmitter (Landsberg & Young 1994: 424 - 425, Rang & Dale 1991: 129).

2.4.2 Effects on the Respiratory System

The parasympathetic nervous system innervates the airway smooth muscle, vascular smooth muscle and glands via ganglia embedded in the walls of the bronchi and bronchioles supplied by the Vagus (CN X) nerve. The effects of parasympathetic stimulation of muscarinic receptors in the respiratory system are increased bronchosecretion and bronchiolar constriction. There is no direct sympathetic supply to the bronchial smooth muscle with only innervation of the vascular smooth muscle and airway glands. The bronchial smooth muscle has receptors present for circulating catecholamines. Sympathetic stimulation produces constriction of the vascular smooth muscle, bronchiolar dilation and inhibits secretion from the airway glands. It is thought that the effects of circulating catecholamines bring about all sympathetic effects (Neal 1992: 21, Rang & Dale 1991: 402, Rees 1995: 267).

2.5 ASTHMA

2.5.1 Definition

Asthma may be defined as a disease of the airways resulting from an increased responsiveness of the tracheobronchial tree to external stimulants. Narrowing of the airways due to muscle spasm, viscid bronchial secretion, bronchial oedema and mucosal swelling causes paroxysms of wheezing, tight chest, and breathlessness. It is becoming more accepted that the changes experienced in an asthmatic patient are due to an inflammatory reaction in the bronchial wall (Crompton & McHardy 1991: 376, McFadden 1994: 1167 - 1169, Rang & Dale 1991: 406).

2.5.2 Aetiology

The changes that are seen in the airways of an asthma sufferer are thought to be caused by an inflammatory response within the bronchial wall to allergens or asthma triggers. Asthma triggers include mite containing house dust, smoke, airborne moulds, pollen, exercise, simple stress, animal dander, fungal spores, household and industrial products, air pollutants and scents. An asthma attack finds the victim's airways narrowed with the passageways inflamed, from oedema and cellular infiltrate, and clogged with thick mucosal secretions. Bronchial asthma typically starts in early life with approximately 50% of all the cases developing before age 10, and another third of all the cases occurring before age 40. It is more common amongst males in childhood with a 2:1 ratio, but this ratio evens out by age 30 (American Lung Organization 2000, Crompton & McHardy 1991: 376, McFadden 1994: 1167, Rees 1995: 279).

Asthma is an episodic disease with acute attacks lasting minutes to hours, followed by periods where the sufferer seems to recover with no symptoms (McFadden 1994: 1167). There are a number of postulated causes of the increased airway reactivity seen in asthma, but the basic mechanisms remain elusive (McFadden 1994: 1167). Initially asthma was thought to be primarily a Type I hypersensitivity reaction occurring in a sensitised individual when an allergen interacted with IgE (Immunoglobulin E) antibodies on mast cells causing bronchoconstriction due to histamine and other mediator release (Rang & Dale 1991: 406). This is now know to account for only about 30% of asthma caused from allergy, consequently in which other elements besides the Type I hypersensitivity reaction are also present (Rang & Dale 1991: 406).

The most commonly accepted cause of asthma to date is that of inflammatory changes in the airways and bronchial hyper- responsiveness, or the abnormal sensitivity to a wide range of allergens or stimulants (Rang & Dale 1991: 406, McFadden 1994: 1167. The net result is that air becomes trapped in the lungs and smaller airways producing an increased effort during expiration (Crompton & McHardy 1991: 376). Asthma is thus an inflammatory reaction involving all the structures of the bronchial wall, and not just bronchoconstriction (Crompton & McHardy 1991: 377).

2.5.3 Pathophysiology

Table 2.2: The Four Categories of Asthma

Mild Intermittent	Symptoms occur less than or equal to twice a week; nighttime symptoms s 2 times a month.
Mild Persistent	Symptoms occur more than twice a week but not daily; exacerbations that sometimes limit activity; nighttime symptoms more than twice a month.
Moderate Persistent	Daily symptoms; exacerbations that limit activity; nighttime symptoms more than once a week.
Severe Persistent	Continual symptoms; limited physical activity; frequent nighttime symptoms.

Adapted from Table 68-3 in Beers & Berkow 1999: 561

The reduction of airway diameter due to vascular congestion, smooth muscle contraction, oedema of the bronchial wall and thick secretions in the airways is the defining characteristic of asthma. The results are increased airway resistance, hyperinflation of the lungs and thorax, reduced expiratory flow rates and volumes alterations of respiratory muscle function, changes in the elastic recoil of the lungs, altered arterial blood gasses and abnormal distribution of both ventilation and pulmonary blood flow; all resulting from the hyper responsive inflammatory reaction. These results demonstrate that an asthmatic attack is not only limited to the airways, but involves virtually all aspects of pulmonary function (McFadden 1994: 1169).

There are also postulated neural mechanisms, which contribute to bronchial hyper- responsiveness, such as reduced beta - adrenergic or enhanced cholinergic and alpha- adrenergic responses. Neural peptides have also been identified in human airways such as Vaso - active Intestinal Peptide (VIP), which is a potent relaxant of airways and is a co- transmitter of acetylcholine in cholinergic nerves. Sensory neuropeptides such as neurokinins and substance P may also be involved in asthma, while damage to airway epithelium may expose underlying unmyelinated C - fibre afferent nerves, which could then be excited via inflammatory mediators such as Bradykinin. Indeed the cholinergic reflex bronchoconstriction may be a reaction to the inhaled allergens, but neuropeptides such as Substance P Neurokinin A and Calcitonin Gene related Peptide released from sensory nerves in the axon reflex pathway may be the causative agents of the vascular permeability, mucus secretion, bronchoconstriction and bronchial vasodilatation (Beers & Berkow 1999: 557, Crompton & McHardy 1991: 377).

2.6 CHRONIC OBSTRUCTIVE PULOMONARY DISEASE

Two of the most common diseases associated with COPD and nearly always occurring together are chronic bronchitis and emphysema (Rees 1995: 284 - 285, Ingram 1994: 1197). The reduced ventilatory capacity and breathlessness in COPD is caused by expiratory airflow limitation, which also causes a hyperinflated thorax, increased residual volume and decreased inspiratory capacity due in part to compromised inspiratory muscle function (Moxham & Costello 1994: 487).

2.6.1 CHRONIC BRONCHITIS

2.6.1.1 Definition

Chronic bronchitis is associated with excessive mucus production in the tracheobronchial tree, which produces a cough with expectoration for at least 3 months of the year for more than 2 consecutive years (Ingram 1994: 1197). Chronic bronchitis develops after the continued action of irritants on the bronchial mucosa; the net result of chronic bronchitis is that air is trapped in the alveoli with the degree of obstruction increased during expiration (Crompton & McHardy 1991: 391).

2.6.1.2 Aetiology

Cigarette smoke is the most important aetiological factor in bronchitis with environmental pollution and occupational dust being minor contributors (Ingram 1994: 1197, Moxham & Costello 1994: 487).

2.6.1.3 Pathophysiology

Airway resistance is increased reducing expiratory airflow due to hyperplasia and hypertrophy of the tracheal and bronchial mucosal glands, enlargement of the submucosal glands and dilation of their ducts, increased numbers of goblet cells and excessive intraluminal mucus. There is airway smooth muscle hypertrophy, with focal areas of squamous metaplasia replacing pseudostratified columnar epithelium and inflammation with the predominance of macrophages (Beers & Berkow 1999: 571 - 572, Rees 1995: 285, Moxham & Costello 1994: 486 - 487).

2.6.2 EMPHYSEMA

2.6.2.1 Definition

Emphysema may be described as distension or dilation of the air spaces distal to the terminal bronchiole with destruction of the alveolar septa (Ingram 1994: 1197, Crompton & McHardy 1991: 392). Almost all adult lungs have a degree of emphysema present in them although there is an increase in the fifth decade of life, again in the seventh decade and little after that (Ingram 1994: 1198).

2.6.2.2 Aetiology

Emphysema develops after years of insult to the lungs and is a result of the breakdown of the walls of the alveoli with loss of the elasticity of the lungs. The result is that the lungs are unable to expand and contract correctly and become distended (American Lung Organization 2002[2]). Smoking is once again the primary aetiological factor in emphysema with environmental and occupational pollution contributing slightly to the disease (Ingram 1994: 1197).

2.6.2.3 Pathophysiology

In addition to the airway narrowing as seen in chronic bronchitis, emphysema has characteristic loss of lung elastic recoil, which aids in keeping the airways open. The airways collapse, as radial traction is lost and airflow restriction increases with a decrease in maximal expiratory airflow (Ingram 1994: 1199, Moxham & Costello 1994: 487).

2.7 THE SYMPATHETIC NERVOUS SYSTEM'S ROLE IN DISEASE PROCESSES

Korr (1977: 229) states that one of the most important roles of the sympathetic nervous system is that of constantly adjusting metabolic, circulatory and visceral function according to the postural and musculoskeletal demands placed by the body in motion. He infers that chronic hyperactivity of the sympathetic nervous system seems to be the common thread amongst many clinical syndromes, with three main considerations of sympathetic hyperactivity.

1. Target tissues are detrimentally affected by long- term hyperactivity of sympathetic pathways.
2. Clinical manifestations of the hyperactivity on target tissues and organs are dependent on the tissues innervated by the hyperactive sympathetic nerves, which also includes sympathetically induced vasoconstriction.

3. Sympathetic hyperactivity may be related to spinal and paraspinal musculoskeletal dysfunction.

A number of studies (Hertzog 1996, Sato 1987, Sato 1992[1], Sato 1992[2] & Korr 1977) have shown that reflexes, which may be induced via the activation of nociceptive fibres, emotion or manipulative therapy, affect normal sympathetic function. Sato (1992[2]: 89) mentions that reflexes may be divided into four categories, one of which is somatovisceral or somatoautonomic reflexes which consist of somatic sensory afferent nerves and autonomic efferent nerves. Sato (1992[1]) also mentions that it is through the activation of nociceptive fibres that sympathetic neurons are stimulated, and that chiropractic manipulation is thought to have an effect on the physiology of somatic afferent stimulation on the motor, autonomic, hormonal and immune systems.

Korr (1977) hypothesizes that somatic dysfunction (e.g. muscle spasm) in and around the spinal column places corresponding segmental sympathetic pathways in a state of facilitation (e.g. due to the increased nociceptive stimulation of the somatic sensory fibres). Visceral functions can be controlled and affected by somatic afferent input with integration of autonomic nerves, hormones and immunological processes (Sato, 1987). Unfortunately, the theories surrounding the effects of somato- visceral and viscerosomatic reflexes are complex, and are based mainly on evidence gathered from experiments on animals (Sato 1987, Sato 1992[1], Sato 1992[2]).

An example of the pathogenic influence intense sympathetic discharge has on target tissues is that observed in neurogenic pulmonary oedema. Often occurring after a severe blow to the head, neurogenic pulmonary oedema includes severe pulmonary oedema, marked vascular congestion and protein rich oedema fluid. Vascular responses and haemodynamic changes in the pulmonary circulation are thought to be the causative agents of the pulmonary oedema, which is induced by the sympathetic nervous system. In light of this it can be deduced that intense sympathetic bombardment, focussed for too long on the lungs may cause severe lung damage (Korr 1977: 229 - 252).

2.8 THE ROLE OF MANIPULATIVE THERAPY ON VISCERAL DISEASES

According to Edwards (2000) three basic scientific theories form the foundation of chiropractic:

1. Pathological processes may be influenced by disturbances of the nervous system.
2. Disturbances of the nervous system may be the result of derangements of musculoskeletal structure.
3. Disturbances of the nervous system may aggravate pathological processes in various parts or with various functions of the body.

Vernon (1987) believes that the effects of spinal manipulation are either of mechanical or neurological origin. Apart from the mechanical effects of stretching of musculature and myofascial tissues, releasing entrapped structures (e.g. synovial folds) or breaking synovial joint adhesions, the neurological effects are considered to be of greater importance. The direct neurological effects of spinal manipulation include the reduction of irritation of neural structures in and around the intervertebral foramen. The indirect neurological effects include the removal of persistent spinal pain and hypomobility and their effect on the reflex activities at the corresponding vertebral levels (Vernon 1987).

Korr (1977) believes that musculoskeletal dysfunctions are important because of the pain they produce as well as the sustained sympathetic hyperactivity, which is set up, preventing appropriate responses via the sympathetic nervous system to the demands of the body. According to Korr, re-establishment of normal neural patterns of afferent input reduces the sympathetic hyperactivity along with its pathogenic pain producing influences, and is achievable through manipulation (Korr 1977: 255).

2.9 MUSCULOSKELETAL INVOLVEMENT IN RESPIRATORY CONDITIONS

As early as 1972 Hoag was interested in musculoskeletal involvement in chronic lung disease believing that bronchopulmonary disturbances influenced the musculoskeletal system, which in turn influenced bronchopulmonary function. According to Hoag (1972) this feedback loop could have been initiated either through initial bronchopulmonary disturbance or through a primarily musculoskeletal disturbance influencing bronchopulmonary function via somatogenic reflex disturbance. One of the key points in Hoag's literature was the revolutionary concept of the disease process: Disease, according to Hoag is not an entity that invades a patient; instead disease is a state whereby normal tissues fail to maintain normal health states and functions. Pathological changes occur followed by tissue changes and a full pathologic picture is produced once anatomic, cellular changes occur. It is Hoag's impression that due to the redundant capacity of the lungs when it comes to the requirements of daily activities, it is difficult to ascertain whether pathophysiologic or pathological changes are the precursors to respiratory disease, but any of the functions of breathing may be affected; all of which require musculoskeletal function.

Mellin and Harjula (1987) believe that an anatomical relationship between vertebral mobility and lung function is possible because the inspiratory muscles work to overcome the elasticity of the thoracic cage, which is in turn produced by the muscles, joints, connective tissues and tendons of the thorax. In respiratory disease, by increasing the mobility of the thoracic spine and the ribs, the exertion of the inspiratory muscles to bring about ventilation would be decreased and this would in turn aid impaired lung function.

The effect of the thoracic cage on normal respiration can be outlined by the effect that posture has on respiratory function as Badr *et al.* (2002) found. Their study involved the effect that posture had on lung function between 11 adults with chronic airflow limitation and 25 adults with normal respiratory function. It was concluded that the more upright the position or posture, the better was the respiratory function was. These improvements according to posture changes, in their opinion, could benefit patients with weakened expiratory function.

2.10 CHIROPRACTIC AND RESPIRATORY CONDITIONS

Literature relating to the benefits of spinal manipulative therapy and respiratory disease is full of contradictory accounts, statements and studies (Bronfort *et al.* 2001, Jamison *et al.* 1992, Jamison *et al.* 1986, Nielson *et al.* 1995, Masarsky & Weber 1998. Eisenberg *et al.* 1993 showed that the use of unconventional therapies, including chiropractic, for the treatment of a wide variety of medical conditions was high.

In a survey of all the registered chiropractors in Australia Jamison *et al.* 1992 found that the preferred levels of manipulation for the treatment of asthma were between T1 and T6. These levels coincide with the anatomical innervation levels for the segmental sympathetic supply to the bronchi, which are between T2 and T4 (Jamison *et al.* 1992).

Jamison *et al.* (1986) investigated the effectiveness of chiropractic manipulation in the treatment of asthma in a pilot study on fifteen subjects. After receiving chiropractic treatment over a five-week period, all the subjects reported being satisfied with the treatment, six reduced their asthma medication and one stopped medication completely. However, no significant improvement in forced expiratory lung volumes was found. A limitation of the study was however that the researchers did not look for a correlation between dysfunction of different areas of the spine and respiratory pathology.

Members of the osteopathic profession, a discipline also known for its use of spinal manipulation, have reasoned that viscerosomatic reflexes from the affected internal organ (lung) could cause muscle-splinting and joint restriction at the levels of the second to seventh thoracic vertebrae. According to Lane and Lane (1991) manipulation helps restore joint motion and thus could improve bronchopulmonary function. This could partly account for the subjective improvement of asthmatic patients following thoracic manipulation (Jamison *et al.* 1986, Nilsson 1988, Gobrin 1997).

Subjective improvements in the patients' perception of their quality of life and severity of their asthma have been reported in some studies, along with reduction in β- agonist use (Balon *et al.* 1998); in some cases these improvements, were maintained at a 1 - year follow - up (Bronfort *et al.* 2001). There were, however, no significant changes in lung function or bronchial hyper responsiveness.

Nielsen *et al.* (1995) in a two period cross- over design study with 33 patients found no objective difference between control and experimental groups when chiropractic spinal manipulative therapy was used as an adjunct in the treatment of asthma. The study ran consecutively for eight weeks with two chiropractic treatments per week; at the end of the first four weeks the experimental and control groups were swapped around and the treatments continued. The results of the study showed a subjective asthma severity rating decrease of 34% and non- specific bronchial hyperactivity improved by 36%, with no statistically significant or clinically significant differences between the active and sham treatment groups.

Masarsky and Weber (1988) demonstrated improved lung volumes, decreased frequencies of laryngospasm, decreased allergic symptoms and decreased coughing in a 53 year old patient with diagnosed COPD of 20 year duration. The patient presented with restrictions of T1, T2 and the Occiput/ C1 articulation. It was concluded that the improvements were unlikely to be coincidental due to the natural progression of the disease and were as a result of the chiropractic treatment that the patient was receiving.

The osteopathic profession believes that respiratory function is closely linked to the mobility of the thoracic cage and the thoracic spine (Allen and Kelso 1980, Howell *et al.* 1975, Hoag 1972). Hoag (1972) believes that treatment should first identify which musculoskeletal components are under acting, overacting or reacting in an inappropriate manner. Manipulative measures should then be employed to increase the mobility of the thoracic cage, ribs and thoracic portion of the spine so that the musculoskeletal system becomes an aid in the body's efforts to cope with the disease, instead of obstructing the body's efforts to overcome the disease.

Similarly Allen and Kelso (1980) advocates the use of thoracic mobilatory techniques to remove the mechanical restrictions associated with increased respiratory efforts in patients with respiratory disease.

Howell *et al.* (1975), in a prospective study following the osteopathic treatment of 17 patients, showed an improvement of symptoms in patients with chronic obstructive lung disease following osteopathic manipulation and mobilization of the thoracic cage.

The literature shows that debates are in progress regarding the intimate relationship between the thoracic musculoskeletal system, the respiratory system and the effect spinal manipulative therapy has on both of these systems. The theories behind the mechanisms of involvement show valid clinical and scientific basis with much anecdotal evidence, but no direct relationship has been tested between the thoracic spine and respiratory disease. It is therefore of great clinical and informational importance that a determination is made as to whether or not thoracic spine pain and dysfunction is positively associated with respiratory diseases.

2.11 MOTION PALPATION

Lewit (1999) believes that motion palpation via the palpatory hands is an essential objective diagnostic tool for the spinal assessment of a patient. Mootz and Shekelle (1987) state that the mechanical assessment of the back includes motion palpation as an assessment tool.

Motion palpation is an individual technique, which is used in an attempt to determine the normal active range of motion, hypomobile or aberrant motion, or the capsular end- feel and in this way can be used to determine the specific direction of motion loss of a vertebral segment as well as determine the joint dysfunction (Faye & Wilkes 1992: 305).

Mior *et al.* (1990) assessed the role of clinical experience played in the final accuracy of motion palpation and concluded that clinical experience did not play a significant role in the clinical accuracy of motion palpation. While Love and Brodeur (1987) reported statistically significant agreement for intra-examiner reliability in motion palpation.

Strender *et al.* (1997) believe that it is necessary to use clinical tests that show both a high reliability and validity for clinical assessment, and believe that it is possible to show acceptable reliability for motion palpation when an examiner compares both left and right sides of the cervical spine during the physical examination.

2.12 CONCLUSION

Correct functioning of the lungs as well as the neuromuscular structures involved in ventilation are under the direct influence of the autonomic and somatic nervous systems mainly originating from the thoracic region of the spinal cord. Reflex somatoautonomic pathways, involved with lung function, are possibly influenced by excessive nociceptive stimulation due to musculoskeletal dysfunction in and around the spinal column. In turn, aberrant sympathetic nervous system control of the lungs may be produced, leading to altered physiological functioning of the lungs at the macroscopic and microscopic levels.

Apart from the effect altered neurological function may have on the lungs and their function, musculoskeletal disorders of the articulations and muscles involved in ventilation may contribute to diminished lung function.

Evidence supporting the treatment of respiratory disorders by thoracic manipulation suggests that there may be a positive association between respiratory pathology and thoracic spine pain dysfunction. However, no quantitative studies on a large patient base have been done to determine whether a significant positive association does in fact exist.

CHAPTER 3 MATERIALS AND METHODS:

3.1 INTRODUCTION

A detailed description of the study design, the patient file selection and the data collection is described in this chapter. Included in this description is the measured data obtained and the statistical procedures that were implemented in the study for the analysis of the data.

3.2 CONFIDENTIALITY

Certain steps were undertaken throughout the process of this survey in order to maintain patient confidentiality. All data collected from this study were reduced to file numbers, with no reference to personal information apart from age and sex. The researcher alone conducted the examination of the files, and no files were removed from within the confines of the Chiropractic Day Clinic at the Durban Institute of Technology.

3.3 THE STUDY DESIGN

This pilot study was designed as a quantitative, non- experimental, demographic retrospective clinical survey. Data from 850 files contained at the Chiropractic Day Clinic at the Durban Institute of Technology were analysed to determine whether any relationship existed between lower respiratory tract disorders and thoracic spine pain or dysfunction. File selection was done from 30th October 2002 retrospectively, and only files containing thoracic spine pain or dysfunction as a main or secondary complaint were included in the sample size.

Intra- group descriptive analysis was performed on the data recovered to report any trends involving lower respiratory tract disorders in patients presenting with thoracic spine pain or dysfunction.

Due to the fact that only files containing thoracic spine pain or dysfunction were included in the study, no inter group analyses could be performed. As the sample population was only representative of those files with thoracic spine pain or dysfunction, no comparison could be made to the trends present in that part of the population without any thoracic spine dysfunction, but containing lower respiratory tract pathologies.

3.4 MEASUREMENTS AND OBSERVATIONS

3.4.1 Objective Measurements

All the objective measurements of this survey were recorded by the researcher by means of a Data Collection Sheet (Appendix A), within the confines of the Chiropractic Day Clinic at the Durban Institute of Technology. The objective data collected from the patient files included age, sex, diagnosis or complaint, thoracic segmental level of involvement and any respiratory condition present within the Patient History (Appendix B). The diagnosis or complaint and thoracic segmental level of involvement were recorded from the Treatment Notes (Appendix C) while any presenting history of respiratory complaint was obtained from within the patient history and also recorded on the Data Collection Sheet.

Patient files were assessed to see if there was any history of a thoracic diagnosis or complaint, according to the categories stated in the Data Coding Sheet (Appendix D) in the treatment notes. If any thoracic complaint or diagnosis was present, the file was added to the sample size (n = 850) and further data were extracted from the file including thoracic level of involvement, age, sex, race and any lower respiratory tract disorders by means of a Data Coding Sheet (Appendix D). For the purpose of this study, asthma, bronchitis and emphysema were the main lower respiratory tract disorders that were incorporated into the study. Any other lower respiratory tract disorders were grouped together in a group as "Other".

Motion palpation was used during the initial case assessments done by each of the individual chiropractic interns/ residents, to determine the level and direction of motion loss of each vertebral segment (Shafer and Faye, 1990[1]: 65 - 72, Shafer and Faye, 1990[2]: 153 - 169). The motion palpation findings contained within the treatment notes of the patient files were treated as objective measurements for the assessment of vertebral level of involvement.

3.5 LOCATION OF THE DATA

The data in this survey consisted of primary and secondary data.

3.5.1 The primary data

The primary data consisted of 850 chiropractic patient files contained at the Durban Institute of Technology Chiropractic Day Clinic; drawn retrospectively from 30th October 2002. Only those patient's presenting with thoracic spine pain or dysfunction were included in the sample.

The objective measurements for the survey included:

- Demographic data, including age, sex and race, obtained from the patient history documentation.
- Any lower respiratory tract disorder noted in the patient history documentation.
- The thoracic diagnosis or complaint noted in the treatment notes.
- Motion palpation findings to indicate the thoracic level of involvement noted in the treatment notes.

All the objective measurements were recorded on a Data Collection Sheet (Appendix A) by means of categories set out in the Data Coding Sheet (Appendix D).

3.5.2 The secondary data

Any information considered pertinent to this particular survey was gathered from relevant journals, books and the Internet to constitute the reviewed literature and secondary data.

3.6 STUDY DESIGN AND PROTOCOL

3.6.1 Subjects

The sample size of this study was comprised of 850 patient files limited to patient files obtained from the Durban Institute of Technology Chiropractic Day Clinic.

3.6.1.1 File Selection

Consecutive files were selected from the Chiropractic Day Clinic starting from 30th October 2002 and working retrospectively. Only files containing a thoracic complaint (Appendix D) as a primary or secondary diagnosis were included in the study. This process was continued until a sample size of 850 patient files was achieved.

In order to accommodate the possibility of some of the captured data being erroneous, data from 865 files were included in the study.

3.6.2 Inclusion and Exclusion Criteria

1. This survey was limited to patient files contained within the archives of the Durban Institute of Technology Chiropractic Day Clinic.
2. Only patient files containing thoracic spine pain or dysfunction as a primary of secondary complaint were included in the survey.
3. This survey was only concerned with lower respiratory tract disorders and limited to asthma, bronchitis and emphysema.
4. No differentiations between acute or chronic lower respiratory tract disorders were made during this survey.
5. No age, weight, race or sex exclusion criteria were exercised on the patient files admitted to this survey.
6. Patient files containing childhood asthma, with no mention of asthma as an adult illness or complaint were not included in the survey.

3.6.3 File Examination

All the data for this survey were collected from patient files. Upon examination of each file, the treatment notes were examined to determine if a thoracic complaint or diagnosis existed in the treatment history of the patient. If a thoracic complaint or diagnosis existed in the treatment history it was recorded along with the vertebral segmental level of involvement by means of a data-coding sheet (Appendix D). Thoracic diagnoses or complaints included in this survey were:

- Thoracic spine Facet Joint Syndrome/ joint dysfunction

- Costo- Transverse joint dysfunction
- Myofascial Pain Syndrome
- Muscle strain
- Rib fracture
- Vertebral fracture
- Degenerative joint disease/ osteoarthritis/ spondylosis
- Tumour/ neoplasm
- Any other

Demographic data were extracted from the file including the file number, the age and sex of the patient, and the race of the patient.

The patient history documentation (Appendix D) was studied to determine if any lower respiratory tract disorder was present or mentioned. The lower respiratory tract disorders included in this survey were:

- Asthma
- Bronchitis
- Emphysema
- Any other

3.7 STATISTICAL ANALYSIS

For the purpose of this survey all data captured were extrapolated to a tabular format, for descriptive analysis to be conducted. The software used for this analysis was SPSS for Windows Release 9.0 copyright © SPSS Inc. 1989 -1999.

The different variables used are outlined below

Categorical Variables:

- Sex
- Race
- Thoracic diagnosis or complaint
- Respiratory condition

Continuous Variables:

- Age
- Thoracic vertebral level of involvement

3.7.1 The treatment of the data

All the data collected was reduced to variables for the purpose of the descriptive statistical analysis. Due to the fact that each case could present with more than one vertebral level of involvement, each vertebral level was reduced to an individual variable so that the total number of vertebral levels could exceed the sample population size (n = 850).

The data analysed included the demographic data of each file, thoracic diagnosis or complaint, thoracic vertebral level of involvement and whether or not any lower respiratory tract disorder was present. All data analysed was obtained from a Data Collection Sheet (Appendix A) the values of which were obtained from the Data Coding Sheet (Appendix D).

Tables were used to display frequencies or percentages to show the trends emerging from the data collected.

Bar graphs and pie charts were also used to show graphical representations of the results where more than one variable was being analysed as in the analysis of the different vertebral levels.

3.7.2 Methods of data analysis

The sample size for this study was relatively large, but hampered by the fact that only subjects who presented with thoracic spine pain or dysfunction were added into the sample. No correlations could be established between thoracic spine pain or dysfunction and lower respiratory tract disorders as the survey did not include comparative data from the population without thoracic spine pain or dysfunction. The data collected was described in terms of percentages and frequencies according to what was observed at the Durban Institute of Technology Chiropractic Day Clinic. The results are therefore also limited to the Durban Institute of Technology Chiropractic Day Clinic.

Procedure One: Demographic analysis

The collected data was analysed according to demographic data to see if any trends were present. Frequency tables and pie charts were used to display the results and outline any trends occurring. Age group analysis was used to show any trends emerging in the sample population of the study for the presence of thoracic spine pain or dysfunction according to the different age groups encountered in the survey. Graphical representation of the occurrence of the different sex groups was used to find any differences that occurred between males and females. The three different race groups encountered were described in graphical format to show the differences in their presentation throughout the sample population.

Procedure Two: Thoracic vertebral level analysis

The collected data was analysed using bar graphs to show the occurrence of each vertebral level for the different sub groups of the survey. Sub-groups of the total sample population (n = 850), included the sub-group without any lower respiratory tract pathology (n = 784), that with asthma (n = 50), that with bronchitis (n = 15) and finally the sub-group with emphysema (n = 1).

Procedure Three: Thoracic diagnosis analysis

The collected data was analysed, using frequency tables, to show the frequency with which each thoracic diagnosis encountered in the survey presented in each sub group.

Procedure Four: Respiratory condition analysis

The collected data was analysed using pie charts and frequency tables to show the occurrence of lower respiratory tract pathology within the sample population, and the frequency with which the individual pathology presented.

Procedure Five: Respiratory complaint analysis according to age

The occurrence of the individual lower respiratory tract pathology was described according to the age group within which they occurred. The results were shown as the frequency with which the individual pathology occurred in each age group. This data was used to show the characteristic presentation of the individual lower respiratory tract pathologies within the different age groups.

Procedure Six: Respiratory complaint analysis according to sex

Frequency tables were used to describe the occurrence of the individual lower respiratory tract pathologies in the different sex groups. This data was used to show the characteristic presentation of the individual lower respiratory tract pathologies within the different sexes.

Procedure Seven: Respiratory complaint analysis according to race

Frequency tables were used to describe the occurrence of the individual lower respiratory tract pathologies within the different race groups. This data was used to show the characteristic presentation of the individual lower respiratory tract pathologies within the different race groups of the survey.

CHAPTER 4 RESULTS:

4.1 INTRODUCTION

This chapter contains the results obtained from the analysis of data collected from the patient history documentation and treatment notes contained in the patient files at the Durban Institute of Technology Chiropractic Day Clinic.

4.2 DEMOGRAPHIC ANALYSIS

4.2.1 Age distribution within the sample population (n = 850)

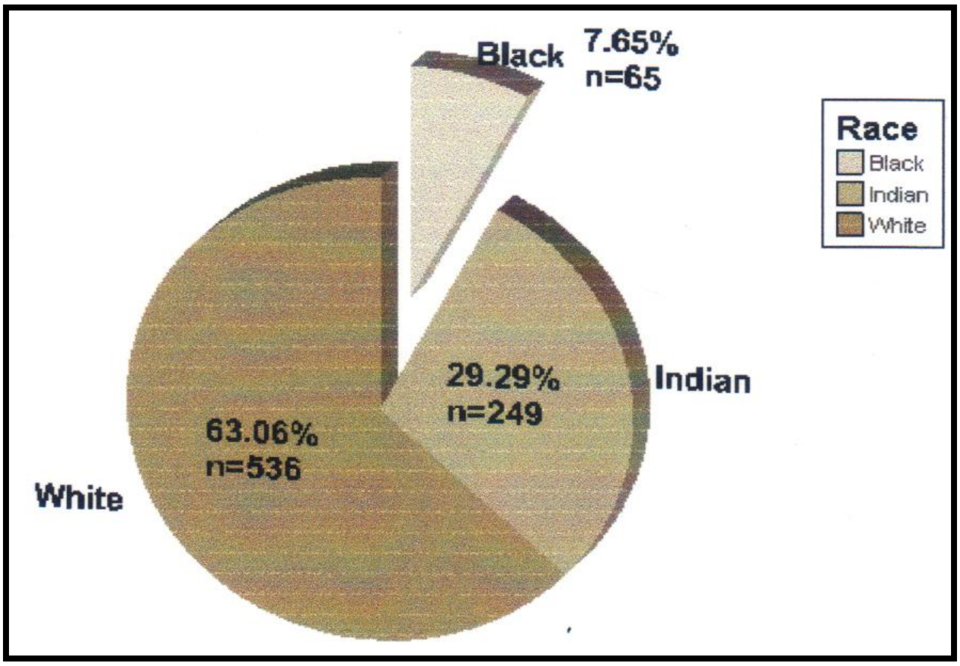
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0 - 25	261	30.7	30.7	30.7
	26 - 35	252	29.6	29.6	60.4
	36 - 45	144	16.9	16.9	77.3
	46 - 55	122	14.4	14.4	91.6
	56 - 65	49	5.8	5.8	97.4
	66 - 75	19	2.2	2.2	99.6
	76 - over	3	.4	.4	100.0
	Total	850	100.0	100.0	

Table 4.1: The Age Distribution within the Sample

The average age for the sample group of 850 patient files was 34, with 60.4% of the sample being younger than 36. The age group with the highest frequency was the second age group category (26 - 35) accounting for 26.6% of the total case files. These results show that the majority of the sample population was under the age of 36, indicating a relatively young sample population.

4.2.2 Race distribution within the sample population (n = 850)

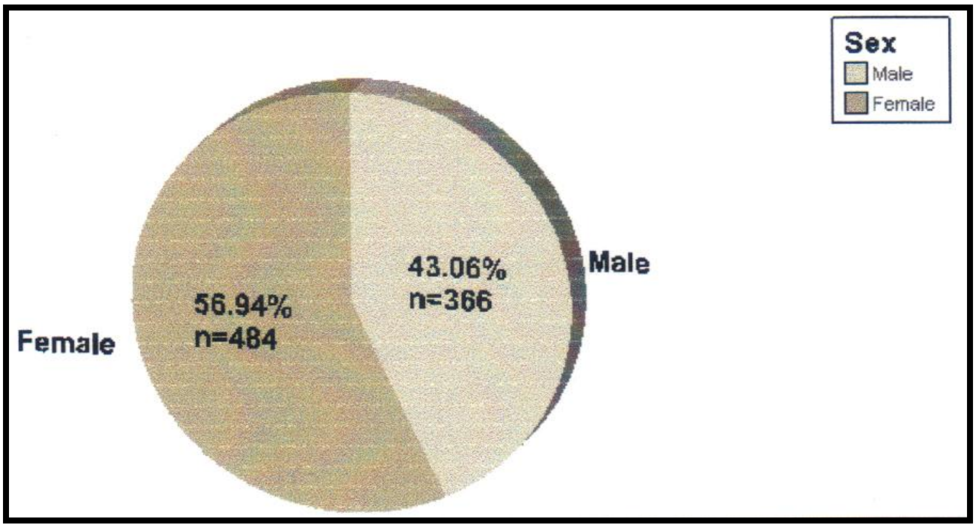
Figure 4.1: The Race Distribution within the Sample



The majority of the files analysed were of the White/ Caucasian race group, accounting for 63.1 % of the sample population, with 29.3% being of the Indian/ Asian race and only 7.7% making up the Black race group.

4.2.3 Sex distribution within the sample population (n = 850)

Figure 4.2: The Sex Distribution within the Sample

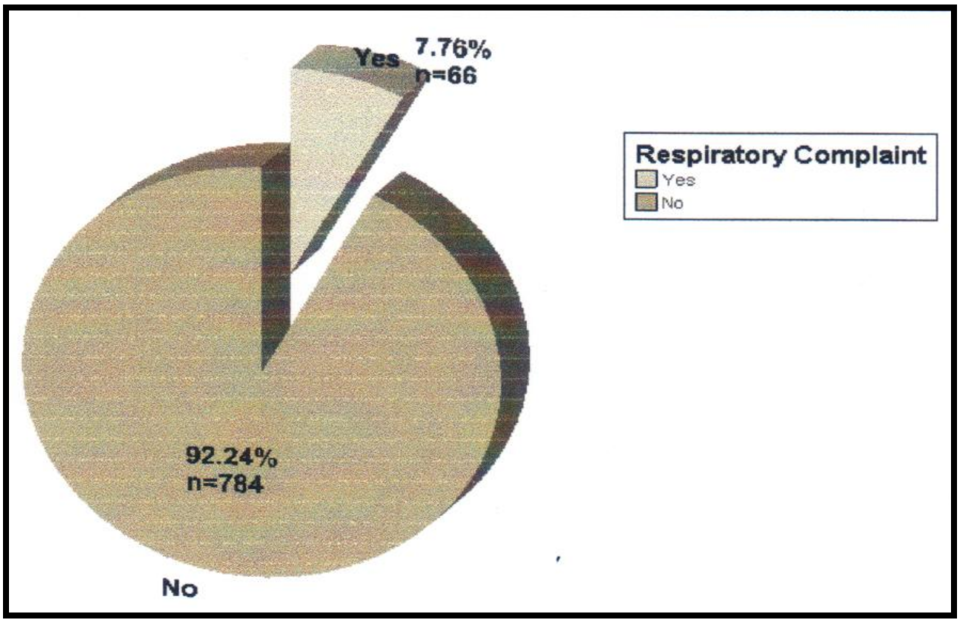


Males accounted for 43.1 % of the sample while females accounted for 56.9% of the total sample.

4.3 LOWER RESPIRATORY TRACT PATHOLOGY ANALYSIS

4 3 1 Presence of lower respiratory tract pathology within the sample population (n = 850)

Figure 4 3: Prevalence of Lower Respiratory Tract Pathology within the Sample Population



Only 66 (7.76%) of the sample population (n = 850) studied had co- existing lower respiratory tract pathology present, whilst 784 (92.24%) had no co-existing lower respiratory tract pathology. These results suggest that there was no significant positive association between lower respiratory tract pathology and thoracic spine pain and dysfunction in the sample population.

4.3.2 Frequencies of the different lower respiratory tract pathologies in sample population (n = 66)

		Frequency	Percent	Cumulative Percent
Valid	Asthma	50	75.8	75.8
	Bronchitis	15	22.7	98.5
	Emphysema	1	1.5	100.0
	Total	66	100.0	

Table 4.2: Frequency of Lower Respiratory Tract Pathologies

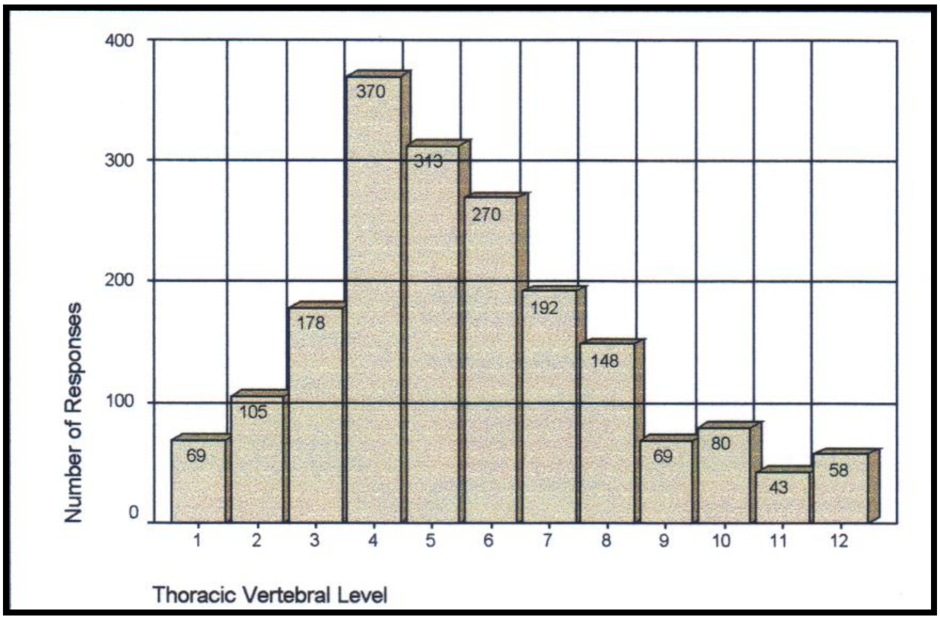
Within the sample size containing reference to lower respiratory tract pathologies (n = 66) asthma was the most common lower respiratory tract pathology occurring in 50 (75.8%) of the sample. Bronchitis was the second most common lower respiratory tract pathology occurring in 15 (22.7%) of the sample. Emphysema was only present in one patient file.

These results show that of the sample population that had a co- existing lower respiratory tract pathology, asthma was the most commonly presenting pathology.

4.4 THORACIC VERTEBRAL LEVEL OF INVOLVEMENT

4.4.1 Thoracic vertebral level distribution for the sample population (n = 850)

Figure 4.4: Overall Thoracic Vertebral Distribution within the Sample

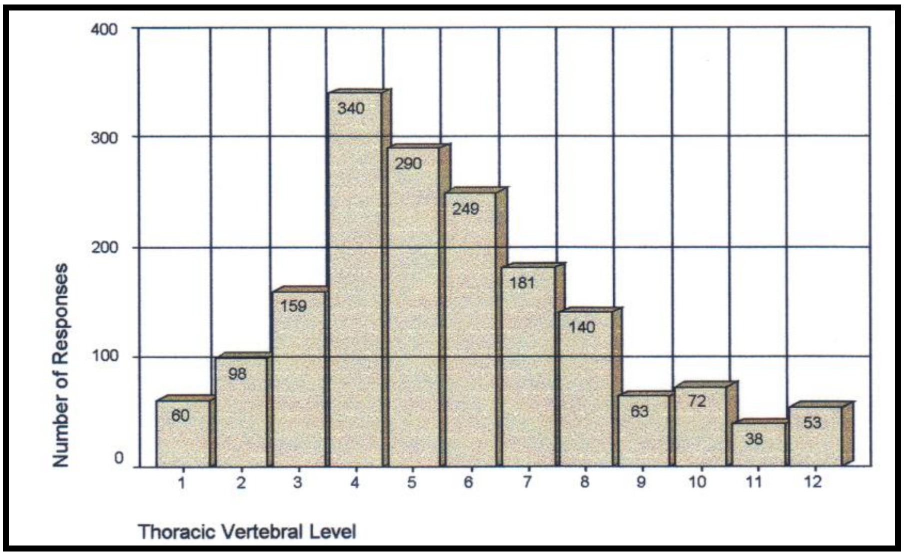


In most cases, more than one vertebral level was diagnosed as having a fixation, and in turn needing chiropractic spinal manipulative therapy. In fact the total number of vertebral levels diagnosed within the sample population (n = 850) was 1895, which averages out to 2.2 vertebral levels per case file. The results of vertebral level involvement are therefore described according to the total number of responses (1895) for the sample population, the percentage occurrence within the total responses of the sample population and finally the percentage prevalence amongst the total cases (n = 850).

Thoracic vertebral level 4 (T4) with 370 responses (19.5% of all the responses and 43.8% of all the cases), was the most commonly involved vertebral level, followed by T5 with 313 responses (16.5% of all the responses and 37% of all the cases) and T6 with 270 responses (14.2% of all the responses and 32% of all the cases).

4.4.2 Thoracic vertebral level distribution for the sample population without any lower respiratory tract pathology (n = 784)

Figure 4.5: Thoracic Vertebral Distribution for No Lower Respiratory Tract Pathology

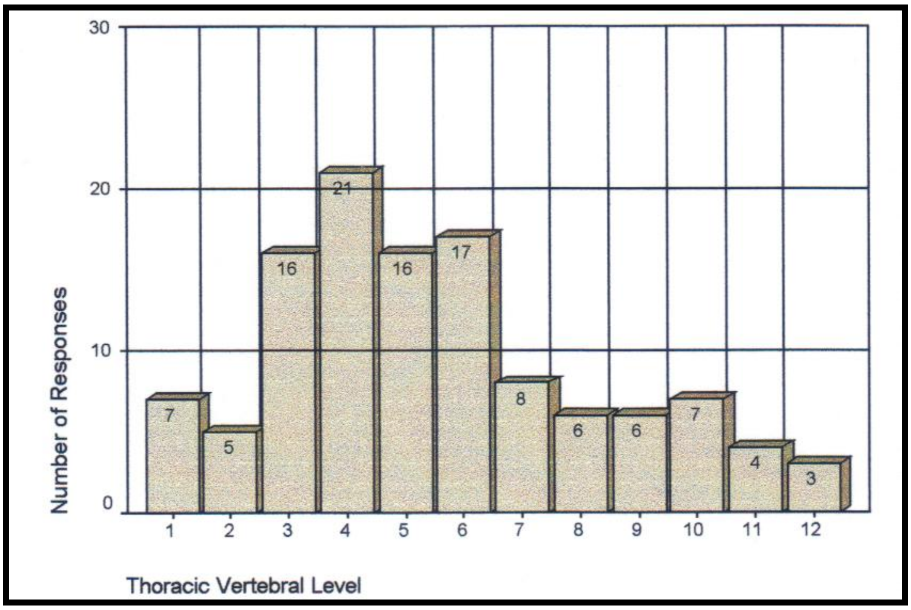


In most cases, more than one vertebral level was diagnosed as having a fixation, and in turn needing chiropractic spinal manipulative therapy. The total number of vertebral levels diagnosed within the sample with no lower respiratory tract pathology (n = 784) was 1743, which averages out to 2.2 vertebral levels per case file. The results of vertebral level involvement are therefore described according to the total number of responses (1743) for files with no lower respiratory tract pathology, the percentage occurrence within these total responses and finally the percentage prevalence amongst the total cases (n = 784 of the group.

Thoracic level 4 (T4) was shown to be the most commonly involved vertebral level when there was no lower respiratory tract pathology present, with a frequency of 340 (19.5% of the responses and 43% of the cases). T5 was the second most commonly involved vertebral level with 290 responses (16.6% of the responses and 37% of the cases), followed by T6 with 249 responses (14.3% of the responses and 32% of the cases).

4.4.3 Thoracic vertebral level distribution for the sample population with asthma (n = 50)

Figure 4.6: Thoracic Vertebral Distribution for Asthma



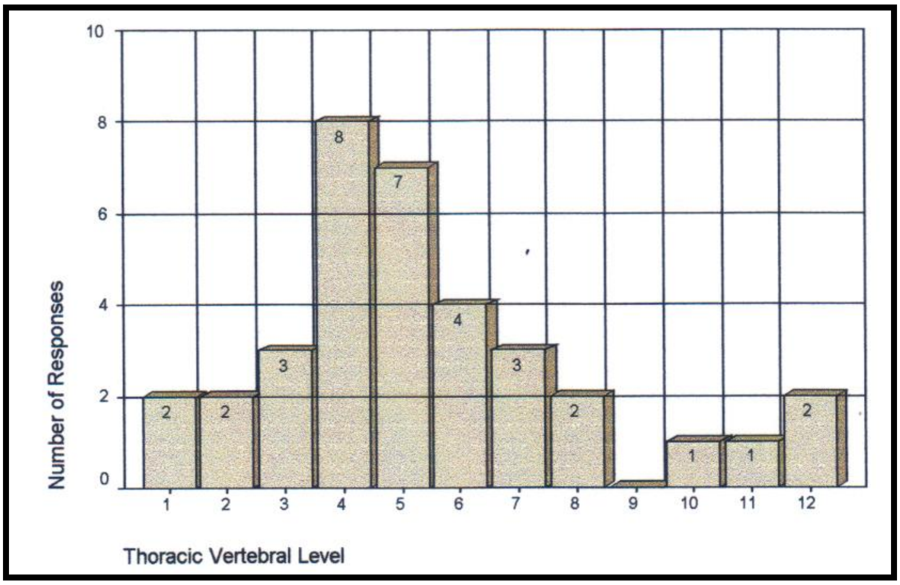
In most cases, more than one vertebral level was diagnosed as having a fixation, and in turn needing chiropractic spinal manipulative therapy. The total number of vertebral levels diagnosed within the sample with asthma (n = 50) was 116, which average out to 2.32 vertebral levels per case file. The results of vertebral level involvement are therefore described according to the total number of responses (116) for files with asthma, the percentage occurrence within these total responses and finally the percentage prevalence amongst the total cases (n = 50) of the group.

Thoracic level 4 (T4) was shown to be the most commonly involved vertebral level when the presenting lower respiratory tract pathology was asthma with

21 responses (18.1 % of the responses and 42% of the cases). T6 was the second most commonly involved vertebral level with 17 responses (14.7% of the responses and 34% of the cases), followed by T3 and T5 both with 16 responses (13.8% of the responses and 32% of the cases).

4.4.4 Thoracic vertebral level distribution for the sample population with bronchitis (n = 15)

Figure 4.7: Thoracic Vertebral Distribution for Bronchitis

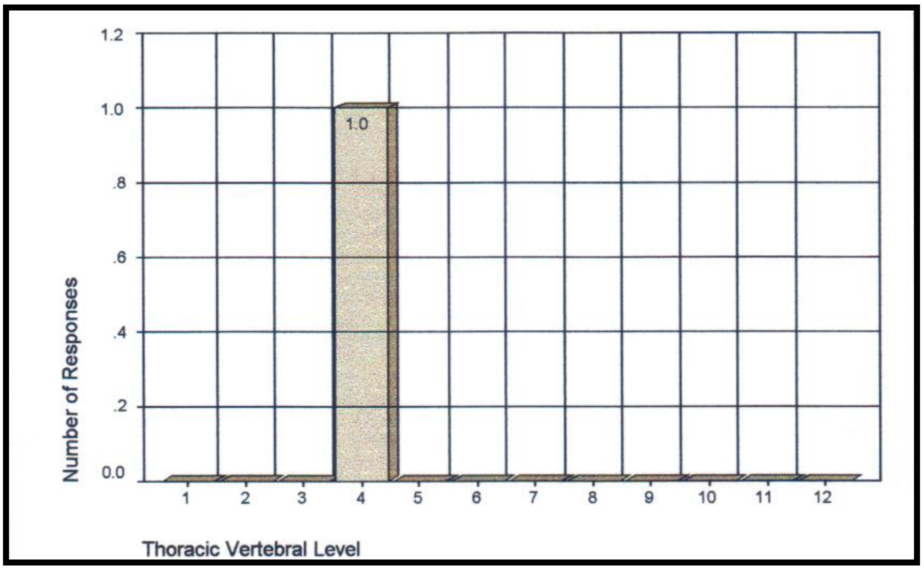


In most cases, more than one vertebral level was diagnosed as having a fixation, and in turn needing chiropractic spinal manipulative therapy. The total number of vertebral levels diagnosed within the sample with asthma (n = 15) was 35, which averages out to 2.33 vertebral levels per case file. The results of vertebral level involvement are therefore described according to the total number of responses (35) for files with bronchitis, the percentage occurrence within these total responses and finally the percentage prevalence amongst the total cases (n = 15) of the group.

Thoracic level 4 (T4) was shown to be the most commonly involved vertebral level when the presenting respiratory condition was bronchitis with 8 responses (22.9% of the responses ands 53% of the cases). T5 was the second most commonly occurring vertebral level with 7 responses (20% of the responses and 47% of the cases), followed by T6 with 4 responses (11.4% of the responses and 27% of the cases).

4.4.5 Thoracic vertebral level distribution for the sample population with emphysema (n = 1)

Figure 4.8: Thoracic Vertebral Distribution for Emphysema



There was only one case where the lower respiratory tract pathology was emphysema with only one thoracic vertebral level involved (T4).

4.5 THORACIC DIAGNOSIS / COMPLAINT ANALYSIS

4.5.1 Thoracic diagnoses for the sample population (n = 850)

		Frequency	Percent	Cumulative Percent
Valid	Thoracic spine facet joint syndrome/ joint dysfunction.	697	82.0	82.0
	Costo- transverse joint dysfunction	31	3.6	85.6
	Myofascial pain syndrome	106	12.5	98.1
	Muscle Strain	1	.1	98.2
	Rib fracture	4	.5	98.7
	Degenerative joint disease/ osteoarthritis/ spondylosis	3	.4	99.1
	Other	8	.9	100.0
	Total	850	100.0	

Table 4.3: Thoracic Diagnoses for the Sample Population

Thoracic spine facet joint syndrome/ joint dysfunction was the most commonly occurring diagnosis for the sample population (n = 850), occurring in 697 (82%) of the files studied. Myofascial pain syndrome was the second most commonly occurring thoracic diagnosis for the sample population, presenting in 106 (12.5%) of the files studied. The only other thoracic diagnosis that occurred with any significant frequency was costo- transverse joint dysfunction, occurring in 31 (3.6%) of the files studied.

4.5.2 Thoracic diagnoses for the sample population with no lower respiratory tract pathology (n = 784)

		Frequency	Percent	Cumulative Percent
Valid	Thoracic spine facet joint syndrome/ joint dysfunction	636	81.1	81.1
	Costo- transverse joint dysfunction	30	3.8	84.9
	Myofascial pain syndrome	102	13.0	98.0
	Muscle strain	1	.1	98.1
	Rib fracture	4	.5	98.6
	Degenerative joint disease/ osteoarthritis/ spondylosis	3	.4	99.0
	Other	8	1.0	100.0
	Total	784	100.0	

Table 4.4: Thoracic Diagnoses for Sample Population Without Lower Respiratory Tract Pathology

Thoracic spine facet joint syndrome/ joint dysfunction was the most commonly occurring diagnosis for the sample population with no lower respiratory tract pathology (n = 784), occurring in 636 (81.1 %) of the files studied. Myofascial pain syndrome was the second most commonly occurring thoracic diagnosis for the sample population, presenting in 102 (13%) of the files studied. The only other thoracic diagnosis that occurred with any significant frequency was costo- transverse joint dysfunction, occurring in 30 (3.8%) of the files studied.

4.5.3 Thoracic diagnoses for the sample population with asthma (n = 66)

		Frequency	Percent	Cumulative Percent
Valid	Thoracic spine facet joint syndrome/ joint dysfunction	46	92.0	92.0
	Costo- transverse joint dysfunction	1	2.0	94.0
	Myofascial pain syndrome	3	6.0	100.0
	Total	50	100.0	

Table 4.5: Thoracic Diagnoses for Asthma

Thoracic spine facet joint syndrome/ joint dysfunction was the most commonly occurring diagnosis when asthma was the lower respiratory tract pathology (n = 66), occurring in 46 (92%) of the files studied. Myofascial pain syndrome was the second most commonly occurring thoracic diagnosis for the sample population, presenting in 3 (6%) of the files studied. Costo- transverse joint dysfunction, occurring in 1 (2%) of the files studied was the only other thoracic diagnosis present for the patient files containing asthma.

These results show that the most commonly associated thoracic diagnosis or complaint with asthma is thoracic spine facet joint syndrome/ joint dysfunction, in the sample population.

4.5.4 Thoracic diagnoses for the sample population with bronchitis (n = 15)

		Frequency	Percent	Cumulative Percent
Valid	Thoracic spine facet joint syndrome/ joint dysfunction	14	93.3	93.3
	Myofascial pain syndrome	1	6.7	100.0
	Total	15	100.0	

Table 4.6: Thoracic Diagnoses for Bronchitis

Thoracic spine facet joint syndrome/ joint dysfunction was the most commonly occurring diagnosis, occurring in 14 (93.3%) of the files that contained bronchitis as a lower respiratory tract pathology (n = 15). Myofascial pain syndrome was the only other occurring thoracic diagnosis for the sample population with bronchitis, presenting in 1 (6.7%) of the files studied.

These results show that the most commonly associated thoracic diagnosis or complaint in the sample with bronchitis was thoracic spine facet joint syndrome/ joint dysfunction.

4.5.5 Thoracic diagnoses for the sample population with emphysema (n = 1)

		Frequency	Percent	Cumulative Percent
Valid	Thoracic spine facet joint syndrome/ joint dysfunction	1	100.0	100.0

Table 4.7: Thoracic Diagnoses for Emphysema

Thoracic spine facet joint syndrome/ joint dysfunction was the only thoracic diagnosis associated with the sample population when the lower respiratory tract pathology was emphysema.

4.6 RESPIRATORY COMPLAINT ACCORDING TO AGE

			Lower Respiratory Tract pathology				
			None	Asthma	Bronchitis	Emphysema	Total
Age	0 - 25	Count	247	9	5		261
		% within Age	94.6%	3.4%	1.9%		100.0%
	26 - 35	Count	230	20	2		252
		% within Age	91.3%	7.9%	.8%		100.0%
	36 - 45	Count	133	6	5		144
		% within Age	92.4%	4.2%	3.5%		100.0%
	46 - 55	Count	109	11	2		122
		% within Age	89.3%	9.0%	1.6%		100.0%
	56 - 65	Count	46	2	1		49
		% within Age	93.9%	4.1%	2.0%		100.0%
	66 - 75	Count	16	2		1	19
		% within Age	84.2%	10.5%		5.3%	100.0%
	76 - over	Count	3				3
		% within Age	100.0%				100.0%
Total		Count	784	50	15	1	850
		% within Age	92.2%	5.9%	1.8%	.1%	100.0%

Table 4.8: Lower Respiratory Tract Pathology Distribution within Age groups

Asthma was most common in the 26 - 35 age group presenting with 40% of all the asthma cases of the sample size (n = 50), and 7.9% of the sample (n = 252) for that age group. The 46 - 55 age group contained the second highest prevalence of asthma with 11 occurrences (22% of the asthma cases of the sample), where asthma accounted for 9% of the sample (n = 122) for that age group.

Bronchitis was most common in the 0 - 25 and 36 - 45 age groups accounting for 33.3% of the total bronchitis cases of the sample in both age groups. In the 0 - 25 age group, bronchitis accounted for 1.9% of the sample (n = 261) for that age group, while in the 36 - 45 age group bronchitis accounted for 3.5% of the sample (n = 144) for that age group.

Emphysema was only present in the 66 - 75 age group where it accounted for 5.3% of the sample (n = 19) for that age group.

4.7 RESPIRATORY COMPLAINT ACCORDING TO SEX

			Lower Respiratory Tract Pathology				Total
			None	Asthma	Bronchitis	Emphysema	
Sex	Male	Count	341	16	8	1	366
		% within Sex	93.2%	4.4%	2.2%	.3%	100.0%
	Female	Count	443	34	7		484
		% within Sex	91.5%	7.0%	1.4%		100.0%
Total		Count	784	50	15	1	850
		% within Sex	92.2%	5.9%	1.8%	.1%	100.0%

Table 4.9: Lower Respiratory Tract Pathology Distribution within Sex

Asthma was the most commonly occurring lower respiratory tract pathology for males (n = 366) accounting for 4.4% of the sample followed by bronchitis (2.2%) and emphysema (0.3%).

Emphysema was absent in the female sample (n = 484). Asthma accounted for 7% of the female sample group followed by bronchitis, which accounted for 1.4%.

The results show that the occurrence of asthma (n = 50) in females (34 cases or 68% of all the asthma cases) was twice as high as in males (16 cases or

32% of all the asthma cases). Bronchitis (n = 15) was more evenly matched occurring in 8 cases in males (53.33% of all the bronchitis cases) and 7 cases in females (46.66% of all the bronchitis cases).

4.8 RESPIRATORY COMPLAINT ACCORDING TO RACE

			Lower Respiratory Tract Pathology				Total
			None	Asthma	Bronchitis	Emphysema	
Race	Black	Count	60	4		1	65
		% within Race	92.3%	6.2%		1.5%	100.0%
	Indian	Count	234	14	1		249
		% within Race	94.0%	5.6%	.4%		100.0%
	White	Count	490	32	14		536
		% within Race	91.4%	6.0%	2.6%		100.0%
Total		Count	784	50	15	1	850
		% within Race	92.2%	5.9%	1.8%	.1%	100.0%

Table 4.10: Lower Respiratory Tract Pathology Distribution within Race

Bronchitis was absent from the Black race group, with asthma accounting for 6.2% and emphysema accounting for 1.5% of the sample (n = 65) for that race group.

Emphysema was absent from both the Caucasian (White) and Asian (Indian) race groups. Asthma accounted for 5.6% and bronchitis accounted for 0.4% of the sample (n = 249) for the Asian race group.

Asthma was the most commonly occurring lower respiratory tract pathology for the Caucasian race group accounting for 6% of the sample (n = 536). Bronchitis accounted for 2.6% of the sample (n = 536) for the Caucasian race group.

The results show that for asthma (n = 50) the highest prevalence occurred in the Caucasian race group with 64% of all the asthma cases, Bronchitis (n = 15) was also most commonly found in the Caucasian race group with 93.33% of all the bronchitis cases.

CHAPTER 5 DISCUSSION OF RESULTS:

5.1 INTRODUCTION

This chapter will discuss the results obtained from the analysis of the data that is presented in chapter 4 and with respect to existing literature.

The results from the evaluation of the overall data give the reader an indication into the structure of the survey sample population and its composition in terms of the demographic makeup of the survey sample population.

The results from the analysis of the data according to the thoracic vertebral levels identify which thoracic vertebral levels were more prevalent with the different lower respiratory tract pathologies.

The results from the analysis of the data according to the thoracic diagnosis identify which thoracic diagnoses were more prevalent with each of the individual lower respiratory tract pathologies.

Respiratory complaint analysis shows the trends observed in the prevalence of lower respiratory tract pathology, as well as the prevalence of the individual pathologies within the sample population.

The results from this survey as set fourth in chapter 4 show the trends as experienced at the Durban Institute of Technology Chiropractic Day Clinic spanning a five- year period.

5.2 DEMOGRAPHIC ANALYSIS

Demographic analysis of the data shows disproportionate representation of the race groups, contrary to what is present in the demographic distribution of South Africa. In a survey conducted by the Department of Health (SADHS 1998[4], SAHDS 1998[5]) 78% of the sample were Black South Africans while White South Africans made up only 10% of the sample. The results of this survey as depicted in figure 4.1 show that White South Africans accounted for 63.06% of the sample, while Black South Africans accounted for only 7.65%. The difference in these figures could be attributed to the fact that the patients seeking chiropractic care at the Durban Institute of Technology Chiropractic Day Clinic are predominantly of the Caucasian race group. Another cause of this discrepancy could be the fact that the benefit or usefulness of chiropractic care has not yet been accepted or introduced in the Black or Asian race groups around the Durban Institute of Technology.

Of similar nature is the age distribution of the sample. Table 4.1 shows that the largest age group was that of 0 - 25, which contained 30.7% of all the subjects.

The comparatively smaller ranged age group of 15 - 24 in the South African Department of Health survey (SADHS 1998[4], SADHS 1998[5]) contained only 28% of the subjects. The age group of 26 - 35 of this survey contained 29.6% of all the responses while the comparative age group of 25 - 34 contained 21 %. This shows that while the majority of this survey, some 60.4% fell between the ages of 0 and 35, the majority of the patients of the Department of Health survey fell between the ages of 15 and 44, with 67% of all the responses. These differences could indicate that younger people seek chiropractic care more readily than the older generations.

The overall gender distribution of this study was relatively evenly matched with that of the South African Department of Health survey (SADHS 1998[4], SADHS 1998[5]). The sample population of this survey, as shown in figure 4.2, consisted of 57% female and 43% male, while the Department of Health survey consisted of 59% female and 41 % male. These results may indicate that the sample population, although limited to patients with thoracic spine pain or dysfunction, was representative of the population of South Africa as a whole.

5.3 RESPIRATORY COMPLAINT

The results of the data obtained for this survey do not conform to those results as seen in other studies regarding the prevalence of respiratory conditions. The South African Department of Health survey (SADHS 1998[3], SADHS 1998[4], SADHS 1998[5]) shows a cumulative total of 27.4% of the respondents reported to be suffering from asthma, chronic bronchitis or emphysema. This survey showed that only 7.76% of the sample population (Fig 4.3) were suffering from lower respiratory tract pathology. The large discrepancy in these results could be attributed to many factors, not least of all the misdiagnosis, or omission of lower respiratory tract disorders from the initial data used for this study.

Although a strict framework is provided for each student for the process of collecting an initial case history, certain omissions are bound to occur. In a training environment where the primary focus is on the diagnosis and treatment of musculoskeletal conditions more complex underlying disease processes, unless clinically obvious, may go unnoticed. Lower respiratory tract conditions fall into this category, and unless the attention of the student is focussed or alerted to this aspect of the patient's health, mention of these conditions are not guaranteed in a typical case history taking. Time constraints in a teaching environment as well as the individual techniques employed by each student during the case history compilation may also account for the omission of lower respiratory tract disorders from the initial case history data.

Complicating the possibility of omission of lower respiratory tract disorders from the case histories conducted by the initial treating chiropractic students, is the composition of the patient base undertaking chiropractic treatment. Patients suffering from lower respiratory tract disorders may not make up the patient base of a typical chiropractic clinic. In fact the likelihood of a patient suffering primarily from a lower respiratory tract disorder, seeking consultation with a chiropractic practitioner, is low (Eisenberg *et al.* 1993). Patients whose musculoskeletal symptoms have resulted after years of respiratory complaints may also be under the impression that the musculoskeletal symptoms are as a direct consequence of the respiratory condition, and may also believe that these symptoms are untreatable.

Another complicating factor, which may contribute to the low occurrence of lower respiratory tract disorders in this survey, could be the design of the survey itself. Only patients with a thoracic diagnosis or complaint were included into the survey, omitting all the patients whose diagnoses lay in the other areas of the spine. Although the literature supports the fact that respiratory conditions could be as a result of thoracic spine dysfunction (Wiles 1990, Schafer 1991), and conversely respiratory conditions could result in thoracic musculoskeletal dysfunction (Lane & Lane 1991, Gatterman & Panzer 1990, Wiles 1990, Hoag 1972), the simple fact remains that other areas of the spine may be associated with higher prevalence of lower respiratory tract disorders.

The results of this survey show that asthma was the most commonly occurring lower respiratory tract pathology at the Durban Institute of Technology Chiropractic Day Clinic (Table 4.2), accounting for 75.8% of all the lower respiratory tract pathology encountered by the survey. Bronchitis was the second most commonly occurring pathology accounting for 22.7% of all the pathologies, then emphysema with 1.5%. Although these trends follow the trends that have been outlined in the literature (SADHS 1998[1], SADHS 1998[2], SADHS 1998[3]), the figures with which the different pathologies presented were much lower than what was expected.

The results of this survey demonstrate that there is not a higher prevalence of lower respiratory tract disorders in patients with thoracic spine pain or dysfunction at the Durban Institute of Technology Chiropractic Day Clinic.

5.4 THORACIC VERTEBRAL LEVEL OF INVOLVEMENT

Thoracic level 4 (T4) was the most commonly involved thoracic vertebral level throughout the sample population (n = 850) as well as within the different lower respiratory tract pathologies (Figs 4.4, 4.5, 4.6, 4.7, 4.8). T4 was involved a total of 370 times (44% of all the patient files of the sample population) followed by T5 with 313 occurrences (in 37% of all the patient files) and then T6 with 270 occurrences (in 32% of all the patient files). These results suggest that T4, T5 and T6 are involved considerably more often than the upper and lower thoracic vertebrae in thoracic spine pain or dysfunction. This involvement may indicate a biomechanical weakness or disposition to dysfunction at these levels, possibly due to the increased biomechanical stresses at the apex of the thoracic kyphosis.

The results for the vertebral distribution within the portion of the sample population without any lower respiratory tract pathology (n = 784) follow

similar trends as those experienced within the whole sample population with T4 being the most commonly involved vertebral level diagnosed (Fig 4.5)
For asthma (n = 50) the most common vertebral levels (Fig 4.6) experienced after T4 were T6 with 17 occurrences (presenting in 34% of all the files with asthma); T3 and T5 both experienced 16 occurrences (presenting in 32% of all the files with asthma). This vertebral distribution for asthma closely follows the preferred levels for chiropractic spinal manipulative therapy (T1 to T6) as reported in a survey of all the registered chiropractors in Australia (Jamison et al. 1992). Although T1 and T2 accounted for lower figures as compared to Jamison's study, the majority of the vertebral responses followed the similar pattern of occurring below T6 as shown in Jamison's study.

Trends for bronchitis (n = 15) showed that the two primarily involved vertebral segments were T4 occurring in 53% of the files, and T5 occurring in 47% of the files (Fig 4.7). These results show significantly higher occurrences than any other vertebral level for the portion of the sample population presenting with bronchitis.

With only one response for emphysema (Fig 4.8) received in the survey, it is not possible to discuss any trends with reference to the vertebral presentation of emphysema.

A complicating matter associated with the diagnosis of vertebral levels of the thoracic spine in need of chiropractic spinal manipulative therapy, is the fact that the spinous processes of T4 - T6 lie at the apex of the thoracic kyphosis and may thus be the most readily palpated vertebral segments.

From the results of this survey, no association can be found or described with regard to any lower respiratory tract pathology and the thoracic vertebral levels of involvement in the patient files contained at the Durban Institute of Technology Chiropractic Day Clinic. Despite the literature indicating that there may be a higher occurrence of upper thoracic vertebral level involvement in lower respiratory tract pathologies compared to a broader occurrence of all the thoracic vertebral levels depending on the injury sustained, the results of this survey indicate that there is no significant difference in the vertebral presentation of patients with or without lower respiratory tract pathologies. Although no significant difference can be found in the vertebral presentation of patients with or without lower respiratory tract pathologies, the results of this survey do indicate that T4, T5 and T6 are the most commonly involved thoracic vertebral levels in thoracic spine pain or dysfunction.

5.5 THORACIC DIAGNOSIS

It is interesting to note that thoracic spine facet syndrome/ joint dysfunction was the most commonly occurring diagnosis associated with the sample with lower respiratory tract pathology (n = 66) (Tables 4.5, 4.6, 4.7). What is interesting about this occurrence is the fact that it is indistinguishable from the data collected to differentiate whether the thoracic musculoskeletal condition occurred before the lower respiratory tract pathology, or resulted as a consequence to the lower respiratory tract disorder, bearing in mind the finding of this survey that there is no positive association between thoracic spine pain and dysfunction and lower respiratory tract pathology.

Respiratory conditions have been purported to cause disturbances in the components of the thoracic musculoskeletal system (Hoag 1972), including the muscles involved in respiration as well as the joints of the thoracic spine and rib cage allowing the movements of ventilation. An alternative point of view is that disturbances of the thoracic musculoskeletal system may have a direct influence on respiratory efforts (Allen & Kelso 1980). Tables 4.5, 4.6 and 4.7 show that collectively, thoracic joint dysfunction accounted for 92.42% of all the thoracic diagnoses experienced by the sample with lower respiratory tract pathology (n = 66). Table 4.4 shows that for the sample without lower respiratory tract pathologies (n = 784), thoracic joint dysfunction accounted for 81.1 % of all the thoracic diagnoses experienced. The fact that thoracic joint dysfunction was so prevalent with the respiratory conditions experienced suggests that thoracic musculoskeletal involvement with respiratory conditions is of clinical importance.

5.6 RESPIRATORY COMPLAINT ACCORDING TO AGE

Table 4.8 shows that for asthma (n = 50), the age groups that experienced the greatest number of occurrences were the 26 - 35 (20 occurrences) and 46 - 55 (11 occurrences) age groups. These results contradict the literature (American Lung Organization 2000, Crompton & McHardy 1991: 376, McFadden 1994: 1167, Rees 1995: 279), which indicates that asthma occurs in early life with up to 50% of all asthma cases developing before the age of 10. In this survey only 18% of the asthma cases occurred between the ages of 0 and 26, with 58% occurring between the ages of 0 and 36.

Chronic bronchitis (n = 15) was most common in the 0 - 25 and 36 - 45 age groups with one third (5 occurrences) of all the cases occurring in each age group. With the literature showing that smoking is the single most important causative factor in chronic obstructive pulmonary disease (American Lung Organization 2002[2]), the trends shown in the results (Table 4.8) could be attributed to the fact that these two age groups could have contained the greatest number of smokers.

Ingram (1994: 1198) suggests that there is an increase of emphysema in the fifth and seventh decades of life, and this trend is possibly shown by the presentation of the one case of emphysema occurring in the 66 - 75 age group.

5.7 RESPIRATORY COMPLAINT ACCORDING TO SEX

The occurrences of the different respiratory disorders (Table 4.9) show similar discrepancies and are in some cases much lower than initially anticipated. The South African Demographic and Health Survey (SADHS 1998[3], SADHS 1998[4], SADHS 1998[5]) showed that asthma in KwaZulu Natal, the same province where this survey was conducted, was present in 10% of the male respondents and 13,5% of the female respondents. This survey found that asthma was present in only 4.4% (n = 25) and 7.0% (n = 41) of the male and female respondents respectively approximately half the prevalence suggested in the literature. Asthma also affected males less than females which was contrary to what McFadden (1994: 1167) suggested when he stated that asthma affected males more than females in early life with a 2:1 ratio, and evened out in later life.

The results for bronchitis for males shows that the 2.2% prevalence was closer to the provincial figure of 2.8% presented by the South African Department of Health, while the female prevalence of 1.4% was well below the provincial figure of 3.6%.

Emphysema presented another contradiction to the figures experienced by the South African Department of Health survey reporting only 0.3% of the responses for males in the survey and being completely absent from the female respondents. These figures were considerably lower than the provincial figures of 3.4% and 3.1 % (SADHS 1998[4], SADHS 1998[5]).

5.8 RESPIRATORY COMPLAINT ACCORDING TO RACE

It is interesting to note that emphysema was absent from all the race groups apart from the Black race group (Table 4.10), even though Ingram (1994: 1197) indicates that all adult lungs have a degree of emphysema present in them and that these changes are as a result of years of insult on the lungs.

The results of this survey do not conform as only one occurrence of emphysema was seen.

Asthma was the most common lower respiratory tract pathology in Caucasians (32 occurrences), as well as in Asians (14 occurrences) (Table 4.10).

5.9 LIMITATIONS OF THIS STUDY

5.9.1 Study design

A retrospective clinical survey is ideal for collecting demographic data in an uncontrolled environment; the collection of specialized data that is not the main focus of the environment should be avoided. In the case of this survey, the data were collected from a chiropractic teaching institution, where the main focus is on the training of students, during their residency and internship, on the correct method of diagnosing and treating musculoskeletal conditions. Although qualified clinicians oversee all cases it is not possible for every case history to be thoroughly checked and validated for all details. For this reason the detection or diagnosis of lower respiratory tract conditions may have gone unnoticed unless reported by the patient.

It is also difficult, being a retrospective study, to be able to interview the patients concerned to ask questions regarding their respiratory condition and its diagnosis, or lack thereof. Vital information regarding the history and progression of the respiratory condition and its relationship to the musculoskeletal condition is lost including the vital fact of whether the respiratory condition was present before or after the musculoskeletal condition.

5.9.2 Setting

The setting of this study, being a teaching institution has a few drawbacks, the first being that the data was collected from the case files of numerous different students. Homogeneity in the case history and treatment notes can almost certainly not be maintained when drawing the data from such a wide variety of sources. Due to the individual adaptations to the case history taking and method of questioning, there is no method for guaranteeing that the same questions were asked for each patient regarding their health status.

5.9.3 Objective measurements

Another drawback of collecting data from numerous sources is the validity of the objective measurements. In some cases, the treatment notes contained motion palpation findings from students with little clinical experience. The validity of these objective measurements is therefore questionable due to the lack of clinical exposure and experience. In a setting where the primary focus is on improving patient health through spinal manipulative therapy, more focus is given to the presenting musculoskeletal condition rather than any compounding underlying disease processes.

5.9.4 Initial data collection

Due to the variety of chiropractic students providing the data of the initial case histories and treatment notes, and the data spanning many years, changes in the training approaches as well as changes in the knowledge of chiropractic prohibits uniform data collection. The variables acting on the initial data collection and its interpretation by each individual student cannot be accounted for or compensated for. This makes the use of a single data collector for the initial data collection very important.

5.9.5 Statistical analysis

Although the sample size of 850 patient files was adequate for statistical analysis of the data and was representative of the patient files contained at the Durban Institute of Technology Chiropractic Day Clinic, the sample should not have been limited to files containing thoracic complaints only. Including files without thoracic complaints would have allowed more powerful statistical analysis to have been carried out with regard to intra- and inter- group analysis, thereby allowing conclusions to have been made regarding the presentation of lower respiratory tract conditions and their spinal involvement.

5.9.6 Patient selection

Including files with and without thoracic complaints would have allowed intra group comparisons to be carried out. Limiting files to those with thoracic complaints only did not allow for any conclusions to be conducted as to the presentation of respiratory complaints with regard to their spinal involvement for the entire patient files contained at the Durban Institute of Technology's Chiropractic Day Clinic. Initial patient selection, as can be implemented in a prospective survey, would also allow for the sample to contain representative proportions of each different race group included in the survey.

CHAPTER 6 CONCLUSIONS AND RECOMMENDATIONS:

6.1 RECOMMENDATIONS

The author of this dissertation would like to suggest the following changes to the survey design and implementation for anyone wanting to repeat the survey.

6.1.1 Study design

A prospective survey, although completely different from the study design of this survey, should be conducted with the investigator as the primary data collector during the initial case histories and initial treatment notes. This would guarantee uniformity during the initial data collection for the study, as in this survey the data was recorded from the case notes of many chiropractic students and uniformity of data could not be maintained. Also having one person collecting the data would guarantee that the correct questions would be asked regarding the presence of any respiratory conditions that the patient may be suffering from.

Alternatively, uniformity of initial data collection should be exercised through either access to the patient during the initial consultation or by means of a questionnaire thereby maintaining a common question structure for all the files added into the sample population.

In addition anteroposterior and lateral thoracic spine radiographs should be evaluated for any possible biomechanical abnormalities (e.g. scoliosis/ vertebral body wedging) in the thoracic spine that may account for clinical findings or subjective pain syndromes.

6.1.2 Sample size

The study sample should include files with and without thoracic complaints, to allow for inter group comparisons to be conducted. This would ensure that the statistical analysis of the data would be more accurate in reflecting the presentation of respiratory conditions with regards to their spinal involvement and also that the results are more representative of all the files contained at the Durban Institute of Technology Chiropractic Day Clinic. By limiting the files to those containing thoracic complaints alone does not allow for statistical comparisons to be made to the general population, as this survey has not addressed the possible trends present in the population without any presenting thoracic complaints.

6.1.3 Data collection

As described earlier, it is the opinion of the researcher that more standardized and error free initial data collection, either through the use of a questionnaire that is presented to the patient during their initial consultation, or by means of a data collector present during the initial consultation, would allow for more accurate initial data collection.

This would ensure that common sets of questions were presented to the patients with special attention to any lower respiratory tract disorders that may be present.

Omissions as to the respiratory health of a patient could then be ruled out and homogeneity of the initial data would be maintained.

6.1.4 Comprehensive initial data collection

Comprehensive initial data collection from the patient directly would allow for more precise classification of the respiratory condition if present. Information regarding the history and progression of the musculoskeletal condition causing the patient to seek chiropractic care could also be collected. This would be useful to determine whether the musculoskeletal condition presented before any lower respiratory tract disorder if present, or as a direct result of the lower respiratory tract disorder.

6.2 CONCLUSIONS

This quantitative, non- experimental, demographic retrospective clinical survey consisted of data obtained from 850 patient files contained at the Durban Institute of Technology's chiropractic Day Clinic in KwaZulu Natal South Africa. Patient file selection was done from 30th October 2002 retrospectively and only files containing thoracic spine pain or dysfunction were included in the survey until a sample size of 850 was achieved. The data collected from the patient files included demographic data of age, sex and race, as well as any presence of lower respiratory tract disorders noted. This data was recovered from the patient history documentation found in the patient files. Further objective data included the thoracic diagnosis or complaint and the thoracic vertebral level of involvement, both of which were obtained from the treatment notes in the patient files.

This survey was designed primarily as a descriptive study of the trends experienced at the Durban Institute of Technology Chiropractic Day Clinic with regard to thoracic spine pain or dysfunction and lower respiratory tract disorders.

Demographic representation of the different races as seen in the results of the survey show that the patient, base of the Durban Institute of Technology Chiropractic Day Clinic is statistically disproportionate to the demographics of South Africa. The majority of the sample of the survey was comprised of the Caucasian race group with the Black race group comprising the minority of the sample size. In a country where the majority race group is of Black ethnicity, and the Caucasian ethnicity is of a minority size, these results were not reproduced in the survey. The reason for this could be attributed to the patient type seeking chiropractic care, which in this case is of Caucasian ethnicity.

The presence of lower respiratory complaints within the sample of this survey was not significant, and in fact showed significantly lower figures than what would have been expected, based on demographic and health surveys conducted by the South African Department of Health and the global trends of asthma and bronchitis. These statistically significant differences could have been attributed in part to the fact that patients suffering from lower respiratory tract disorders may not seek the help of chiropractic care for the treatment of the associated musculoskeletal complications. Another possibility was the erroneous data capture conducted during the initial examination of each patient during the case history compilation.

The individual occurrences of the different respiratory conditions observed by this survey were also statistically lower than described by other health surveys conducted in South Africa and with regard to KwaZulu Natal. The occurrence of asthma was significantly lower, in both males and females than what had been reported for the province by the South African Department of Health. Bronchitis in males was the only respiratory condition that occurred with a frequency close to the provincial estimate as set forth by the Department of Health, while in females occurred significantly lower in this survey compared to the provincial estimate. Emphysema for males and females presented significantly lower in both males and females than what was expected.

A significantly higher occurrence of thoracic spine facet syndrome occurred in relation to respiratory conditions than any other thoracic diagnosis or complaint.

The thoracic vertebral levels of involvement for the different respiratory conditions did not show any significant difference from those vertebral levels seen in the patient files containing no respiratory complaint. It was therefore not possible to show any association between the different respiratory conditions and their corresponding thoracic vertebral levels of involvement.

Despite evidence in the literature to support an association between thoracic spine pain or dysfunction and lower respiratory tract conditions, this survey appears to indicate that there is no positive association between thoracic spine pain and dysfunction and lower respiratory tract disorders at the Durban Institute of Technology Chiropractic day Clinic. There also appears to be no statistically significant association between the level of thoracic spine involvement and any presenting respiratory condition.

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APPENDIX A: DATA COLLECTION SHEET

DIAGNOSIS/ COMPLAINT	CODE
Thoracic spine facet joint syndrome/ joint dysfunction.	D01
Costo- transverse joint dysfunction	D02
Myofascial pain syndrome	D03
Muscle Strain	D04
Rib fracture	D05
Vertebral fracture	D06
Degenerative joint disease/ osteoarthritis/ spondylosis	D07
Tumor/ neoplasm	D08
Other	D09
AGE GROUPING	**CODE**
15 – 25	A01
26 – 35	A02
36 – 45	A03
46 – 55	A04
56 – 65	A05
66 – 75	A06
75 and over	A07
ETHNIC GROUP	**CODE**
BLACK	R01
COLOURED	R02
INDIAN	R03
WHITE	R04
OTHER	R05
SEX	**CODE**
MALE	S01
FEMALE	S02
RESPIRATORY COMPLAINT	**CODE**
ASTHMA	RC1
BRONCHITIS	RC2
EMPHYSEMA	RC3
OTHER	RC4

APPENDIX B: PATIENT HISTORY
(1 OF 4)

DURBAN INSTITUTE OF TECHNOLOGY
CHIROPRACTIC DAY CLINIC
CASE HISTORY

Patient: .... Date: ....

File # : .... Age : ....

Sex : .... Occupation: ....

Intern : .... Signature: ....

FOR CLINICIANS USE ONLY:

Initial visit
Clinician: Signature :

Case History:

Examination:
Previous: Current:

X-Ray Studies:
Previous: Current:

Clinical Path. lab:
Previous: Current:

Case Status:

PTT:	Signature:	Date:

CONDITIONAL: Reason for Conditional:	
Signature:	Date:

Conditions met in Visit No:	Signed into PTT:	Date:

Signed off:	Date:

Intern's Case History:

1. **Source of History:**
2. **Chief Complaint : (patient's own words):**
3. **Present Illness:**

	Complaint 1	Complaint 2
► Location		
► Onset : Initial:		
Recent:		
► Cause:		
► Duration		
► Frequency		
► Pain (Character)		
► Progression		
► Aggravating Factors		
► Relieving Factors		
► Associated S & S		
► Previous Occurrences		
► Past Treatment		
► **Outcome:**		

4. **Other Complaints:**

5. **Past Medical History:**

- General Health Status
- Childhood Illnesses
- Adult Illnesses
- Psychiatric Illnesses
- Accidents/Injuries
- Surgery
- Hospitalizations

6. **Current health status and life-style:**

- Allergies
- Immunizations
- Screening Tests incl. xrays
- Environmental Hazards (Home, School, Work)
- Exercise and Leisure
- Sleep Patterns
- Diet
- Current Medication
  Analgesics/week:
- Tobacco
- Alcohol
- Social Drugs

7. **Immediate Family Medical History:**

- Age
- Health
- Cause of Death
- DM
- Heart Disease
- TB
- Stroke
- Kidney Disease
- CA
- Arthritis
- Anaemia
- Headaches
- Thyroid Disease
- Epilepsy
- Mental Illness
- Alcoholism
- Drug Addiction
- Other

8. **Psychosocial history:**

- Home Situation and daily life
- Important experiences
- Religious Beliefs

9. **Review of Systems:**

- General
- Skin
- Head
- Eyes
- Ears
- Nose/Sinuses
- Mouth/Throat
- Neck
- Breasts
- Respiratory
- Cardiac
- Gastro-intestinal
- Urinary
- Genital
- Vascular
- Musculoskeletal
- Neurologic
- Haematologic
- Endocrine
- Psychiatric

APPENDIX C: TREATMENT NOTES

DURBAN INSTITUTE OF TECHNOLOGY

Patient Name: ***File #:*** ***Page:***

Date: ***Visit:*** ***Intern:***
Attending Clinician: ***Signature:***

S: *Numerical Pain Rating Scale (Patient)* *Intern Rating*
Least ***0 1 2 3 4 5 6 7 8 9 10*** *Worst*

A:

0:

P:

E:

Special attention to: ***Next appointment:***

Date: ***Visit:*** ***Intern:***
Attending Clinician: ***Signature:***

S: *Numerical Pain Rating Scale (Patient)* *Intern Rating*
Least ***0 1 2 3 4 5 6 7 8 9 10*** *Worst*

A:

O:

P:

E:

Special attention to: ***Next appointment:***

Date: ***Visit:*** ***Intern:***
Attending Clinician: ***Signature***

S: *Numerical Pain Rating Scale (Patient)* *Intern Rating*
Least ***0 1 2 3 4 5 6 7 8 9 10*** *Worst*

A:

O:

P:

E:

Special attention to: ***Next appointment:***

APPENDIX D: **DATA CODING SHEET**

DIAGNOSIS/ COMPLAINT	CODE
Thoracic spine facet joint syndrome/ joint dysfunction.	D01
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Myofascial pain syndrome	D03
Muscle Strain	D04
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75 and over	A07
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INDIAN	R03
WHITE	R04
OTHER	R05
SEX	**CODE**
MALE	S01
FEMALE	S02
RESPIRATORY COMPLAINT	**CODE**
ASTHMA	RC1
BRONCHITIS	RC2
EMPHYSEMA	RC3
OTHER	RC4