THE THERAPEUTIC EFFICACY OF SPINAL ADJUSTIVE PROCEDURES IN THE MANAGEMENT OF ASTHMA .

A dissertation submitted in partial compliance with the requirements for a Master's Degree in Technology in the department of Chiropractic at Technikon Natal .

by GILON GOBRIN

I, Gilon Gobrin, do hereby declare that this work is my own, both in conception and execution, except where otherwise indicated in the text.

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DEDICATION

To Mom, Dad, Ohran and Oriela

For your love, guidance, support and most of all for believing in me.

THANK YOU

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This dissertation represents the completion of the foundation of my chiropractic education. I would like to thank all of those who assisted in and contributed to the completion thereof.

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ABSTRACT

Asthma, one of the most frustrating medical conditions known to man, has been a thorn in the side of physicians world wide. A condition that seems to consist of all exceptions and no rules has resulted in endless debates regarding the correct treatment protocol for its management, which at present only seem to subdue the patient's symptomatology rather than eliminate them. The ever increasing number of asthmatic sufferers and the increasing number of deaths related to asthma are both reflections of the inadequacy of present treatment protocols and therefore demonstrate the need for their revision. It is thus the aim of this study to ascertain the therapeutic efficacy of spinal adjustive procedures in the management of asthma.

Patients were obtained for this study by consecutive sampling, whereby any patients presenting to the Chiropractic Clinic at Technikon Natal, as a response to the newspaper adverts and pamphlets placed in the greater Durban area, were considered for the study. Of these patients, only those who conformed to the specified delimitations and diagnostic criteria were accepted.

The study was divided into 3 distinct periods. The first, called the baseline study, required the entire sample of 30 patients to undergo subjective and objective tests, whilst receiving no chiropractic treatment, in order to establish the patients' asthmatic condition. The second period, called the initial treatment period, required the entire sample to undergo further subjective and objective testing while receiving chiropractic treatment, which comprised soft tissue therapy and adjustments of fixations in the C0-C2 and T2-T7 areas.

The third period, called the follow-up study, saw the sample group of 30 patients being randomly divided into 2 groups, the one group of patients receiving a further series of treatments while the other did not. This period was initiated to establish the effect of longer term chiropractic treatment on asthmatic patients.

Subjective information regarding the patients' progress was collected from an asthma questionnaire and disability index. Objective information was gathered with the aid of a spirometer and sputum eosinophil levels tests. In addition to the above, demographic data was collected from the patients' files.

The subjective data was analyzed using frequency tabulations. The objective data was analyzed using Wilcoxon's signed rank test and the Mann-Whitney U test. The statistical level of significance was set at 5% for both of these tests. The demographic data was displayed using diagrams and tables.

This study demonstrated a statistically significant subjective improvement in the patients' asthmatic condition. In addition to this, statistically significant improvements were noted in the patients' forced expiratory volume in 1 second, forced vital capacity and sputum eosinophil levels during the initial treatment period, as well as during the follow-up period.

From this study it can be concluded that the chiropractor and spinal adjustive procedures play a role in the management of asthmatic patients. It must, however, be emphasised that until further research proves otherwise, the role of the chiropractor and spinal adjustive procedures is as a team member in conjunction with preexisting treatment protocols, and not as an individual, caring for asthmatic patients alone.

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DEFINITIONS OF TERMS

* Subjective perception:

  Subjective response includes the answers to the relevant questionnaire and disability index as well as the associated symptomatology as described by the patient.

* Objective response:

  Objective response includes the physical findings on examination i.e. Spirometry readings, sputum analysis, motion palpation and relevant orthopaedic tests.

* Adjustment:

  A short lever, specific, high velocity, low amplitude controlled forceful thrust by hand directed at specific spinal articulations.

* Manipulation:

  A long lever, non-specific, high velocity, high amplitude thrust to the body without being specifically directed at a particular spinal articulation.

* Vertebral subluxation / Fixation:

  These have one or more of the following characteristics, viz. : alteration of the normal dynamics, anatomical or physiological relationships of contiguous articular structures, lack of joint play, palpable soft tissue changes such as muscle hypertonicity or imbalance, as well as local tenderness.

* Osteopathic lesion:

This is the same as a vertebral subluxation / fixation.

* Asthma:

A disease characterized by (i) airway obstruction that is reversible (but not completely in some patients), either spontaneously or with treatment, (ii) airways inflammation and (iii) increased airways responsiveness to a variety of stimuli.

CHAPTER 1

INTRODUCTION

Carl B. Umanzio (1929:693) very aptly summarises the general attitude which prevailed at the time, and still prevails to some extent today, towards asthma : "Asthma is second only to the common cold as a classic symbol of medical frustration and is perhaps the only condition that seems to consist of all exceptions and no rules."

Asthma by definition is a disease characterized by (i) airway obstruction that is reversible (but not completely in some patients), either spontaneously or with treatment, (ii) airways inflammation and (iii) increased airways responsiveness to a variety of stimuli. The airway obstruction in itself may be due to a number of factors that include spasm of airways smooth muscle; edema of airways mucosa; increased mucus secretion; cellular, especially eosinophilic, infiltration of the airways walls and lastly injury and desquamation of the airways epithelium. (Berkow 1992:646.)

Burney (1986) reviewed the trend in asthma deaths in England and Wales between 1974-84, taking into account changes in the classification of cause of death in 1979. His results showed that mortality rose annually by an average of 4.7% in the 5-34 year age group ($p<0.05$) and the increased mortality since 1974 probably accounted for 408 excess deaths in the 5-64 year age group between 1975 and 1984. He concluded that no satisfactory explanation for this rise in mortality is likely until there is adequate monitoring of the prevalence and severity of asthma.

At present it is estimated that 5 to 10 per cent of the population in industrial countries is affected by asthma. (Bartlette 1991)

In 1987, the number of asthmatics living in the United States of America was 10 million. From 1980 to 1987 the prevalence rates of asthma increased 29%. In addition to the increase in number of asthmatics not only in the United States of America but worldwide, so the mortality from asthma is increasing worldwide. (Berkow 1992:653; British Thoracic Society 1990a)

Treatment for this condition at present consists mainly of a regime of allopathic drugs consisting of Theophylline (a methylxanthine), Corticosteroids, Cromolyn sodium (disodium cromoglycate-DSCG), anticholinergic agents (e.g. atropine and its derivative ipratropium bromide) and B-Adrenergic agents. (Berkow 1992:653.)

It is the opinion of this researcher that the need for an alternative treatment protocol for asthma is required for the following reasons :

i. The drugs being used are not curing but only temporarily stabilising the disease.

ii. The long term effect of the drugs being used in the management of asthma in themselves result in numerous debilitating side-effects.

iii. The financial implication, of long term drug therapy, productive work-hours lost and general well being of society, is vast.

iv. Lastly, the increasing number of asthmatic sufferers and the increasing number of deaths due to asthma are both reflections that the present treatment protocol is inadequate and thus needs revision.

It is therefore possible to suggest that a treatment protocol for asthma may not lie in conventional allopathic treatment but elsewhere.

A small amount of published evidence exists to suggest that several forms of alternative medicine may posess a therapeutic effect in the management of asthma. (Lane and Lane,1991.) Therapies such as acupuncture, massage therapy and chiropractic spinal adjustments have been some of the more popular alternative therapies used by the general public. (Eisenberg et al. 1993.)

This interest in the role of alternative therapy for the treatment of asthma is shared not only by the general public but also by primary care providers and thus an interest in more thorough examination of these modes of therapy exists. (Reilly 1983; Eisenberg et al. 1993.)

To date, descriptive studies and anecdotal reports exist that claim both positive and no clinical effects of manual spinal therapy for asthma. (Hviid 1978; Jamison et al. 1986; Goldman 1969; Masarsky and Weber 1988; Nilsson and Christiansen 1988; Nielsen et al. 1995.)

Nilsson and Christiansen (1988) attained similar results to the 1986 study performed by Jamison et al. (1986). Both reports indicated that there was not enough evidence to suggest that chiropractic adjustments reduce respiratory obstruction in asthma. Nilsson and Christiansen (1988) did, however, demonstrate that some asthmatic sufferers are more likely to gain some benefit from chiropractic treatment than others.

They demonstrated that the age of the patients treated played a significant role in the outcome of the treatment. So too did the severity of the asthma with which the patients presented. It was shown that the less severe the asthma and the younger the age of onset of the asthma, the more favourable the treatment outcome in terms of chiropractic care.

From the above studies by Nilsson and Christiansen (1988) and Jamison et al. (1986) a number of areas regarding their studies need to be addressed :

i. Jamison et al. (1986) treated only the dorsal spine and ribcage. The study neglected to treat the rest of the autonomic nervous system to the airways - via Nervus Vagus (linked to the first 2 cervical segments by proximity) - thus presumably restoring homeostasis to the airways.

ii. The number of treatments given (7) to patients by Jamison et al. (1986) may not have been adequate in treating a chronic disease.

iii. Jamison et al. (1986) neglected to assess the long term effect of their treatment on the asthmatic patients.

In 1995, Nielsen et al. (1995) published a study , once again demonstrating the lack of objective evidence to substantiate the subjective improvement of patients receiving spinal manipulative therapy for the treatment of asthma.

The above knowledge has resulted in this study therefore proposing to investigate the effects of chiropractic treatment of asthma, in terms of the patient's objective physiological response and subjective perception, in order to determine an alternative approach to the treatment of asthma.

The first objective of this study was to determine the patient's objective response to chiropractic treatment in terms of physiological parameters in order to determine the efficacy of chiropractic treatment of asthma.

The second objective of this study was to determine the efficacy of chiropractic treatment in terms of the patient's subjective perception in order to determine how patients experience chiropractic treatment of asthma.

The third objective of this study proposed to integrate the data from the above two objectives in order to determine the efficacy of chiropractic treatment of asthma.

The benefits that will arise from advancing a step closer to establishing an effective treatment protocol for the asthmatic sufferer are far reaching. The asthmatic patient will become able to lead a healthier, less expensive and thus a more productive life-style.

CHAPTER 2

REVIEW OF THE RELATED LITERATURE

2.1 INTRODUCTION

The following is a review of the literature available at present regarding asthma, the physiology thereof pertaining to this dissertation and the current medical and chiropractic trends towards the management and treatment of asthma.

2.2 Medical Background to Asthma

2.2.1 Introduction

Clinically, asthma may be defined as a condition marked by recurrent attacks of paroxysmal dyspnea, with wheezing due to spasmodic contraction of the bronchi. In some cases, it is an allergic manifestation in sensitized persons; in others it may be induced by vigorous exercise, irritant particles or physiologic stress. (Anderson 1989:65.)

Bronchial asthma may also be termed reactive or reversible airway disease and is characterized by episodic wheezing, dyspnea, or cough. Although initial onset may occur at any time of life, it is more frequent during infancy or youth. A past or family history of atopy is also more likely to be found when the onset is early. (Kiss 1982:147.)

Formerly, attention was focused on bronchospasm due to smooth muscle contraction as the main contributor to the airways obstruction. More recently, it is appreciated that asthma, particularly in its chronic form, is truly an inflammatory disease of the airways including not only spasm of the smooth muscles of the airways but also edema of the airways mucosa, increased mucus secretion, cellular, especially eosinophilic, infiltration of the airway walls and lastly injury and desquamation of the airways epithelium. (Berkow 1992:646; Edwards and Boucher,1991:376.)

2.2.2 Aetiology of Asthma

Clark et al. (1992:7) suggested that increased resistance to airflow may be related to environmental factors, especially inhaled substances in concentrations that do not affect the majority of persons. Such factors may include hyperresponsiveness of the airways to physical and chemical stimuli, specific antigen-antibody reactions, usually to inhaled antigens, and to exercise.

A possible link between air pollution and asthma has resulted in conflicting evidence. Although anecdotally patients complain that polluted air exacerbates their asthma, there has been a general feeling amongst chest physicians in the United Kingdom that air pollution at present levels is not a major factor in either the aetiology of asthma or as an aggravating factor. Very few studies have been done in the United Kingdom over the last 10-15 years on a possible relationship between air pollution and asthma. (Wardlaw 1993)

Wardlaw (1993) emphatically states that, in contrast to the above, epidemiological studies have clearly demonstrated an adverse effect of air pollution on asthma but has not been able to identify causative agents with any certainty. Sulphur dioxide, inhaled by asthmatics, has been shown to cause a significant degree of wheezing at concentrations considerably lower than those which affect non asthmatics. Ozone may result in impairment of lung function at concentrations frequently detected in air with evidence of an increased effect on asthmatics.

Ozone can also cause an increase in airways responsiveness to both non-specific bronchoconstrictors and specific allergens. It is thus implicated both in exacerbating asthma through increased airway responsiveness and causing asthma through triggering an inflammatory reaction in the airways. Laboratory studies, while raising the level of suspicion and allowing dose-response curves to be calculated, cannot accurately mimic the effects of real air pollution with its combination of interacting circumstances and effects of prolonged exposure. (Kiss 1982:148.)

Factors known to precipitate bronchial asthma are specific inhaled antigens, environmental pollutants, infection, heat or cold, exercise, physical or psychological stresses and drugs such as aspirin, indomethacin, popranolol and aerosolized cromolyn. Acetyl cysteine and pituitary snuff can sometimes cause bronchospasm. Bronchospasm can occur in acute systemic drug reactions. The bronchospasm induced by exercise has been shown to be related to drying of the airways. (Kiss 1982:148.)

Bronchospasm can also be caused by occupational exposure to particles of cotton, clothing, rubber or plastic or to metals such as nickel, cadmium or platinum. Baker's flour and enzyme laundry detergents have also been implicated. (Kiss 1982:148.)

Due to the number of causative agents which trigger off the asthmatic reaction, Clark et al.(1992) suggest that it is useful to recognize certain categories, governed by certain criteria, into which asthmatic patients may be categorized. He further suggests that these categories display the current state of knowledge of the field of asthma. These categories are as follows :

2.2.2.1 Extrinsic atopic asthma :

This group of asthmatic sufferers may be classified as individuals who readily form IgE antibodies to commonly encountered allergens. (Clark 1992:7; Edwards et al. 1991: 376.)
The susceptibility of these individuals to develop IgE antibodies as a result of minor exposure to common environmental antigens is presumably genetic. (Clark 1992:7.)

Family and twin studies show that atopy, as assessed by total serum IgE, is under strong genetic control, although its mode of inheritance is unclear. (Sibbald 1992:23.)

Allergens causing asthma in atopic patients more than not enter the bronchi with inspired air and are derived from organic materials such as pollen, mite-containing house dust, feathers, animal dander and fungal spores. Due to previous exposure to these agents and the formation of IgE, an anaphylactic antigen-antibody reaction in the bronchi may occur on further exposure to a specific allergen, resulting in bronchial constriction and an inflammatory reaction of allergic type in the bronchial wall. To a lesser degree similar effects may be caused by ingestion of allergens which presumably reach the bronchi via the bloodstream. (Edwards et al. 1991:376-377.)

2.2.2.2 Extrinsic non - atopic asthma :

Reactions between inhaled antigens and antibodies of sorts other than the IgE type, associated with atopy, play a role. In other words it refers to the type of asthma associated with other types of hypersensitivity reaction to inhaled antigens excluding IgE-mediated reactions. (Clark 1992:8.)

2.2.2.3 Cryptogenic asthma :

In some cases, patients showing the defining characteristics of asthma have no evidence of the recognizable hypersensitivity reaction. Among these patients with cryptogenic asthma, a group may be identified, based mainly on clinical features such as non-seasonal incidence, possibility of onset without previous respiratory symptoms at any age, in some a high but usually variable eosinophilia in blood and bronchial secretions and these patient usually display dramatic response to corticosteroids but not any other therapeutic measure. This group of patients is thus referred to as having "intrinsic asthma". (Clark 1992:8.)

2.2.2.4 Exercise-induced asthma :

Onset of asthma following strenuous exertion results in the classification of this group of asthmatics. This classification may cover a large percentage of asthmatics as airways resistance of some type can be seen in all types of asthma patients subjected to exertion. (Clark 1992:9; Edwards et al. 1991:377.)
More recently, investigation during exercise sessions has revealed that airway obstruction may occur during long exercise sessions of 20 minutes or more as well as during the recovery period.(Suman et al. 1995.)

2.2.2.5 Asthma associated with chronic bronchopulmonary disease:

The largest percentage of patients composing this group may be classified as having chronic obstructive bronchitis. (Clark 1992:9.)

2.2.2.6 Others :

Other categories of asthma are sometimes mentioned, such as nocturnal asthma but this classification may be redundant because sleep disturbance is a feature of asthma and therefore does not warrant a separate category. (Clark 1992:10.)

2.2.3 Diagnosis , Symptoms and Signs of Asthma

Although the onset of asthma may occur at any time of life, it is more frequent during infancy or youth, and may occur as early as the first few weeks of life. Particularly in infancy, the first attack usually is associated with a lower respiratory tract infection or bronchiolitis. As age increases, there is a progressively greater tendency for initial and subsequent episodes to be associated with inhalant allergens or irritants. (Pearlman et al. 1993:952.)
The initial inciting event appears to render the tracheobronchial tree more susceptible to reactions to both similar and unrelated precipitants.
(Kiss 1982:147-148; Pearlman et al. 1993:952.)

The symptoms of each asthmatic sufferer differ greatly in frequency and degree. Some asthmatics are symptom free most of the time, with an occasional episode that is mild and brief. Others have mild coughing and wheezing much of the time, punctuated by severe exacerbations of symptoms following exposure to known allergens, viral infections, exercise or non-specific irritants.

Psychologic factors, particularly those associated with crying, screaming or hard laughing, may precipitate symptoms. (Berkow 1992:647.)

An itch over the anterior neck or upper chest, especially in children, may be an early prodromal symptom and dry cough, particularly at night and with exercise, may be the sole presenting symptom. However, an attack usually begins acutely with paroxysms of wheezing, coughing and shortness of breath or insidiously with slowly increasing manifestations of respiratory distress . In either case, the asthmatic usually first notices dyspnea, tachypnea, cough, and tightness or pressure in the chest and may even notice audible wheezes. The episode may subside quickly or persist for hours to days. (Berkow 1992:647.)

On physical examination various signs and symptoms may present during an acute, severe or a prolonged attack. These may include the following :

* A distressing cough, generally nonproductive of mucus during the acute attack. Except in young children, who rarely expectorate, tenacious mucoid sputum is produced as the attack subsides. (Berkow 1992:647-648; Pearlman et al. 1993:952-953.)
* Dyspnea, increasing prolongation of expiration, high-pitched rhonchi and wheezes throughout the chest, diminishing in intensity as the obstruction becomes more severe, may all be present. (British Thoracic Society 1990a:797.)
* Tachycardia and tachypnea are often noted. (Berkow 1992:647-648; Pearlman et al. 1993:952-953.)
* Flushed moist skin, pallid cyanosis and dry mucous membranes. Because of sweating and increased insensible water loss from the lungs secondary to tachypnea, variable degrees of dehydration may occur during prolonged episodes. (Berkow 1992:647-648; Pearlman et al. 1993:952-953.)

* The asthmatic may present with restlessness, apprehension, fatigue, drowsiness and even coma. (Berkow 1992:647-648; Pearlman et al. 1993:952-953.)
* The use of accessory muscles of respiration may be pronounced and the asthmatic may appear to struggle for air. (Hoag 1972:698-706.)
* In more severe episodes speech may be impaired due to the inability to speak without stopping every few words for a breath of air. Cyanosis becomes evident as the attack worsens. Confusion and lethargy may indicate the onset of progressive respiratory failure with carbon dioxide narcosis. (Berkow 1992:647-648; Pearlman et al. 1993:952-953.)

Asthmatic patients present with the following laboratory findings during examination :
* Eosinophilia - in blood or sputum is common regardless of whether allergic factors can be shown to have an etiologic role. Their presence tend rather to reflect disease activity. In many asthmatics, the degree of eosinophilia may correlate with the asthma's severity.

Eosinophils, however, may be absent in the presence of infection or when corticosteroids are given.
* Pulmonary function tests, using a spirometer, are valuable in differential diagnosis and in known asthmatics to assess the degree of airways obstruction. (Berkow 1992:647-648; Pearlman et al. 1993:952-953; Brewis 1977:687.)

Care must be taken not to misdiagnose asthma with other conditions that may mimic it. Patients presenting with asthma like symptoms may not have asthma but obstruction of the extrathoracic airway. Chronic disease of the upper respiratory tract, such as post nasal drip, laryngitis or sinusitis, may account for asthma like symptoms, especially coughing and wheezing. (Bucca et al. 1995.)

2.2.4 Physiological Parameters

2.2.4.1 Introduction

To confirm the acceptability of lung function tests, the measurement and evaluation techniques include the question of controls. Because measurements of ventilatory function are dependent on age, height, sex, race and other factors, all these parameters should be considered in any interpretation. Lung function tests are therefore evaluated by using the subjects as their own control or comparing the subjects with a "normal population". However, according to the American Thoracic Society, using subjects as their own control gives better sensitivity than comparison with the normal population. (American Thoracic Society 1982:954.)

2.2.4.2 Forced Expiratory Volume in 1 Second (FEV1) and Forced Vital Capacity (FVC)

Tai (1978) in his study on the diagnosis of asthma in the adult , discussed the importance of simple lung function tests such as forced expiratory volume in 1 second (FEV1) and vital capacity (VC) to be as follows :

* The severity of asthma can be precisely quantified. While any large change in the severity of the asthmatic condition can be readily detected by clinical assessment, smaller changes are usually demonstrable only by lung function tests.
* Lung function tests are useful for assessing the response to bronchodilators and steroids.
* Pulmonary function tests can detect early relapse of asthma.
* Serial lung function tests, which the patient can perform unsupervised, may help confirm severe nocturnal asthma or occupational asthma.

In addition to the above, Woolcock et al. (1986), in their study of the effect of asthma on the rate of decline of lung function, concluded that spirometry (including FEV1 and FVC measurements) is useful in monitoring asthmatic patients at all lung function levels. This view was further enhanced by Pride (1992) who stated that if relatively large changes in airway calibre are being followed (as found in asthmatic patients) measuring the FEV1 is often all that is required.

Kiss (1982) suggested that the clinical response of asthma should be gauged by not only the disappearance of the wheezing but more accurately by the normalization of the forced expirogram. This can be simply done in the office by following the FEV1 and FVC. This was further emphasized by Adelroth et al.(1986) who stated that despite physicians knowledge and experience in the field of asthma, an objective measurement of airways responsiveness is required for an accurate diagnosis and evaluation of the progression of the condition.

2.2.4.3 Sputum Eosinophil Levels

The eosinophil granulocyte in its activated state is a secretory cell. If extracellular release of its granule constituents of cytotoxic compounds takes place, this leads to damage of the surrounding cells. This can be of benefit if the target is an unwanted element such as a parasite but it aggravates or creates tissue lesions in other inflammatory disease states. (Dahl et al. 1992:121.)

In asthma, eosinophils are numerous in the inflammatory infiltrates, and damage to the epithelium and mucosa of the bronchi can be caused by toxic eosinophil-derived proteins. For the treatment of asthma it seems important to concentrate efforts to control the eosinophil.
(Dahl et al. 1992:121.)

Numerous authors have stated that there exists an important association between eosinophils and allergy, asthma and other respiratory illnesses.(Honsinger et al. 1972; Burrows et al. 1980; Brown 1958.) Like other leukocytes, the eosinophil participates in the inflammatory response associated with asthma, as its phagocytic properties and enzymatic contents show. (Honsinger et al. 1972.)

The association of blood eosinophilia and asthma is a consistent finding, even when the patient shows no sensitivity to inhaled allergens by skin test or inhalation challenge as in intrinsic asthma.(Honsinger et al. 1972.) Eosinophilia of chronic asthma may serve to contain the disease locally but in doing so mediates bronchial damage. (Luksza and Jones,1982.)

The above concept by Honsinger et al. (1972) was further enhanced by Bousquet et al. (1990) in their study on eosinophilic inflammation in asthma. They found a significant correlation between peripheral blood eosinophil counts and the severity of asthma, according to either the Aas score or FEV1. In addition to the correlation between peripheral blood eosinophil counts and the severity of asthma, Bousquet et al. (1990) also demonstrated a slight but significant correlation between eosinophil counts in bronchoalveolar-lavage fluid and the severity of asthma.

As discussed above, it may be clear to see that a significant link exists between the eosinophil and asthma, more so the inflammatory process of asthma. This link may be seen by the correlation of blood eosinophilia and asthma.
(Burrows et al. 1980; Honsinger et al. 1972.)

The asthma-eosinophil correlation may also be seen by the levels of eosinophils detected in bronchoalveolar-lavage fluid and sputum and this correlation has been ascribed as being of more value than blood eosinophil counts.
(Bousquet et al. 1990; Brown 1958.)

An interesting finding made by Brown (1958) was the correlation between the affect of prednisolone and the eosinophil count in the sputum. Whether sputum eosinophil levels have any significant baring on the chiropractic care of asthmatic patients has yet to be established.

2.3 Medical Treatment of Asthma

Due to the diverse nature of asthma, it may be stated that the management of asthma must be individualized for each patient and circumstance. Milder cases may be controlled by maintenance of good general health, hydration and avoidance of known precipitating factors. (Kiss 1982:151; Pearlman et al. 1993:954.)

Cessation of smoking and avoidance of environmental pollutants as much as possible are basic for all asthmatics. Maintenance of clean, temperate and properly humidified air in sleeping areas is essential. Thus many asthmatics may be managed without long-term medication provided they are correctly educated in terms of their condition. (Kiss 1982:151; Pearlman and Comer, 1993:954.)

Some patients, however, require periodic or long term medication. This may either be determined by their recurrent symptoms, by wheezing or by persistence of an abnormal forced expirogram.

Berkow (1992) suggests five useful groups into which drug therapy for asthma may be divided :

1. **Beta-Adrenergic agents** cause bronchial smooth muscle relaxation and modulate inhibition of mediator release, at least in part by stimulating the adenylate cyclase-cAMP system. They also protect against challenge with various bronchoconstrictor substances and may inhibit microvascular leakage into the airway.
Adverse effects to **Beta-Adrenergic agents** are dose related ; they are more common after oral than aerosol administration because of the manyfold higher dose required for oral drugs. Sustained-release (SR) oral formulations help to prevent nocturnal asthma.

2. **Theophylline (a methylxanthine)** relaxes bronchial smooth muscle. Its mechanism of action is unclear but theophylline appears to inhibit intracellular release of calcium, decrease microvascular leakage into the airways mucosa, inhibit the late response to allergens and may inhibit mast cell release of chemical mediators. It does not inhibit mediator release from eosinophils and neither prevents bronchial hyperresponsiveness following allergen challenge nor decreases bronchial hyperresponsiveness in asthma after long term use.
Theophylline is a valuable adjunct to adrenergic drugs for management of acute episodes, especially in patients who do not respond to optimal aerosol bronchodilator therapy. SR theophylline is very useful for management of nocturnal asthma.

3. **Corticosteroids** inhibit attraction of polymorphonuclear leukocytes to the site of an allergic reaction, stimulate synthesis of Beta 2-receptors and block leukotriene synthesis. Very importantly, corticosteroids, particularly when given by aerosol, block the late response (but not the early response) to inhaled allergens and subsequent bronchial hyperresponsiveness.

With long term therapy, bronchial hyperresponsiveness also gradually decreases. While systemic corticosteroids are exceptionally effective, they are reserved for more difficult episodes because of their potential for adverse effects.

Short term use in high dosage (e.g for 5 to 7 days to abort an attack) is unassociated with significant problems. The new surface-active inhaled steroids are useful for maintenance therapy but not for managing acute episodes, although this is under active investigation.

4. **Cromolyn sodium (disodium cromoglycate - DSCG)**, used prophylactically, appears to inhibit mediator release and reduce airway hyperactivity. DSCG is primarily useful in children and some adults for maintenance therapy only and has no place in treatment of the acute attack. Cost and problems with patient compliance appear to have limited its use in the USA. It is the safest of all drugs used to treat asthma.

5. **Anticholinergic agents** (e.g. atropine and its derivative ipratropium bromide) block cholinergic pathways that cause airways obstruction. They may provide added bronchodilator effect in patients who have already received inhaled Beta 2-agents for acute asthma . The role of anticholinergics in day-to-day treatment has not been defined.

2.4 Innervation of the Lungs

2.4.1 Introduction

The portion of the nervous system that controls the visceral functions of the body is called the autonomic nervous system. This system is activated mainly by centres located in the spinal cord, brain stem and hypothalamus. The autonomic signals are transmitted to the body through two major subdivisions called the sympathetic and parasympathetic systems. (Guyton 1991:667; Moore 1985:46-47.)

The subdivision of the autonomic nervous system into sympathetic and parasympathetic components, is both anatomic and physiological in nature. That is, the anatomic arrangement or configuration of the two subsystems helps to group or categorize some of their characteristic actions, which in terms of physiologic effect tend to complement each other. Both systems serve the end of homeostasis and their opposition is essential for ultimate balance within the body. (Cole 1969:38.)

2.4.2 Parasympathetic and Sympathetic Innervation of the Lungs

The vagus nerve is attached by eight or ten rootlets to the medulla oblongata, below the glossopharyngeal nerve, in the groove between the olive and the inferior cerebral peduncle. The fibres of the vagus nerve are connected to four nuclei in the medulla oblongata, viz. dorsal nucleus, nucleus ambiguus, nucleus of the tractus solitarius, and spinal nucleus of the trigeminal nerve. The rootlets of the nerve unite and form a flat cord which passes below the flocculus of the cerebellum to the jugular foramen, through which it leaves the cranium. (McMinn 1994:572,638.)

In emerging through this opening, the vagus nerve is accompanied by and contained in the same sheath of dura and arachnoid mater as the accessory nerve. In this situation the vagus nerve presents a well-marked enlargement, named the superior ganglion. (McMinn 1994:564.)

After its exit from the jugular foramen the vagus nerve enlarges into a second swelling, named the inferior ganglion which lies anterior to the anterior arch of the first cervical vertebra. The vagus nerve then passes vertically down the neck within the carotid sheath, lying between the internal jugular vein and the internal carotid artery as far as the upper border of the thyroid cartilage and then between the same vein and the common carotid artery to the root of the neck. Here the course of the nerve becomes different on the two sides of the body. (McMinn 1994:564; Moore 1985:130.)

The vagus nerve gives off a number of branches in the thorax. The anterior pulmonary branches, two or three in number and of small size, are distributed on the anterior aspect of the root of the lungs. They join with filaments from the sympathetic trunk and form the anterior pulmonary plexus. (McMinn 1994:286; Moore 1985:130.)

The posterior pulmonary branches, more numerous and larger than the anterior, are distributed on the posterior aspect of the root of the lung. The vagus nerve passes behind the right principal bronchus to reach the posterior aspect of the root of the right lung and there breaks up into posterior pulmonary branches, which unite with filaments from the second to fifth or sixth thoracic sympathetic ganglia to form the right posterior pulmonary plexus. Behind the root of the left lung the Vagal nerve divides into posterior pulmonary branches, which unite with filaments of the second, third and fourth thoracic sympathetic ganglia and form the left posterior pulmonary plexus. (McMinn 1994:286.)

From the plexuses, nerves pass into the lung to form networks around the branches of the bronchi and the pulmonary and bronchial vessels, extending as far as the visceral pleura. On these nerves, near the hila of the lungs, there are minute collections of nerve cells with which the efferent preganglionic vagal fibres synapse. The efferent vagal fibres are bronchoconstrictor, secretomotor to the mucous bronchial glands and vasodilator in function. The efferent sympathetic fibres are bronchodilator and vasoconstrictor.
(Pick and Howden 1980:1133.)

Whether a subluxation of the upper cervical vertebrae can result in direct stimulation of the vagus nerve has still to be established.

The functioning of the autonomic system in asthma is aptly summarised by Kiss (1982) as follows :

1. The bronchial airways are regulated by the autonomic nervous system, with parasympathetic or vagal activity producing bronchial smooth muscle contraction and sympathetic activity producing relaxation.
2. Bronchospasm occurs when parasympathetic tone exceeds sympathetic tone.
3. Vagal activity is mediated by acetylcholine on the receptor.

This increases intracellular guanosine 3': 5'-cyclic monophosphate (C'GMP) production, which produces contraction. Norepinephrine on the alpha receptor is similarly mediated.

4. Sympathetic nerve fibers release epinephrine or isoproterenol, which in turn increases formation of cellular adenosine 3': 5'-cyclic monophosphate (C'AMP) and produces muscle relaxation.

C'AMP is derived from adenosine triphosphate (ATP) and its breakdown is catalyzed by phosphodiesterase.

5. In the atopic individual, specific antigens may react with IgE antibody bound to the cell surface of sensitized bronchial basophils or mast cells, causing the release of mediators such as eosinophil chemotactic factor (ECF-A). These mediators in turn stimulate the smooth muscle cholinergic receptors.

2.5 Chiropractic and Asthma

2.5.1 Introduction

The question of whether chiropractors or other practitioners can alleviate or cure certain diseases of internal organs by somatic manipulation is fraught with controversy. Even though it is a central belief of chiropractic philosophy that treatment is not given per se for any disorder directly, many, if not most chiropractors, report anecdotally that patients with many types of visceral disorders often improve under their care. (Dhami and DeBoer 1980:115; Hviid 1978.) Whether this is due to the manipulation or the natural history of the disease, is not clear.

2.5.2 How can chiropractic work ?

The rationale for the spinal intervention in the management of visceral conditions is based upon empiricism; that is, it is based on practical experience, rather than on scientific evidence provided by randomised controlled studies. (Jamison et al. 1992.)

Korr (1978:229) makes mention that a large though scattered body of clinical and experimental literature that gives the distinct impression of a significant, often critical sympathetic nervous system component as a common feature in a large variety of syndromes exists. Chronic hyperactivity of the innervating sympathetic pathways seems to be a prevailing theme in many clinical conditions, involving many organs and tissues. He fails, however, to mention any of the relevant literature.

Long-term exposure to osteopathic theory and practice as well as research experience in related fields has led Korr (1978) to the following hypotheses :

* Long-term hyperactivity of particular sympathetic pathways is deleterious to the target tissues and may indeed have a rather general clinical significance.

* Clinical manifestations are determined by the organs or tissues which are innervated by the hyperactive sympathetic neurons, each responding in its own way, even to the sympathetically induced vasoconstriction that may be a common factor.

* The high impulse traffic in selected sympathetic pathways may be related to musculoskeletal dysfunction, especially in the spinal and paraspinal area.

With respect to the above hypotheses proposed by Korr (1978: 229-230), he does not go into any detail to explain what he is implying by "a rather general clinical significance".

A number of osteopathic studies have stated that various vertebral lesions in animals can markedly affect the circulation in several important glands and organs and may thus result in associated microscopic pathologies and degenerative abnormalities. The mechanism is explained by way of a vertebral lesion affecting the circulation of the various organs through the sympathetic nerves that control tone of the blood vessels, especially those of the viscera. These somatosympathetic pathways become routes for aberrant neural transmission when they are affected adversely by spinal fixation. (Leach 1986:142.)

Although conservative medicine accepts the importance of the autonomic nervous system in achieving body homeostasis, it has yet to come to terms with the notion that the spinal joint fixation can deleteriously influence normal body reflexes with predictable results. (Korr 1978:230.)

Homewood (1963:185) discusses the possibility of upper cervical vertebral disfunction causing Vagal nerve interference as follows. He states that the subluxation of an upper cervical vertebral segment disturbs the arterial supply to and the venous drainage from the corresponding nerve trunk, nerve roots and neuromeres. He adds that such disturbance of vascularity and nutritional status involves the upper neuromeres and the more distal portion of the medulla oblongata, thereby altering the irritability of the components. Superimposed upon these deleterious influences, he adds that there is the addition of unbalanced proprioceptive impulses and noxious neural signals from the involved somatic structures. He (Homewood 1963:185) therefore strongly suggests that there can be little reason to doubt the likelihood that the controlling neuronal pools for visceral structures, located in the grey matter of the medulla, are caused to react in a manner productive of functional aberrations in the visceral structures supplied.

Homewood (1963:185) goes on to explain that the intimate relation of the cells of the Nucleus of the Spinal tract of the Trigeminal nerve with the fibres conducting noxious impulses into the cord by way of the posterior nerve roots of the upper cervical nerves and the intimate connection that exists between this nucleus and the Dorsal Nucleus of the Vagus facilitates the disturbance of Vagal function.

He believes that through such neural connections and the alterations of irritability created by the fixations, the possibilities of visceral symptoms become very real and probable. He concludes that coupled with the clinical evidence there can be little doubt of the pernicious influence of the cervical subluxation upon visceral control by the vagus nerve. (Homewood 1963:185-186.)

On several occasions in this particular chapter of his book, Homewood (1963:185) makes mention of clinical evidence available to substantiate the contention that cervical subluxations result in inimical functions of the organs and structures supplied. However, none of the specific clinical evidence is quoted, let alone any scientific evidence.

Korr (1978:137-177) explained the clinical implications of nerve interference as any factor that causes derangement of transport mechanisms in the axon or that chronically alters the quality or quantity of the axonally transported substances could cause the trophic influences to become adverse and detrimental. This in turn would produce aberrations of structure, function and metabolism, thereby contributing to dysfunction and disease.

He went on to define a number of these derangement factors to be compression, irritation, stretching, angulation or even torsion of nerve or roots, thereby resulting in a disturbance of the intra-axonal transport mechanism, intraneural microcirculation and the blood-nerve barrier. He states that it can therefore be seen how vulnerable the neural structures are to deformation, due to their anatomical relation with highly mobile joints, bony canals, intervertebral foramina, fascial layers and tonically contracted muscles.

He concludes by remarking that many of these biomechanically-induced deformations may be subject to correction by manipulation.

The other important factor discussed by Homewood (1963:187) is the presence, or absence, of fixations lower in the spine that may influence the sympathetic supply to the same viscus.

As an example Homewood suggests that symptoms from excess vagal stimulation may be exaggerated in the event that the sympathetic supply has been decreased as a result of a chronic thoracic fixation or the symptoms would be less severe were the sympathetic signals reaching the viscus normally or in excess.

Should the subluxation in the upper thoracic segments occur, resulting in an inhibition of normal sympathetic impulses through the pulmonary plexus, then vasodilation, bronchial constriction and over-activity of the mucous glands are likely responses, being the symptoms in catarrhal complexes and asthma. These are also the symptoms of over-activity of the parasympathetic system whose fibres are distributed to the respiratory structures. (Homewood 1963:205.)

Such conditions may result from upper cervical subluxations disturbing vagal function, or combinations of thoracic and cervical subluxations, which is perhaps the more common circumstance . (Homewood 1963:184-213.)

In his case study on the "Correlation of somatic dysfunction with visceral disease", Nicholas (1975) concludes that the data demonstrated a more than inconsequential correlation between somatic dysfunction and visceral disease.

A grand total of 286 patients were examined, with 73 separate disease entities being seen and classified into the following systemic groupings: respiratory disease, cardiovascular disease, gastrointestinal disease and genitourinary disease. Somatic dysfunction at the different spinal levels was noted for each system. With regard to Nicholas' conclusion, the question of cause and effect has to be considered. Nicholas (1975) tries to establish the fact that there is a correlation between somatic dysfunction and visceral disease but he does not suggest which was a consequence of the other. Did the somatic dysfunction cause the visceral disease or was the somatic dysfunction as a result of a chronic visceral disease?

Gitelman and Fitz-Ritson (1984) categorized subluxation-related visceral disorders into four groups :

i. Vertebrogenic disorders with reflex changes which mimic visceral pathology.

ii. Acute visceral disorders which facilitate the development of associated spinal subluxations. Correction of subluxations constitutes symptomatic treatment; curative therapy needs to be directed at the visceral condition.

iii. Chronic visceral disorders in which viscerosomatic reflexes are subject to prolonged and repeated stimulation. Established pain patterns persist even after disorder has been corrected.

iv. Chronic subluxations which, via their reflex pathways, are postulated to create an environment in which organ susceptibility to disease is enhanced. Persistent vertebrogenic lesions, via reflex pathways, are deemed to reduce the resistance of viscera to environmental insults.

Gitelman and Fitz-Ritson's (1984) theories seem feasible but that is exactly what their postulations are: theories. They fail to provide any scientific evidence to substantiate their claims.

The hypothesis underlying chiropractic intervention in visceral disorders is based upon the proposition that spinal adjustment can modify autonomic nervous system balance and/or activity. Bony subluxations are believed to affect somato-somatic, somato-visceral, viscero-somatic and viscero-visceral pathways. (Faucret et al. 1980.)

The existence of a somatoautonomic reflex has been repeatedly demonstrated in animal experiments and the notion that somatosympathetic pathways may become routes for aberrant neural transmission when adversely affected by spinal subluxation is familiar in chiropractic and osteopathic literature. (Leach 1986:141-142; Sato 1980:93.)

2.5.3 Current Research

A small amount of published evidence exists to suggest that several forms of alternative medicine may possess a therapeutic effect in the management of asthma. (Lane et al. 1991.)
Therapies such as acupuncture, massage therapy and chiropractic spinal adjustments have been some of the more popular alternative therapies used by the general public.
(Eisenberg et al. 1993.)
After reviewing several controlled trials, Kleijnen (1991) concluded that acupuncture as a management protocol for asthma is not much better than placebo and thus does not lend substantially to the treatment of asthma. Yoga, as an alternate treatment modality, has been shown to reduce bronchial hyperresponsiveness. (Nagarathna and Nagendra, 1985; Singh et al. 1990.)

This interest in the role of alternative therapy for the treatment of asthma is shared not only by the general public but also by primary care providers and thus an interest in more thorough examination of these modes of therapy exists. (Reilly 1983; Eisenberg et al. 1993.)

Contrary to these findings, Canadian chiropractors have adopted a slightly more conservative stance regarding chiropractic being able to cure disease, stating that these claims originated in the United States. In addition to this, Canadian pediatricians have voiced concern that these claims by chiropractors is a ploy to attract more paediatric patients. (Lowry 1995.)

An Australian survey conducted in 1985 by Donnelly et al. (1985) showed that just under half of asthmatic families had consulted non-medical practitioners, of which the majority were made up by chiropractors.

All the above leads one to believe that there could be substance to the role of chiropractic in the management of asthma.

As far back as 1925, Murphy and Wilson (1925) performed a study on patients, trying to establish the value of osteopathic manipulative therapy in asthmatic bronchitis. All 20 patients chosen for the study were chronic asthmatics. All had failed to respond to the prescribed treatment protocols at the time and had responded only minimally to adrenalin injections.

The investigators made the assumption that osteopathic lesions existed at the fourth and fifth dorsal levels (the levels presumed to supply the bronchial tubes sympathetically). These patients were treated with from 10 to 70 osteopathic manipulations.

Of the 20 patients treated, 15 experienced at least some degree of temporary relief while the remaining 5 reported no change. Six of the 15 who reported relief of symptoms were as much as 90 to 100 % improved and another 4 reported between 50 and 75 % improvement. Although the authors themselves drew no conclusions, it may be worthy to note that treatment of the spinal area segmentally associated with the visceral disturbance resulted in significant results in 75 % of the patients on whom previous medical treatment had failed.
More current osteopathic research has indicated that manipulative treatment can limit the frequency and severity of respiratory disease. (Allen and Kelso 1980.)

Jamison et al. (1986) performed a pilot study, using 15 asthmatic patients, to ascertain the adequacy of subjective evaluation of the patient's clinical response and to determine whether chiropractic care alters respiratory function, using both subjective and objective indices to monitor the patients.

Their objectives were as follows :
i. To determine whether subjective assessment adequately monitors the progress of ambulatory asthmatics.
ii. To determine whether chiropractic adjustments alter respiratory function.
iii. To determine whether chiropractic care constitutes adequate care for certain asthmatics.
iv. Lastly, to determine whether the chiropractor has a role to play as a team member caring for the asthmatic patient.

Each patient in their study received 7 treatments over a 5 week period, 2 treatments in both the first and second weeks and thereafter one treatment per week. The treatment offered to the patients included spinal adjustments and/or soft tissue therapy as indicated, mobilization and spondylotherapy to the thoracic cage.

From their study, they concluded the following :

i. Assessment of the asthmatics clinical status requires more accurate information than can be derived solely from subjective data. They therefore suggested that chiropractors include objective measurements of respiratory function in their patient records.

ii. As a whole they concluded that their study failed to provide sufficient evidence to suggest that chiropractic adjustments reduces respiratory obstruction in asthmatic patients.

Even though their study was inconclusive, a number of problems arise with regards this study :

i. Jamison et al. (1986) treated only the dorsal spine and ribcage. The study neglected to treat the rest of the autonomic nervous system to the airways- via Nervus Vagus (linked to the first 2 cervical segments by proximity) - thus presumably restoring homeostasis to the airways.

ii. The number of treatments given to the patients may not have been adequate in treating a chronic disease.

iii. They did not assess the long-term effect of their treatment on the asthmatic patients.

iv. The subjective assessment of the patients may not have been accurate enough, by limiting them to 3 categories of well being. (Jamison et al. 1986.)

It may be interesting to note that in Nilsson and Christiansen's (1988) retrospective case record study of asthmatic patients receiving chiropractic care, it was concluded that certain patients, namely those young at the time of asthma onset and having a less severe form of asthma, were most likely to obtain a perceived benefit from chiropractic adjustments.

Once again a number of problems arise with regards to this study :

i. No objective measurement of the patients were recorded thus not allowing for conclusive results regarding the patients response to chiropractic care to be reached.

ii. Whether the type of chiropractic treatment given to each patient was the same or did it differ from patient to patient depending on the number of fixations with which they presented was not specified.

Nilsson and Christiansen (1988) concurred with Jamison et al. (1986) that medical treatment at present is the immediate solution for asthmatic sufferers until such a time as more substantial evidence to refute this exists.

Nielsen et al. (1995) published a study, once again demonstrating the lack of objective evidence to substantiate the subjective improvement of patients receiving spinal manipulative therapy for the treatment of asthma.
Questions regarding the sham treatment used in this study as to whether they did or did not have an effect on the different segmental levels may be one of the factors contributing to the inconsistency in results obtained.

2.6 Summary :

From the body of literature above the following conclusions may be arrived at :

* Asthma is a debilitating condition which poses more questions to the physicians than answers and much suffering to the patients.
* The need for a solution to this dilemma is urgently required.
* The possibility for chiropractic care to have a beneficial effect in the treatment of asthma is at hand.

CHAPTER 3

MATERIALS AND METHODS

3.1 THE OBJECTIVES

The first objective of this study proposes to evaluate the patient's objective response to chiropractic treatment in terms of physiological parameters in order to determine to what extent chiropractic treatment impacts asthma.

The second objective of this study proposes to evaluate the efficacy of chiropractic treatment in terms of the patient's subjective perception in order to determine how patients experience chiropractic treatment of asthma.

The third objective of this study proposes to integrate the efficacy of chiropractic treatment in terms of the patient's subjective perception and physiological parameters in order to determine to what extent chiropractic treatment affects asthma.

3.2 THE RESEARCH METHODOLOGY - Methods , Techniques and Measurements

3.2.1 The Sample

The sample of 30 patients entered into the study consisted of asthmatics whose condition had been previously diagnosed by a medical practitioner or asthma specialist more than 6 (six) months prior to their arrival for participation in this study.

Patients had to conform to certain selection criteria before being admitted to the study. Only patients attending the Technikon Natal Chiropractic Clinic were considered for the study. Only patients older than 10 years of age were considered for the study. Patients considered for the study were chronic cases ie. suffering from Asthma, as clinically diagnosed by medical practitioner, for periods exceeding six months. Patients presenting with any other illness that may clinically contribute to their asthmatic condition were not considered for this study. Lastly, only patients who had signed the consent form were allowed to participate in the study.

The sample group was obtained by advertising in the two main local newspapers in Durban (The Natal Mercury and the Daily News) as well as placing pamphlets (Appendix J) in all the pharmacies, health shops and gyms in the greater Durban area. Pamphlets were also placed in the library and on all notice boards at Technikon Natal-Berea Campus. Lastly a few patients entered the programme after learning about it by word-of-mouth.

During the period of the study a total of 34 subjects were interviewed. Of this total number 32 Subjects were admitted into the study, with 2 not completing the treatment. The first of the 2 patients not admitted into the study was referred to a cardiologist due to severe hypertension and cardiac arrythmia. The second patient was not admitted to the study due to the presence of a bronchial carcinoma. The 2 patients who discontinued their treatment did so due to excessive work commitments.

Eight of the thirty patients who completed the study were admitted to the study after responding to the advertisements published in the local newspapers. Seven patients responded to the pamphlets placed at Technikon Natal and eight patients responded to the pamphlets distributed in the greater Durban area. The rest of the patients were admitted to the study after hearing about it from patients who were in the process of or had already completed the treatment period.

3.2.2 METHODOLOGY

The following steps were followed in the execution of this study :

* At the initial consultation, each patient was required to have a full case history taken and undergo a full physical examination as outlined and recorded on the Technikon Natal case history form (Appendix E) and Technikon Natal physical examination form (Appendix F) respectively.

* Once the above was completed, the detailed outline of the treatment period was explained to each patient as follows :

- The entire treatment is subdivided into 3 block periods.

- Each patient would undergo each block period thus making them their own control and their own experiment.
(American Thoracic Society 1982 : 954)
- The first block period would comprise no more than fourteen (14) consecutive working days during which an objective and a subjective baseline of the patients asthmatic condition would be established. The patient would be required to attend the chiropractic clinic on the first (1), the eighth (8) and the fourteenth (14) days of this block period during which they were to complete a Disability Index (Appendix C) as well as undergo spirometry and sputum tests, which were recorded on the data collection form (Appendix H).
- During the first consultation, the patients would be required to, in addition to the above, complete the Asthma Questionnaire (Appendix B).
- The second block period would comprise no more than twenty eight (28) consecutive working days which would commence directly after completion of the first block period.

On the second (2), the sixth (6), the tenth (10), the fourteenth (14), the sixteenth (16), the twentieth (20), the twentyfourth (24) and the twenty eighth (28) days, the patients would be required to attend the chiropractic clinic. On each of these days, the patients would receive chiropractic treatment. Chiropractic treatment will be limited to the application of chiropractic adjustments and soft tissue work only. Chiropractic adjustments will be limited to the upper cervical (C0-C2) and mid thoracic (T2-T7) areas only. Chiropractic adjustments will only be carried out if a spinal fixation(s) are present in the above mentioned areas. Soft tissue work will only be done on the musculature of the back and neck (from the level of T12 cephalid, up to and including the suboccipital musculature).

On the sixth (6), the fourteenth (14), the twentieth (20) and the twenty eighth (28) days of this block period the patient would be required to, in addition to receiving chiropractic treatment, complete a Disability Index (Appendix C) as well as undergo spirometry and sputum tests, which would be recorded on the data collection form (Appendix H). On the twenty eighth (28) day, the patient would be required to, in addition to the above, complete a questionnaire (Appendix B).

- The third block period, called the follow up study, would comprise no more than 4 consecutive weeks. This block period would commence directly on completion of Block 2.

- It was then explained to the patients that they would be randomly divided into 2 groups, the one group receiving a further 4 chiropractic treatments, once per week, while the other group would only be required to attend the chiropractic clinic after 4 weeks, thus receiving no further chiropractic treatment from the completion of Block 2.

- During the last visit to the chiropractic clinic, at the end of Block 3, the patients would be required to complete a Disability Index (Appendix C) as well as undergo spirometry and sputum tests, which would be recorded on the data collection form (Appendix H).

* At the completion of each patients treatment period, the subjective and objective data would be collated, analyzed and interpreted via statistical methods.
The study will consider only the following physiological parameters, in terms of the patient's response:

- Forced Expiratory Volume In 1 Second
- Forced Vital Capacity
- FEV1/FVC %
- Sputum Eosinophil Level

The study will consider only the following subjective factors, in terms of the patient's perception:

- their perception of their general health and their perception of their asthmatic condition measured by means of the Asthma Questionnaire (Appendix B)
- The degree of disability caused by the patient's asthma measured by means of the Asthma Disability Index (Appendix C).

At the completion of the treatment period of the entire patient sample, the data as an entirety would be collated, analyzed and interpreted via statistical methods. The patients perception would be analyzed in order to determine whether the treatment protocol used in this study had any bearing on the way in which the patient viewed their condition, the extent to which their asthma effected their daily lives or the management of their asthma, whilst participating in the study.

The objective parameters would be analyzed in order to determine weather the chiropractic treatment protocol employed during this study resulted in a physiological response which may have been indicative of progression, regression or stagnation of the patients asthmatic condition. These subjective and objective indicators would then be used to develop an alternative approach to the treatment of asthma.

* Once the patients had had the procedure explained to them to their satisfaction, each patient was then required to read and sign the patient informed consent document (Appendix A) .

* On completion of the patient informed consent document (Appendix A) all the patients underwent a cervical spine regional examination which was recorded on a cervical spine regional examination form (Appendix G).

* Any fixation located in the upper cervical (C0-C2) and/or the upper to mid thoracic (T2-T7) region were recorded on the S.O.A.P. notes (Appendix D). These fixations would be appropriately adjusted and the patients would also receive soft tissue therapy, on the designated days discussed above.

* Patients were then instructed in : a) the use of the spirometer (Appendix L) b) the completion of the questionnaires (Appendix B) and disability index (Appendix C) c) the procedures required for sputum testing.

* Spirometrical tests were then performed and the results recorded on the data collection form (Appendix H). A sputum sample was then obtained from the patient and sent to Pillay, McIntosh and Partners laboratory accompanied by a requisition form requesting sputum eosinophil levels (Appendix I). Results of these tests were sent to Technikon Natal Chiropractic Day Clinic and recorded on the data collection form (Appendix H).

* The patients were also instructed to try to maintain their present diet and exercise programmes as closely as possible so as to ensure that these variables remained as constant as possible.

* For ethical and medical reasons the patient's present treatment, via allopathic drugs, was not altered in any way. Patients were, however, required to record the amount of medication being used by themselves during the course of the treatment programme. This information was recorded on the Medication Diary (Appendix K) from the first consultation and was handed back at the end of block 2.

3.2.3 THE ASTHMA QUESTIONNAIRE AND DISABILITY INDEX

Both these documents were compiled by this researcher, as no documents were available which fulfilled the exact requirements of this study. These documents are in use for the first time and have neither been assessed in terms of validity or reliability. The Disability Index was based on the Numerical Rating Scale as discussed by Aker (1995).
The Asthma Questionnaire was not based on any preexisting questionnaire.

3.2.4 THE ADJUSTING TECHNIQUES

The following adjusting techniques were used during this study:
In the C0-C2 area:

* Superior Condyle
* Wrist Action Cervical Break
* Lateral Atlas Index
* Cervical Break
* Thumb Cervical Extension

In the T2-T7 area:

* Thumb Movement: Bench TM
* Combination Movement
* Crossed Bilateral Transverse Pisiform
* Anterior Thoracic Technic

The appropriate adjusting techniques were chosen from the above list according to the nature of the fixations with which the patients presented at each consultation.

All of the above adjusting techniques may be found in States Manual Of Spinal, Pelvic and Extravertebral Technic.
(States 1985:10-230.)

3.2.5 THE PROCESS OF RANDOMISATION (THE FOLLOW-UP STUDY)

For the purpose of the follow-up study patients were allocated either into the treatment group (receiving 4 additional treatments over a 4 week period) or the non-treatment group (not receiving any additional treatments but having to return to the chiropractic clinic after 4 weeks) by virtue of when they entered the study i.e. all patients entering on odd numbers e.g. first, third, fifth, were entered in the non-treatment group; all patients entering on even numbers e.g. second, fourth, sixth, were entered in the treatment group. Non-compliant patients were systematically replaced as and when new subjects entered into the study.

3.3 THE CRITERIA GOVERNING THE ADMISSIBILITY OF THE DATA

* Only such data that has been collected from compliant subjects was admissible and was statistically analyzed .
* This data was collected from the above - mentioned questionnaire and forms .
* Only if the questionnaire and index were completed correctly was their data admissible and statistically analyzed.
* Data collected from non - compliant subjects was not admissible to this study and therefore disregarded .

3.4 APPARATUS USED IN THIS STUDY

Among the advantages of using a spirometer Brewis (1977) lists the following :
* A great amount of information is readily available all at once , such a FVC , FEV1 and others .
* The ease with which the adequacy of forced expiration may be checked . The FEV1 is more reproducible than the Peak Expiratory Flow Rate.
* Most spirometers today are light weight , durable and easy to operate .

The spirometer used in this study was the Micro Medical Pocket Spirometer II (Appendix L).

3.5 THE SPECIFIC TREATMENT OF THE DATA

3.5.1 The first objective :

The first objective proposed to evaluate the patient's objective response to chiropractic treatment in terms of physiological parameters in order to determine whether chiropractic treatment impacted on the treatment of asthma.

3.5.1.1 The data needed

The data needed for the purposes of evaluating this objective would be obtained from physiological tests performed on each patient.

These physiological tests were specific in obtaining the following data :

a. Forced Expiratory Volume in 1 Second
b. Forced Vital Capacity
c. Forced Expiratory Volume in 1 Second / Forced Vital Capacity %
d. Sputum Eosinophil Level

3.5.1.2 The location of the data

Spirometer and sputum test results obtained from patients, during their treatment programmes, were collected at the Technikon Natal Chiropractic Day Clinic.

3.5.1.3 The means of obtaining the data

The data needed for the purposes of evaluating this objective was obtained from physiological tests performed on each patient.

These tests took the form of :

a. Spirometry readings
b. Sputum analysis by Pillay, McIntosh and Partners pathology laboratory.

A simple mathematical calculation was used to establish the FEV1/FVC %.
Each patient was allocated a data collection form (Appendix H) which was updated after every consultation.

3.5.1.4 The treatment of the data

The data obtained regarding this objective was treated by using inferential statistical methods. These methods took the form of Wilcoxon Signed Rank tests and the Mann Whitney U-test. (Daniel 1978:31-36; Steyn et al. 1994:415-421.)

3.5.1.5 Interpretation of the data

The results obtained in 3.5.1.3 were used to draw certain conclusions.

3.5.2 The second objective :

The second objective proposed to evaluate the efficacy of chiropractic treatment in terms of the patient's subjective perception in order to determine how patients experienced chiropractic treatment of asthma.

3.5.2.1 The data needed

The data needed for the purposes of evaluating objective two was obtained from the asthma questionnaires as well as the disability index completed by the patients.

Data regarding the patient's perception of their asthmatic condition and the degree to which the chiropractic treatment influences their perception of their asthmatic condition, was needed.

3.5.2.2 The location of the data

Only the responses from the Asthma Questionnaire and Asthma Disability Index completed by the patient at the Technikon Natal Chiropractic Day Clinic, were used.

3.5.2.3 The means of obtaining the data

The data needed for the purposes of evaluating objective two was obtained from the asthma questionnaires as well as the disability indices completed by the patients.

These questionnaires as well as the Asthma Disability Index were given to the patients as outlined in the methodology. They were then returned to the researcher for analysis and interpretation.

3.5.2.4 The treatment of the data

The data obtained regarding this objective was treated by using frequency tabulations. Graphical techniques were also used.

3.5.2.5 Interpretation of the data

The results obtained in 3.5.2.4 were used to draw certain conclusions.

3.5.3 The third objective :

The third objective of this study proposed to integrate objective one and objective two in order to determine the impact of chiropractic treatment on asthma.

3.6 Statistical Procedures

All of the data required were transferred from each patient's file to spreadsheets on Lotus 123. The information on these spreadsheets was then statistically analyzed using the Statgraphics Plus Version 6 as supplied by Manugistics Inc. All of the statistical analysis was performed at Technikon Natal with the assistance of Mr. Jacques de Klerk. The entire dissertation was typed using Wordperfect 5.1.

CHAPTER 4

THE RESULTS

4.1 Demographic data obtained from the patients' files

Table 1: Patient Age Group Ranges

RANGE	12-21	22-31	32-41	42-51	52-61	62-71	72+
NUMBER OF PATIENTS	7	8	5	5	2	2	1
N = 30	23.3%	26.7%	16.7%	16.7%	6.7%	6.7%	3.3%

Patients' ranged in age from the youngest being 12 years old to the oldest being 75 years old. The majority (20) of the participants in the study were less than 42 years old, while only 10 patients were 42 and older.

Table 2: Division Of Patient Gender

MALE	FEMALE
13 (43.3%)	17 (56.7%)

The sample of this study was made up of 17 female (56.7%) and 13 (43.3%) male participants. This distribution was based on a first-come-first-serve basis of patients complying to the parameters of this study being accepted.

Table 3: Division Of Patient Race

WHITE	INDIAN	BLACK	COLOURED
20 (66.7%)	6 (20%)	3 (10%)	1 (3.3%)

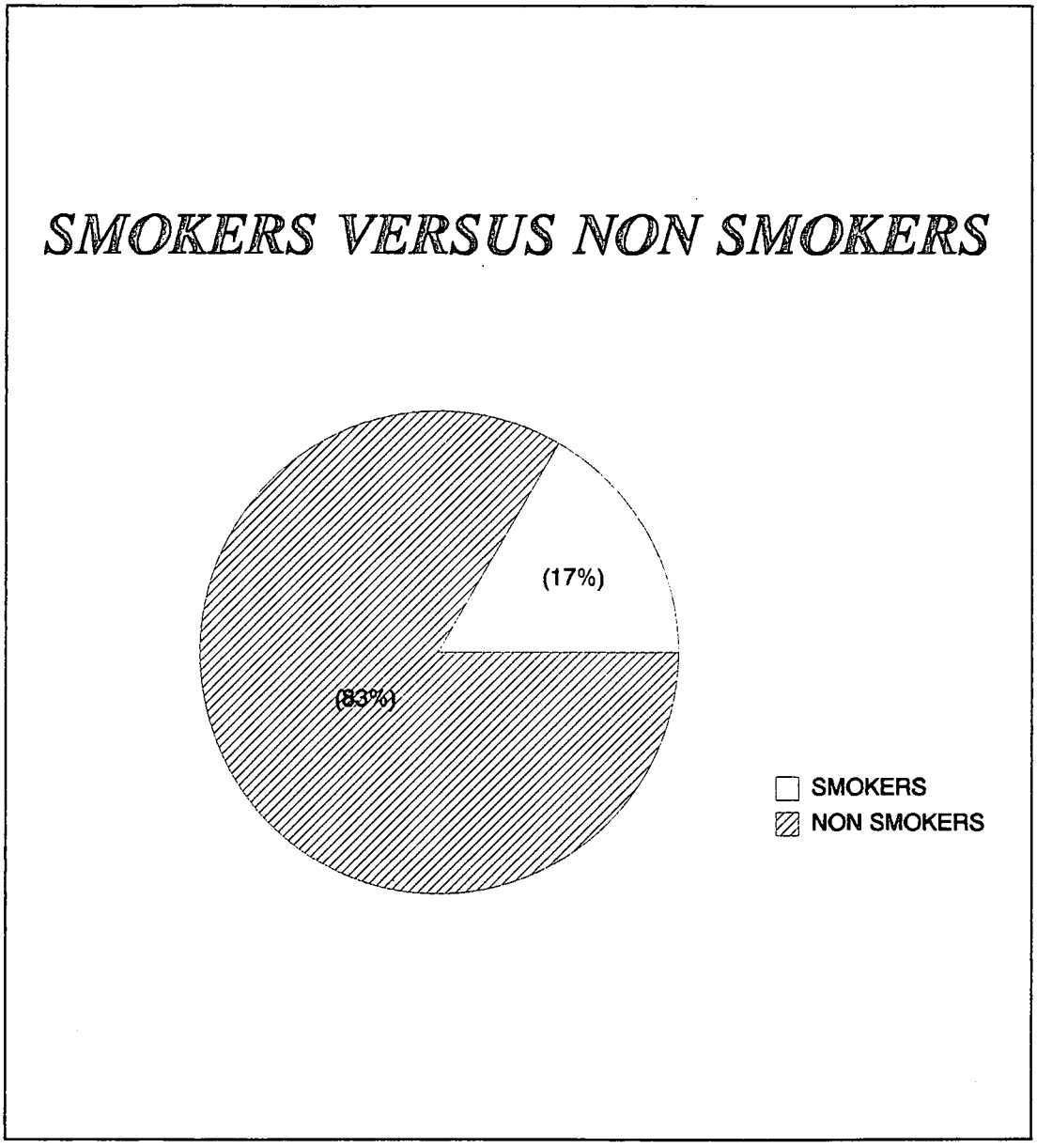
The sample of this study consisted of 20 White (66.7%), 6 Indian (20%), 3 Black (10%) and 1 Coloured (3.3%) patient. This distribution was once again based on a first-come-first-serve basis of patients complying to the parameters of this study being accepted.

Table 4: Patients' Occupation

Occupation	Number of Patients	N = 30
Pensioner	3	10.0%
Scholar	4	13.3%
Home Executive	8	26.7%
Student	5	16.7%
Businessmen	2	6.7%
Telesalesperson	1	3.3%
Teacher	1	3.3%
Musician	1	3.3%
Chemical engineer	1	3.3%
Courier	1	3.3%
Librarian	1	3.3%
Sales manager	1	3.3%
Receptionist	1	3.3%

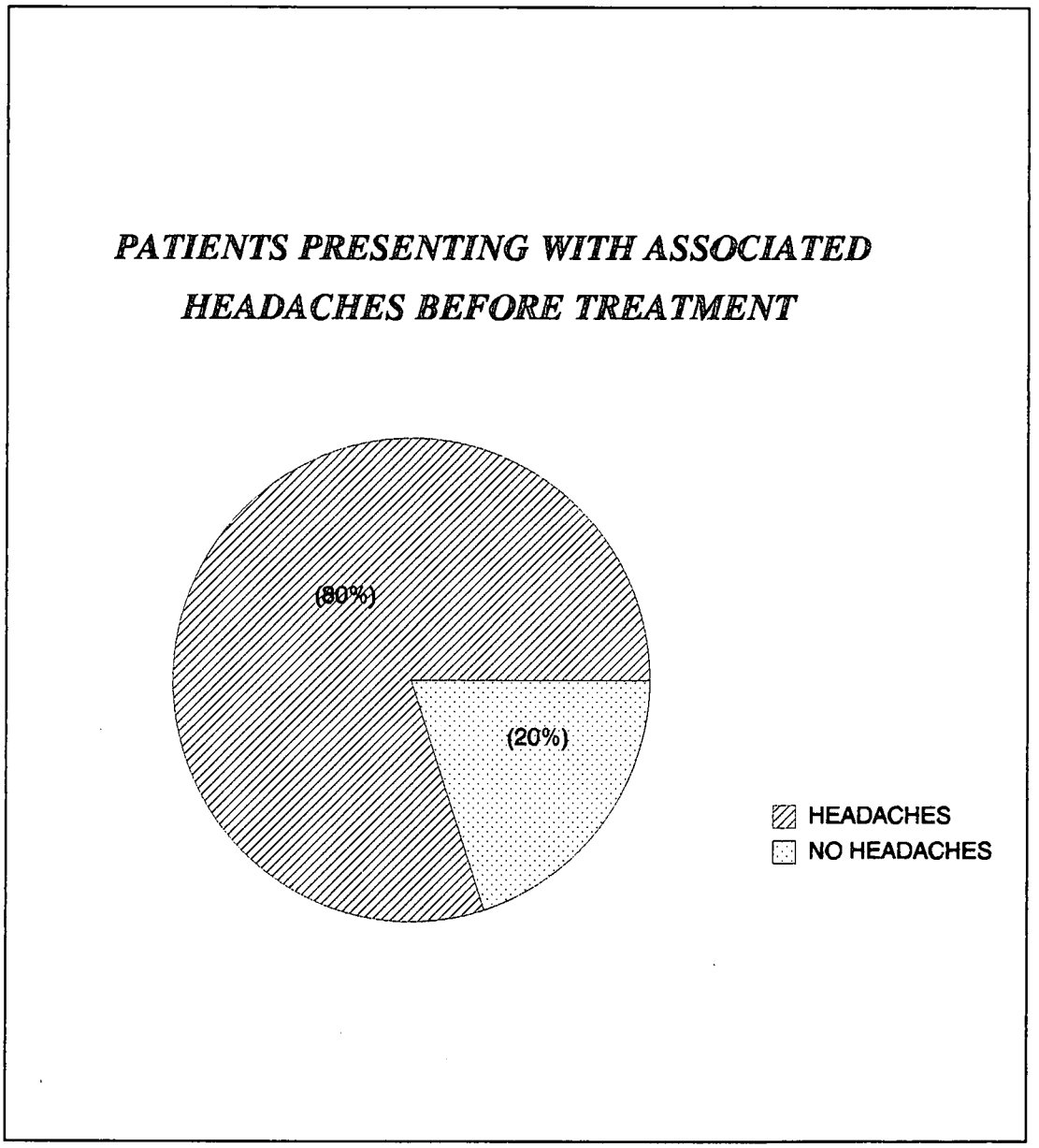
Of the sample group, 8 (26.7%) listed their occupation as being home executives, 5 (16.7%) as students, 4 (13.3%) as scholars and 3 (10%) as pensioners. These 4 occupations accounted for 66.7% (20 patients) of the sample group. The remainder of the group consisted of a variety of different occupations all of which are listed in Table 4.

Diagram A:



Of the 30 patients who took part in the study, 5 were smokers (Diagram A). Although this variable may influence the asthmatic condition of the patients concerned, they were not asked to refrain from smoking in order not to change any preexisting variable, thus ensuring that any changes noted in their asthmatic condition could be deduced to have been as a result of the chiropractic care and not other external agents. Three of the 5 smokers made up part of the treatment group of the follow-up study while the remaining 2 smokers formed part of the non-treatment group of the follow-up study.

Diagram Ba :


PATIENTS PRESENTING WITH ASSOCIATED HEADACHES BEFORE TREATMENT
(80%)
(20%)
HEADACHES
NO HEADACHES

During the history taking at the onset of the study, 24 (80%) of the 30 patients who participated in the study presented with headaches (Diagram Ba). On completion of the study only 3 (10%) patients still experienced headaches to some degree or another (Diagram Bb).

Diagram Bb :

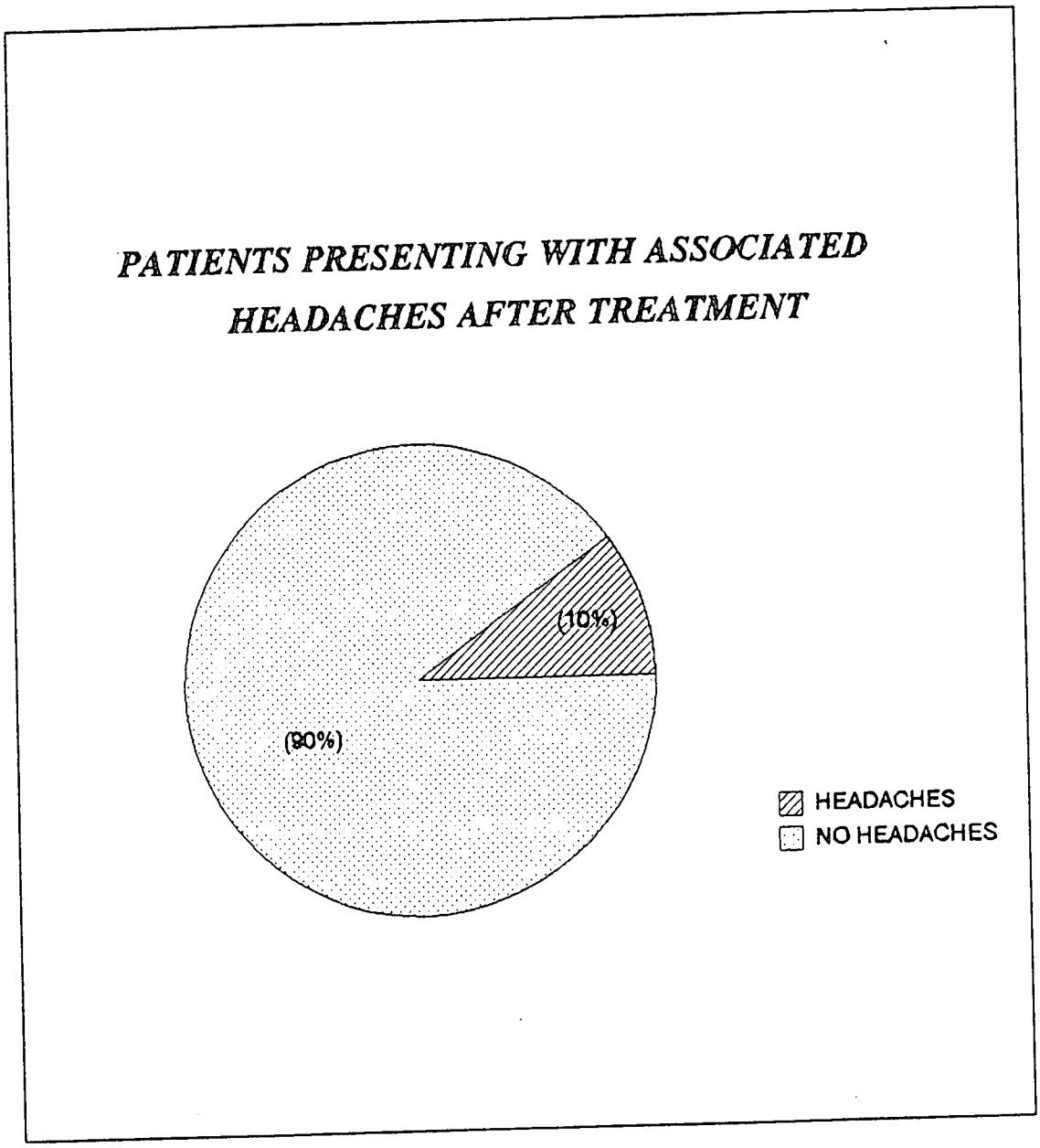
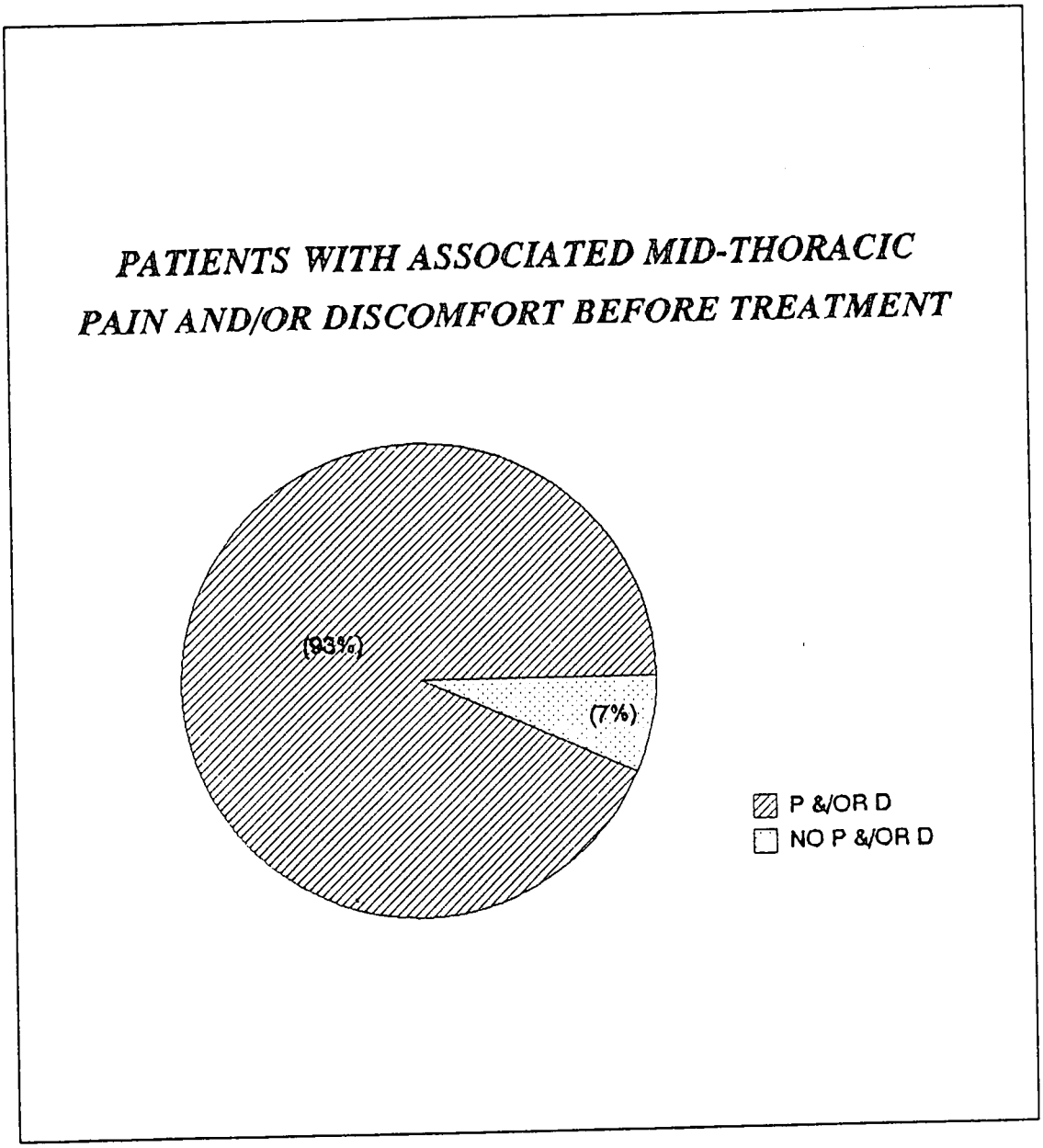
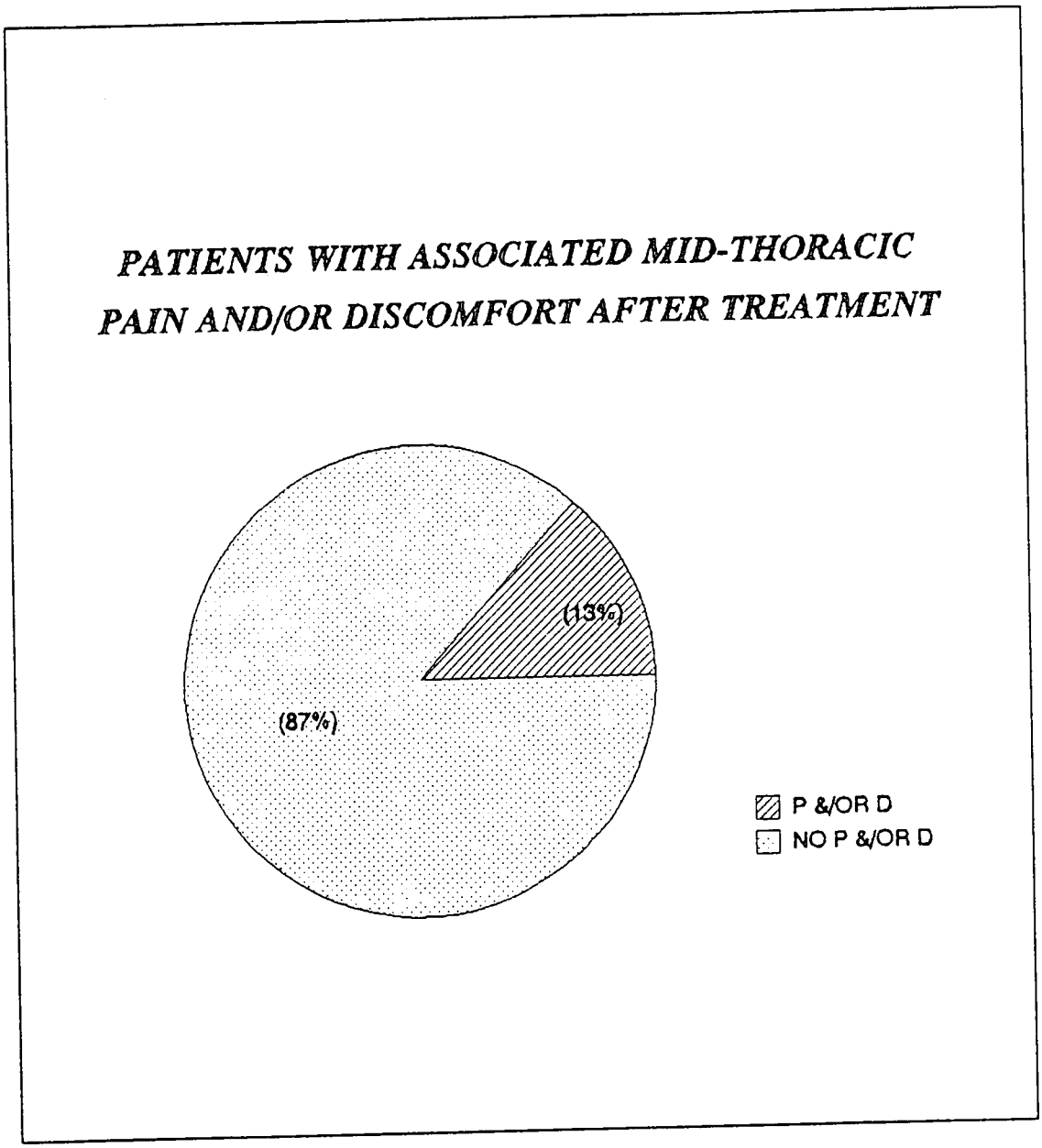

PATIENTS PRESENTING WITH ASSOCIATED HEADACHES AFTER TREATMENT
(10%)
(90%)
HEADACHES
NO HEADACHES

Diagram Ca :


PATIENTS WITH ASSOCIATED MID-THORACIC
PAIN AND/OR DISCOMFORT BEFORE TREATMENT
(93%)
(7%)
P &/OR D
NO P &/OR D

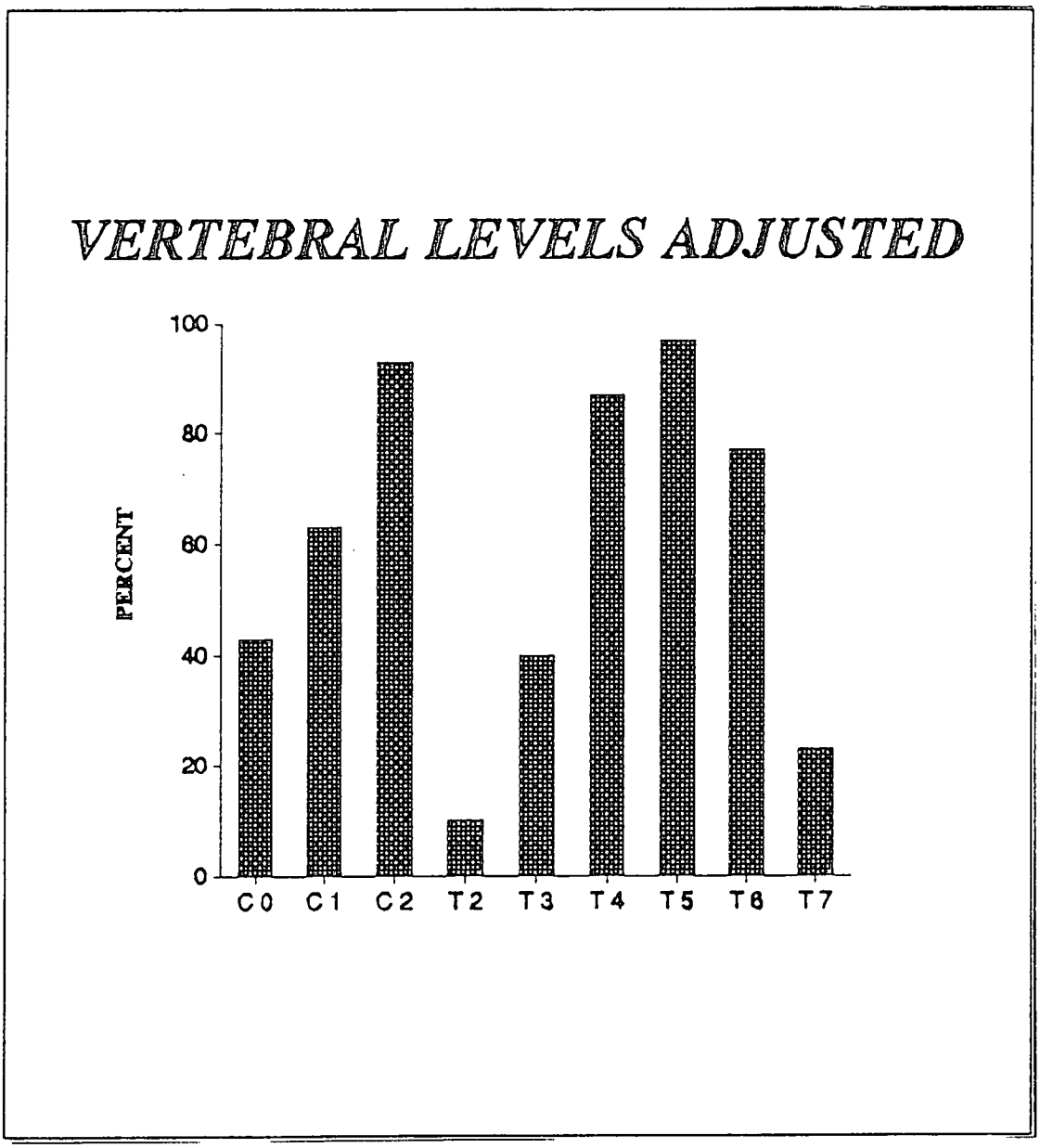
Of the 30 patients participating in this study, 28 (93%) presented initially with mid-thoracic pain and/or discomfort (Diagram Ca). On completion of the study only 4 (13%) patients still experienced mid-thoracic discomfort (Diagram Cb).

Diagram Cb :


PATIENTS WITH ASSOCIATED MID-THORACIC PAIN AND/OR DISCOMFORT AFTER TREATMENT
(13%)
(87%)
P &/OR D
NO P &/OR D

4.2 Vertebral levels adjusted during the study

Graph A:



In the upper cervical (C0-C2) region, the level most frequently found to be fixated in the patients who completed this study was C2. Twenty-eight of the 30 patients presented with this fixation (93%). In the upper and mid-thoracic region (T2-T7) the levels most often found to be fixated were T4 (87%), T5 (100%) and T6 (77%) (Graph A).

4.3 Subjective Data

4.3.1 The Asthma Questionnaire

When responding to question 2 of the asthma questionnaire (Appendix B), patients were asked to use the following rating scale :

1 = not at all
2 = slightly
3 = moderately
4 = severely
5 = very severely

These ratings were then translated into the class classification used in Tables 5 to 15.
The BEFORE class were the results of the questionnaire taken at the beginning of the study, while the AFTER class were the results obtained from the questionnaire at the end of the initial treatment period.

Table 5: Extent to which Asthma interferes with patients' life

CLASS	1	2	3	4	5
BEFORE	0 (0%)	9 (30%)	14 (47%)	6 (20%)	1 (3%)
AFTER	5 (17%)	9 (30%)	14 (47%)	2 (7%)	0 (0%)

It may be seen from the trend of patient numbers from right to left that their perception of the level to which asthma interferes with their lives has decreased as a result of the chiropractic care which they received during this study . This implies that patients perceived the chiropractic care which they received as favourable regarding the management of their asthma.

Table 6: Extent to which Asthma affects patients' relationships with others

CLASS	1	2	3	4	5
BEFORE	9 (30%)	12 (40%)	8 (27%)	1 (3%)	0 (0%)
AFTER	9 (30%)	17 (57%)	4 (13%)	0 (0%)	0 (0%)

It may be seen from the trend of patient numbers from right to left that their perception of the extent to which their asthma affects their relationships with others has decreased as a result of the chiropractic care which they received during this study.
This implies that patients perceived the chiropractic care which they received as favourable regarding the management of their asthma .

Table 7: Degree of patients' tiredness

CLASS	1	2	3	4	5
BEFORE	3 (10%)	12 (40%)	12 (40%)	2 (7%)	1 (3%)
AFTER	11 (37%)	8 (27%)	8 (27%)	3 (10%)	0 (0%)

From Table 7 it may be seen, by the trend of patient numbers from right to left in the AFTER class, that patients no longer felt as tired as they did prior to receiving chiropractic care.
This may be interpreted favourably regarding patients' perception of chiropractic care with respect to their asthmatic condition.

Table 8: Degree of patients' depression

CLASS	1	2	3	4	5
BEFORE	16 (53%)	6 (20%)	7 (23%)	0 (0%)	1 (3%)
AFTER	21 (70%)	7 (23%)	1 (3%)	1 (3%)	0 (0%)

It may be seen from the trend of patient numbers from right to left, in the AFTER class, that their perception of the level to which they felt depressed, had decreased.
This may be interpreted favourably regarding patients' perception of chiropractic care with respect to their asthmatic condition.

Table 9: Degree of patients' anxiety

CLASS	1	2	3	4	5
BEFORE	12 (40%)	6 (20%)	9 (30%)	3 (10%)	0 (0%)
AFTER	17 (57%)	9 (30%)	3 (10%)	1 (3%)	0 (0%)

From Table 9 it may be seen, by the trend of patient numbers from right to left in the AFTER class, that patients no longer felt as anxious as they did prior to receiving chiropractic care.
This may be interpreted favourably regarding patients' perception of chiropractic care with respect to their asthmatic condition.

Table 10: Degree of patients' frustration

CLASS	1	2	3	4	5
BEFORE	5 (17%)	11 (37%)	8 (27%)	5 (17%)	1 (3%)
AFTER	16 (53%)	10 (33%)	2 (7%)	2 (7%)	0 (0%)

By the trend of patient numbers from right to left in the AFTER class in Table 10, it may be seen that patients no longer felt as frustrated as they did prior to receiving chiropractic care.
This may be interpreted favourably regarding patients' perception of chiropractic care with respect to their asthmatic condition.

Table 11: Degree of patients lack of drive

CLASS	1	2	3	4	5
BEFORE	8 (27%)	12 (40%)	6 (20%)	3 (10%)	1 (3%)
AFTER	14 (47%)	13 (43%)	2 (7%)	1 (3%)	0 (0%)

From Table 11 it may be seen, by the trend of patient numbers from right to left in the AFTER class, that patients no longer experienced a lack of drive to the same extent to which it was felt by them prior to chiropractic care.
This may be interpreted favourably regarding patients' perception of chiropractic care with respect to their asthmatic condition.

Table 12: Degree to which the patients asthma has restricted them from performing certain jobs

CLASS	1	2	3	4	5
BEFORE	9 (30%)	7 (23%)	10 (33%)	3 (10%)	1 (3%)
AFTER	12 (40%)	10 (33%)	7 (23%)	1 (3%)	0 (0%)

Table 12, by the trend of patient numbers from right to left in the AFTER class, indicates that patients no longer perceived their asthma to restrict them from performing certain job to the extent to which they where restricted prior to receiving chiropractic care.
This may be interpreted favourably regarding patients' perception of chiropractic care with respect to their asthmatic condition.

Table 13: Degree to which the patients' asthma has restricted them from exercising

CLASS	1	2	3	4	5
BEFORE	6 (20%)	9 (30%)	5 (17%)	8 (27%)	2 (7%)
AFTER	6 (20%)	15 (50%)	5 (17%)	4 (13%)	0 (0%)

By the trend of patient numbers from right to left in the AFTER class in Table 13, it may be seen that patients no longer felt as restricted from exercising as they did prior to receiving chiropractic care.
This may be interpreted favourably regarding patients' perception of chiropractic care with respect to their asthmatic condition.

Table 14: Degree to which the patients' asthma has restricted them from socializing

CLASS	1	2	3	4	5
BEFORE	15 (50%)	8 (27%)	4 (13%)	3 (10%)	0 (0%)
AFTER	22 (73%)	6 (20%)	2 (7%)	0 (0%)	0 (0%)

The trend of patient numbers from right to left in the AFTER class in Table 14, is indicative of the patients' reduction in feeling restricted from socializing after receiving chiropractic care.
This may be interpreted favourably regarding patients' perception of chiropractic care with respect to their asthmatic condition.

Table 15: Degree to which the patients' asthma has restricted them from travelling

CLASS	1	2	3	4	5
BEFORE	17 (57%)	6 (20%)	5 (17%)	2 (7%)	0 (0%)
AFTER	20 (67%)	8 (27%)	2 (7%)	0 (0%)	0 (0%)

Table 15, by the trend of patient numbers from right to left in the AFTER class, indicates that patients no longer perceived their asthma to restrict them from travelling to the same extent to which it did prior to them receiving chiropractic care.
This may be interpreted favourably regarding patients' perception of chiropractic care with respect to their asthmatic condition.

When responding to question 3 of the asthma questionnaire (Appendix B), patients were asked to use the following rating scale :

1 = never
2 = seldom
3 = once per month
4 = once per week
5 = once per day

These ratings were then translated into the class classification used in Tables 16 to 21 .
The BEFORE class were the results of the questionnaire taken at the beginning of the study, while the AFTER class were the results obtained from the questionnaire at the end of the initial treatment period.

Table 16: Frequency with which patients become short of breath

CLASS	1	2	3	4	5
BEFORE	1 (3%)	6 (20%)	5 (17%)	5 (17%)	13 (43%)
AFTER	1 (3%)	11 (37%)	3 (10%)	8 (27%)	7 (23%)

Table 16, by the trend of patient numbers from right to left in the AFTER class, indicates that the frequency with which patients experienced shortness of breath, after receiving chiropractic care, had decreased.
This may be interpreted favourably regarding patients' perception of chiropractic care with respect to their asthmatic condition.

Table 17: Frequency with which patients wheeze

CLASS	1	2	3	4	5
BEFORE	0 (0%)	6 (20%)	2 (7%)	7 (23%)	15 (50%)
AFTER	3 (10%)	13 (43%)	1 (3%)	7 (23%)	6 (20%)

By the trend of patient numbers from right to left in the AFTER class in Table 17, it may be deduced that the frequency with which patients experienced wheezing, after receiving chiropractic care, had decreased.
This may be interpreted favourably regarding patients' perception of chiropractic care with respect to their asthmatic condition.

Table 18: Frequency with which patients become tight chested

CLASS	1	2	3	4	5
BEFORE	1 (3%)	5 (17%)	3 (10%)	5 (17%)	16 (53%)
AFTER	2 (7%)	13 (43%)	3 (10%)	4 (13%)	8 (27%)

The trend of patient numbers from right to left in the AFTER class in Table 18, is indicative of the decrease in frequency with which patients became tight chested, after receiving chiropractic care.
This may be interpreted favourably regarding patients' perception of chiropractic care with respect to their asthmatic condition.

Table 19: Frequency with which patients coughed up phlegm

CLASS	1	2	3	4	5
BEFORE	2 (7%)	9 (30%)	2 (7%)	5 (17%)	12 (40%)
AFTER	1 (3%)	12 (40%)	4 (13%)	4 (13%)	9 (30%)

By the trend of patient numbers from right to left in the AFTER class in Table 19, it may be deduced that the frequency with which patients coughed up phlegm, after receiving chiropractic care, had decreased.
This may be interpreted favourably regarding patients' perception of chiropractic care with respect to their asthmatic condition.

Table 20: Frequency with which patients suffered from hoarseness

CLASS	1	2	3	4	5
BEFORE	8 (27%)	14 (47%)	1 (3%)	3 (10%)	4 (13%)
AFTER	9 (30%)	13 (43%)	3 (10%)	3 (10%)	2 (7%)

The lack of significant movement of patient numbers either to the right or left is indicative of little change in the frequency with which patients suffered from hoarseness.

Table 21: Frequency with which patients suffered from a sore throat

CLASS	1	2	3	4	5
BEFORE	9 (30%)	14 (47%)	3 (10%)	3 (10%)	1 (3%)
AFTER	12 (40%)	14 (47%)	1 (3%)	3 (10%)	0 (0%)

By the trend of patient numbers from right to left in the AFTER class in Table 21, it may be deduced that the frequency with which patients suffered from a sore throat, after receiving chiropractic care, had decreased.
This may be interpreted favourably regarding patients' perception of chiropractic care with respect to their asthmatic condition.

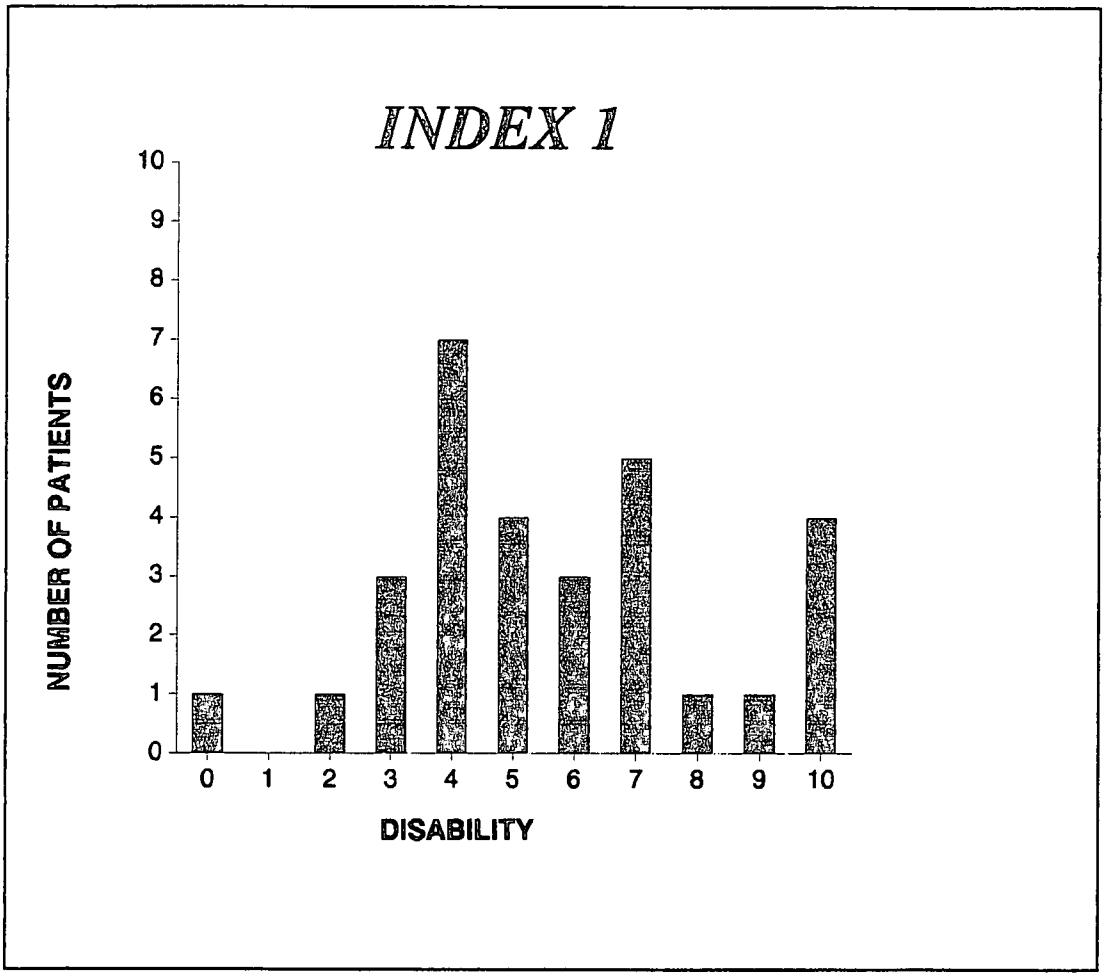
4.3.2 Asthma Disability Index

TABLE 22 : ASTHMA DISABILITY INDEX DATA

INDEX	1	2	3	4	5	6	7	8
Patient 1	5	5	6	4	2	1	0	0
Patient 2	7	8	7	7	7	6	6	5
Patient 3	3	5	7	2	2	2	1	0
Patient 4	0	0	0	0	0	0	0	0
Patient 5	7	6	6	7	6	7	6	5
Patient 6	4	3	3	3	2	3	2	3
Patient 7	6	4	4	4	3	3	3	1
Patient 8	4	6	6	3	2	3	2	1
Patient 9	10	4	10	0	0	1	0	0
Patient 10	4	3	4	5	4	3	3	2
Patient 11	10	2	3	6	2	1	2	1
Patient 12	5	3	0	0	3	1	0	0
Patient 13	4	4	4	4	4	3	3	2
Patient 14	2	7	5	2	3	2	1	0
Patient 15	3	5	8	7	4	2	3	1
Patient 16	4	3	3	3	4	3	3	4
Patient 17	10	7	7	3	4	3	3	4
Patient 18	4	3	8	7	2	1	2	4
Patient 19	9	7	4	2	2	4	1	2
Patient 20	6	6	6	6	6	6	4	6
Patient 21	8	10	10	7	6	7	7	7
Patient 22	3	5	4	3	4	3	3	5
Patient 23	7	7	5	4	3	3	2	3
Patient 24	5	5	5	5	4	5	4	6
Patient 25	5	8	8	7	6	5	6	7
Patient 26	6	7	4	2	1	4	4	4
Patient 27	7	10	4	3	3	3	4	4
Patient 28	10	5	8	2	1	5	0	5
Patient 29	7	6	9	3	4	3	2	4
Patient 30	4	4	4	3	3	2	2	3
MEAN	5.7	5.3	5.4	3.8	3.1	3.2	2.6	3.0

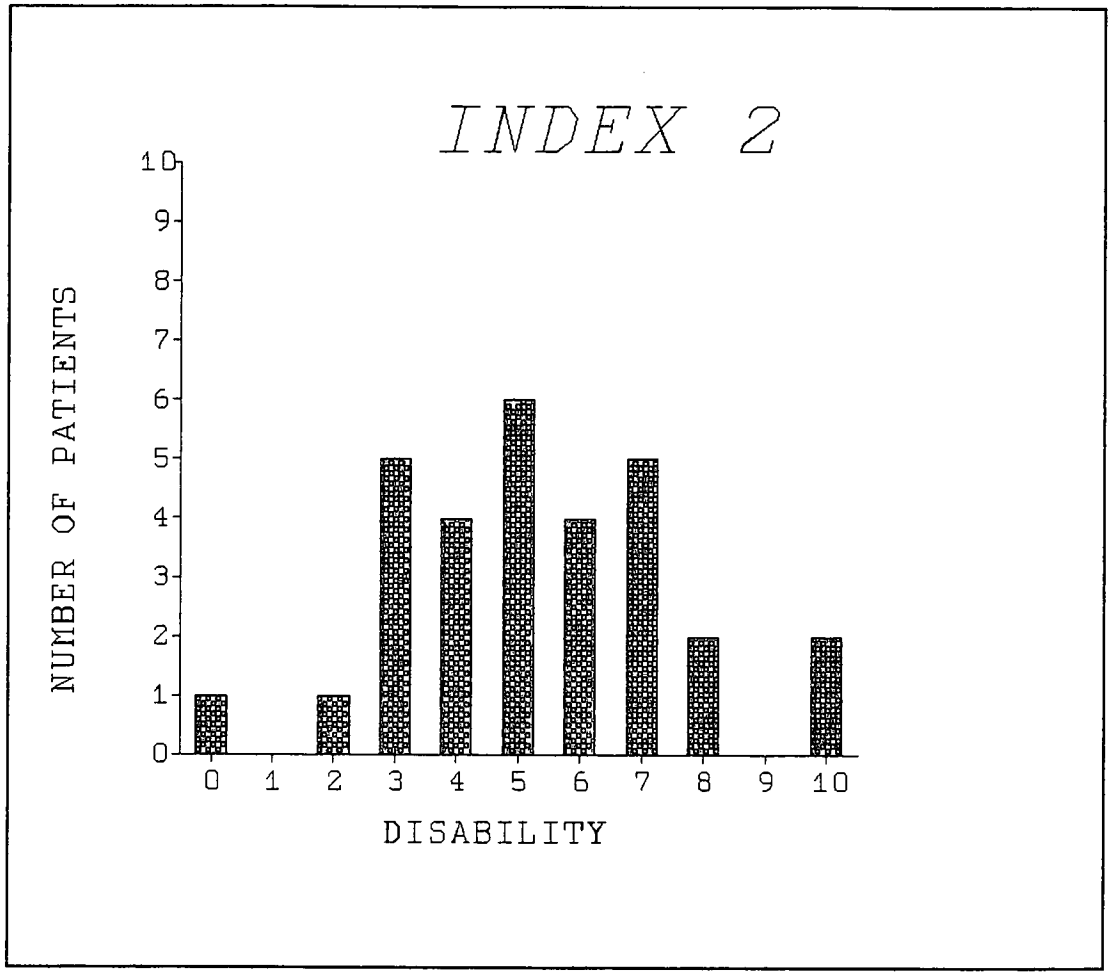
With a disability of 0 indicating that the patients' asthma was not in the least disabling and a disability of 10 indicating that asthma severely disable the lives of the patients, the following graphs were established to display the trend of patients' perception regarding their asthmatic condition during the baseline study, the initial treatment and the follow-up periods.

Graph B: The First Asthma Disability Index Of The Entire Group



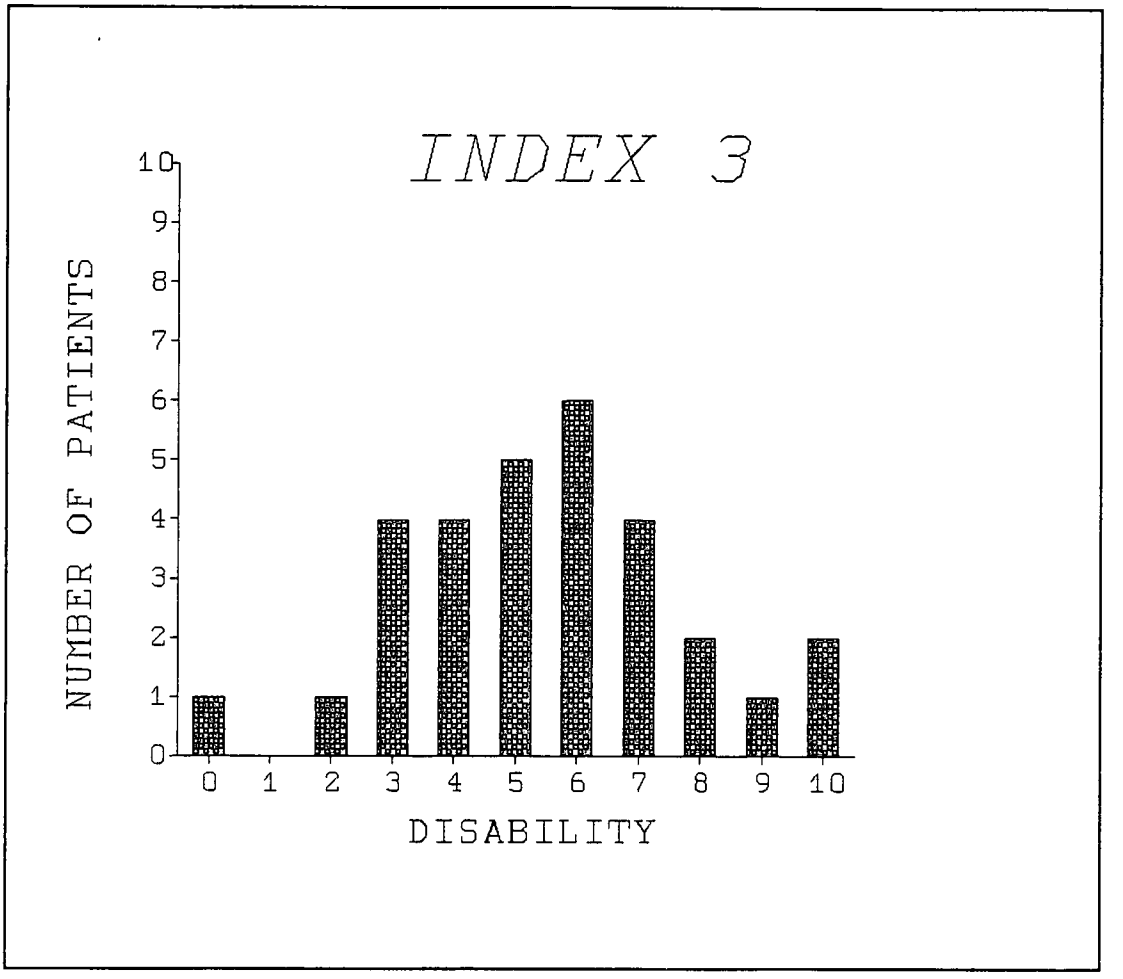
Graph B is a representation of the first Disability Index completed by the sample group at the end of their first consultation. From this graph it may be seen that the majority of the sample group fell within the 3 to 7 disability range (22 patients). As this was the first index all that could be established was a base with which to compare future indices.

Graph C: The Second Asthma Disability Index Of The Entire Group .



Graph C is a representation of the second Disability Index completed by the sample group at the end of their second consultation. From this graph it may be seen that the majority of the sample group fell within the 3 to 7 disability range (24 patients). In comparison with Index 1, no significant differences may be noted.

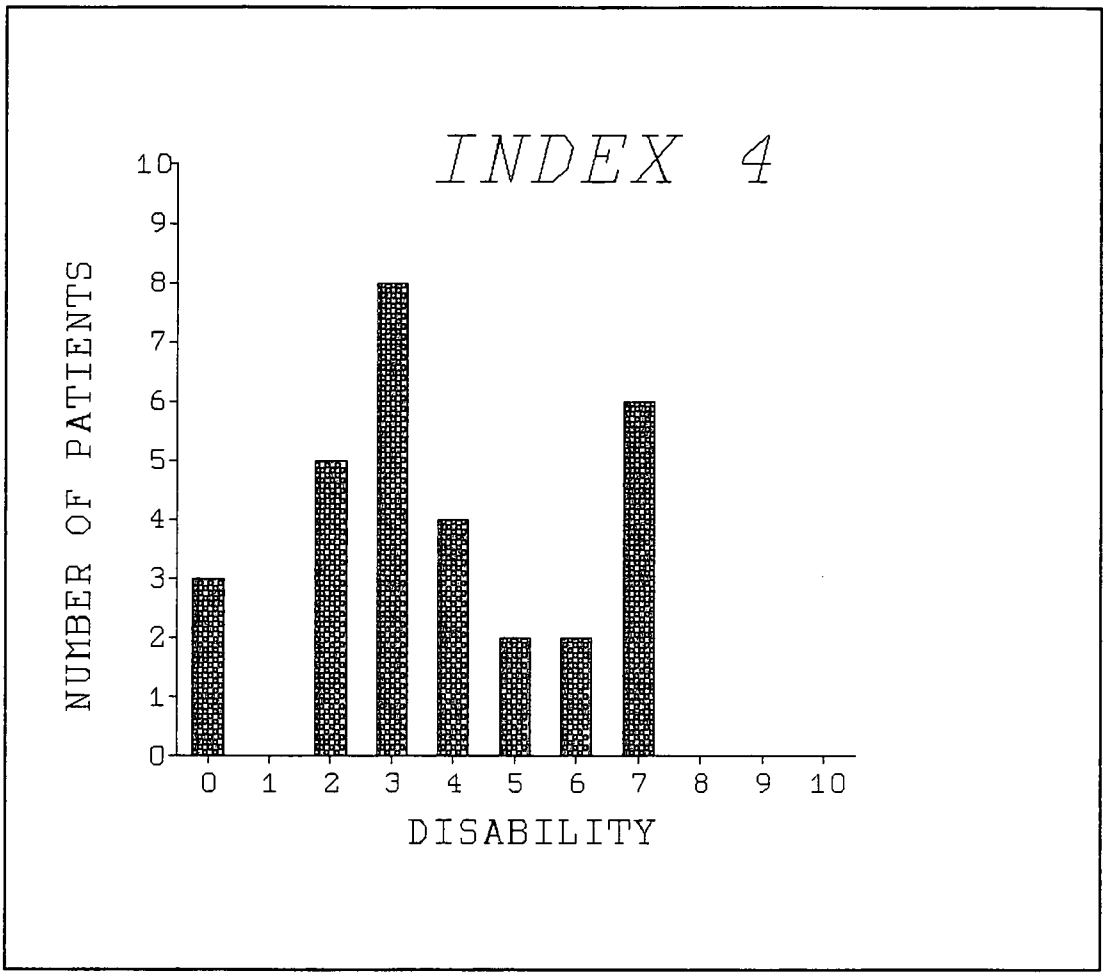
Graph D: The Third Disability Index Of The Entire Group



Graph D is a representation of the third Disability Index completed by the sample group at the end of their third consultation. From this graph it may be seen that the majority of the sample group fell within the 3 to 7 disability range (23 patients). In comparison with Index 1 and 2, no significant differences may be noted.

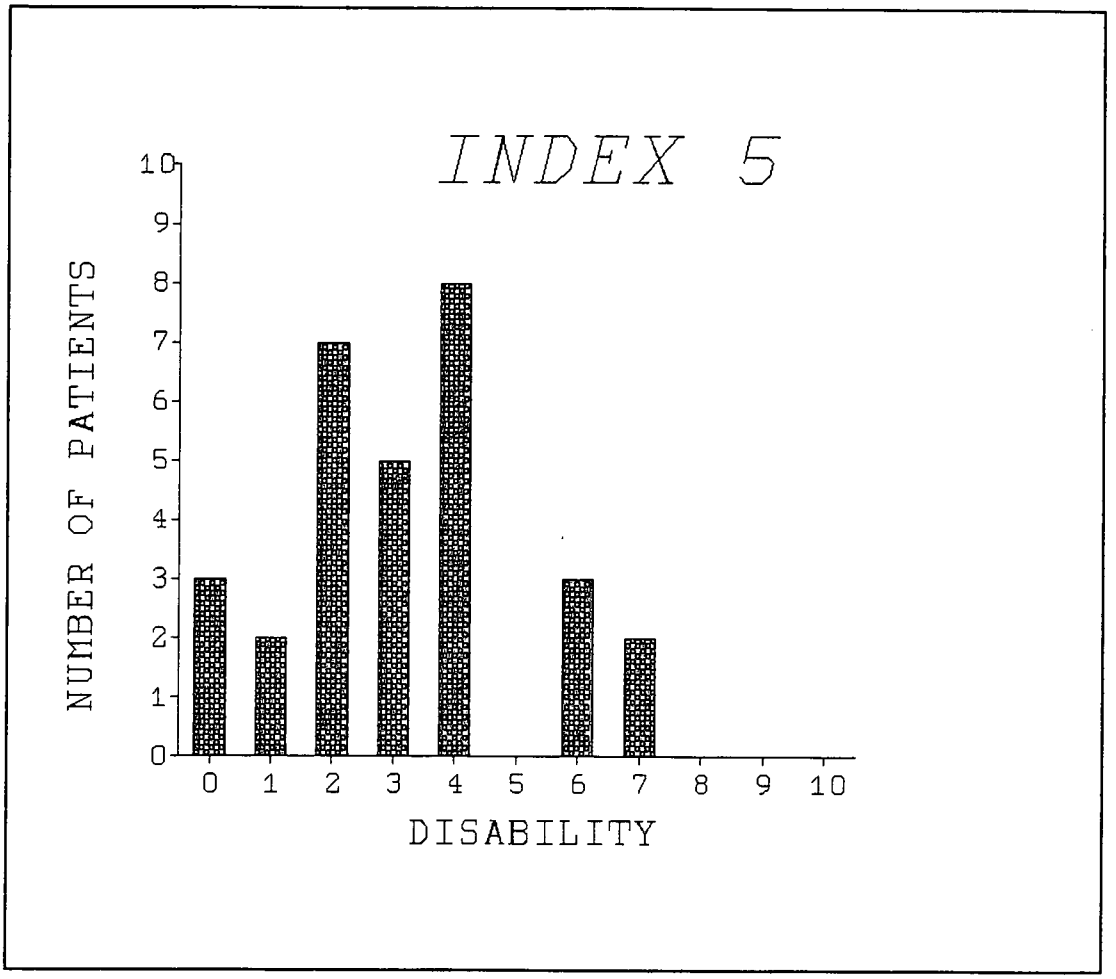
Indices 1, 2 and 3 (Graphs B,C and D), which were taken during the baseline study, show no significant movement of patient numbers to either the right or left. From this it may be deduced that the patients' perception of their asthmatic condition during this period was unchanged.

Graph E: The Fourth Disability Index Of The Entire Group



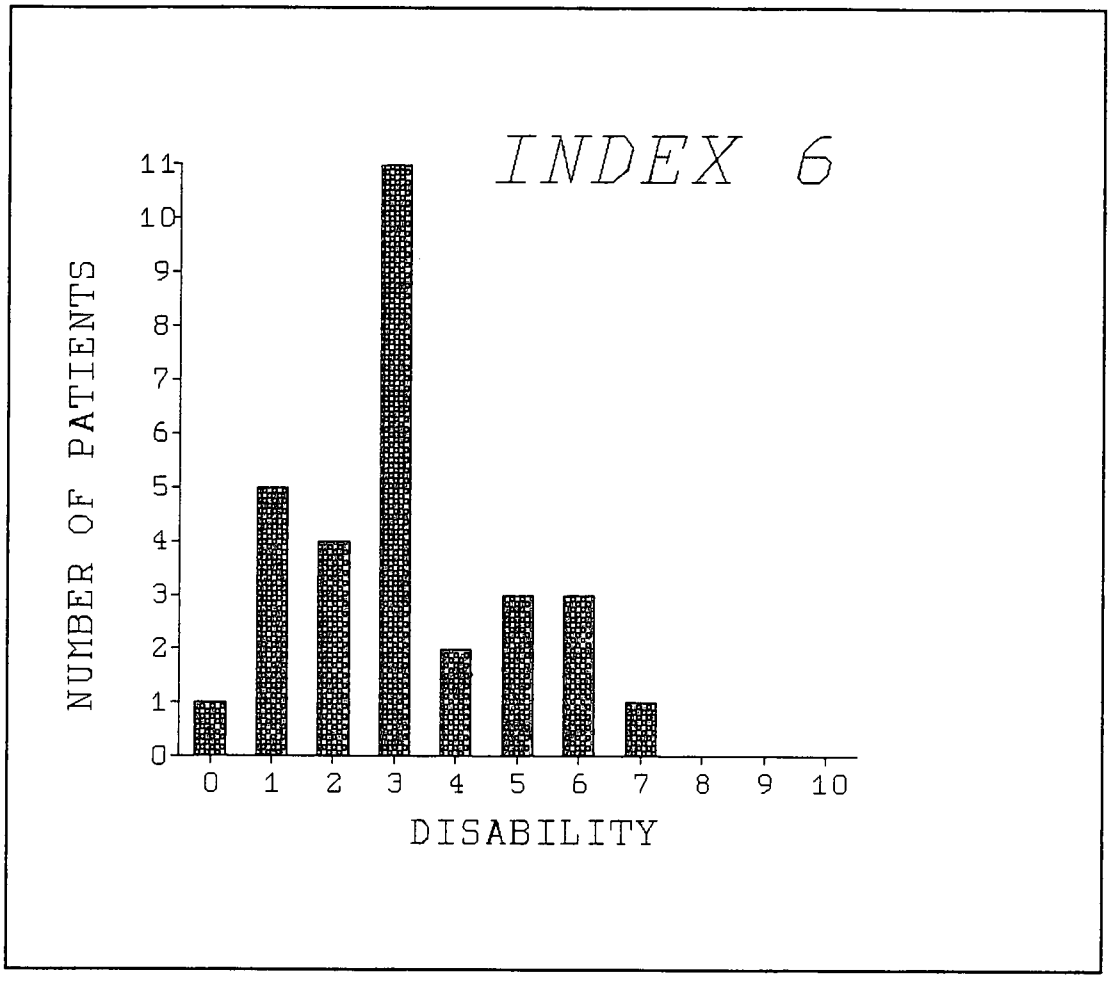
Graph E is a representation of the fourth Disability Index completed by the sample group at the end of their fourth consultation. From this graph it may be seen that the majority of the sample group fell within the 2 to 7 disability range (27 patients). Not one patient experienced a disability greater than 7. The trend of patient numbers from right to left in Index 4, as compared with Index 1, 2 and 3, indicates that patients perceived their asthma to be less disabling after receiving chiropractic care.

Graph F: The Fifth Disability Index Of The Entire Group



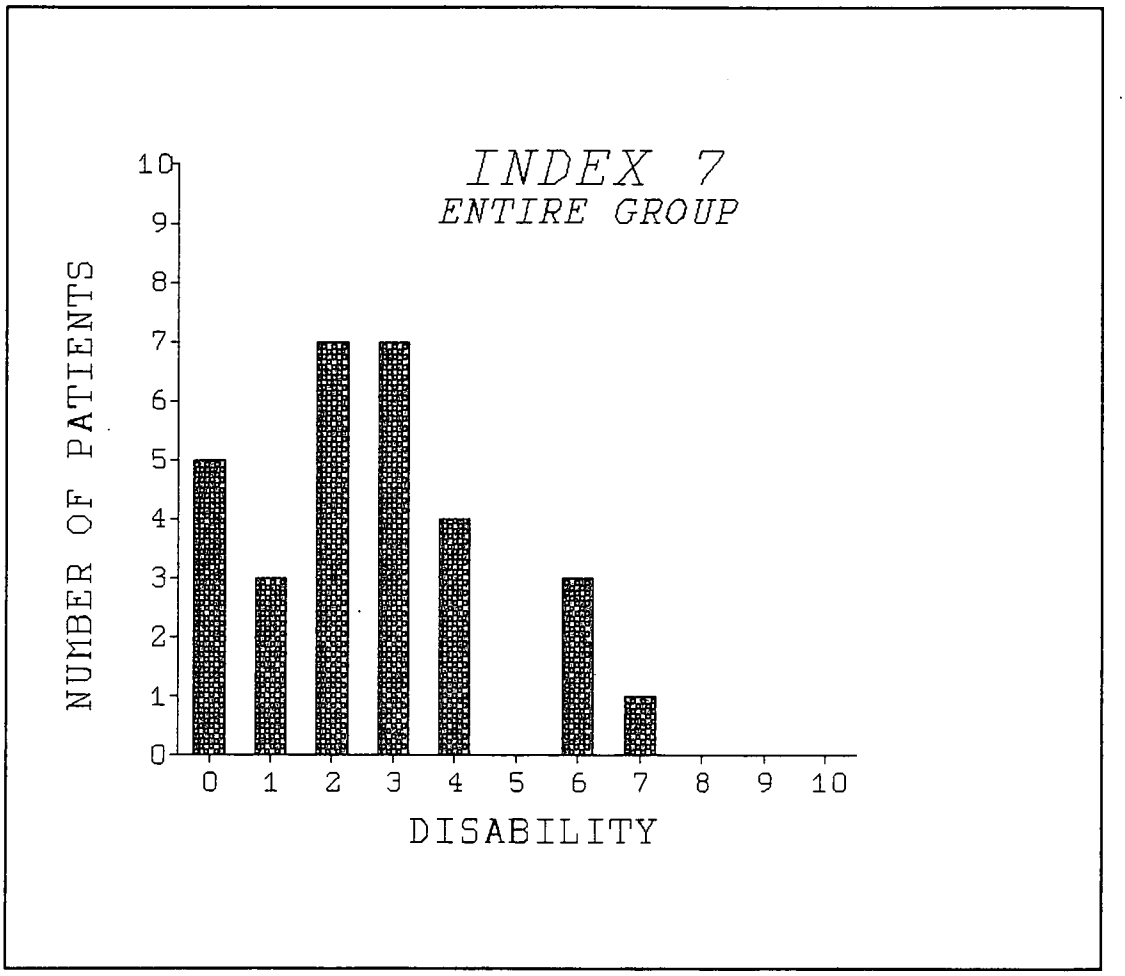
Graph F is a representation of the fifth Disability Index completed by the sample group at the end of their fifth consultation. From this graph it may be seen that the majority of the sample group fell within the 2 to 4 disability range (20 patients). Not one patient experienced a disability greater than 7. The trend of patient numbers from right to left in Index 5, as compared with Index 4, indicates that patients perceived their asthma to be less disabling after receiving further chiropractic care.

Graph G: The Sixth Disability Index Of The Entire Group



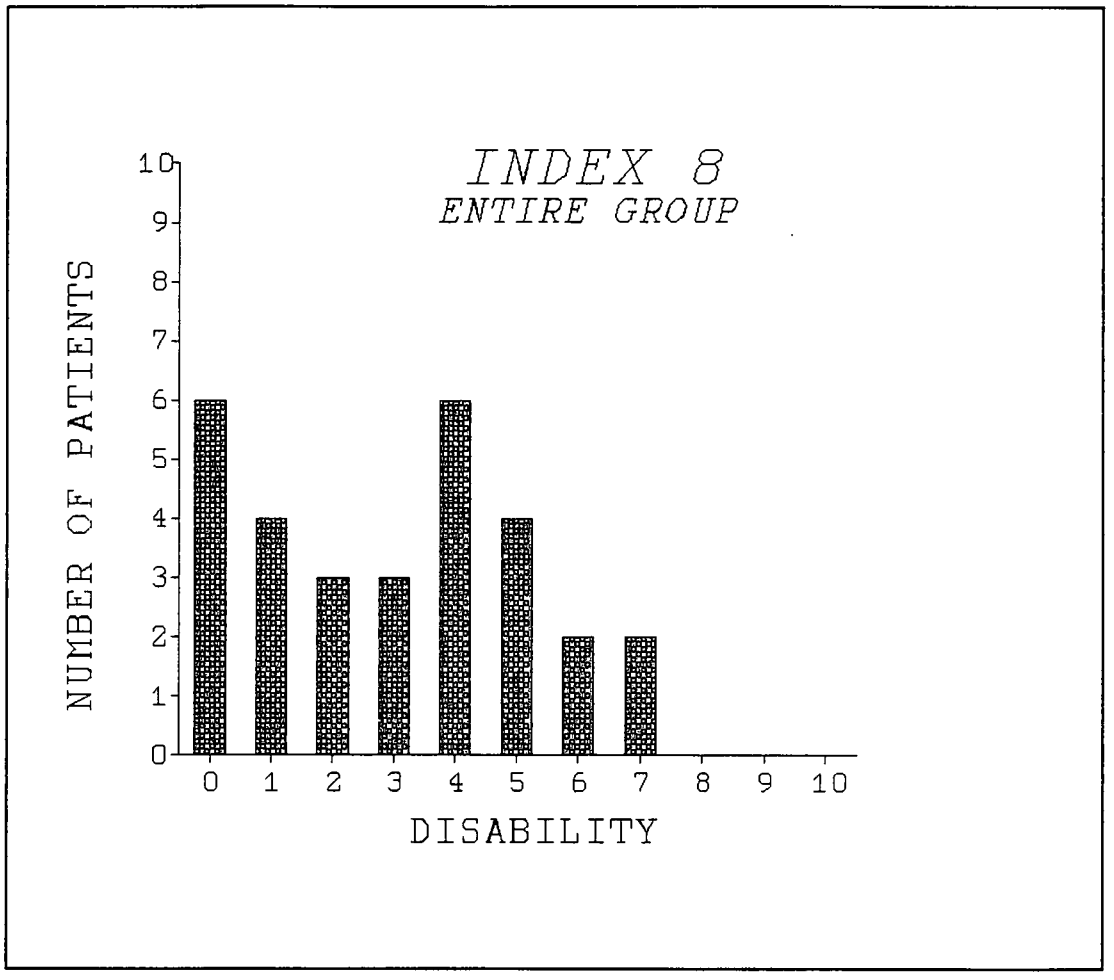
Graph G is a representation of the sixth Disability Index completed by the sample group at the end of their sixth consultation. From this graph it may be seen that the majority of the sample group fell within the 1 to 4 disability range (22 patients). Not one patient experienced a disability greater than 7. The trend of patient numbers from right to left in Index 6, as compared with Index 5, indicates that patients perceived their asthma to be less disabling after receiving further chiropractic care.

Graph H: The Seventh Disability Index Of The Entire Group



Graph H is a representation of the seventh Disability Index completed by the sample group at the end of their seventh consultation. From this graph it may be seen that the majority of the sample group fell within the 0 to 4 disability range (26 patients). Not one patient experienced a disability greater than 7. The trend of patient numbers from right to left in Index 7, as compared with Index 6, indicates that patients perceived their asthma to be less disabling after receiving further chiropractic care.

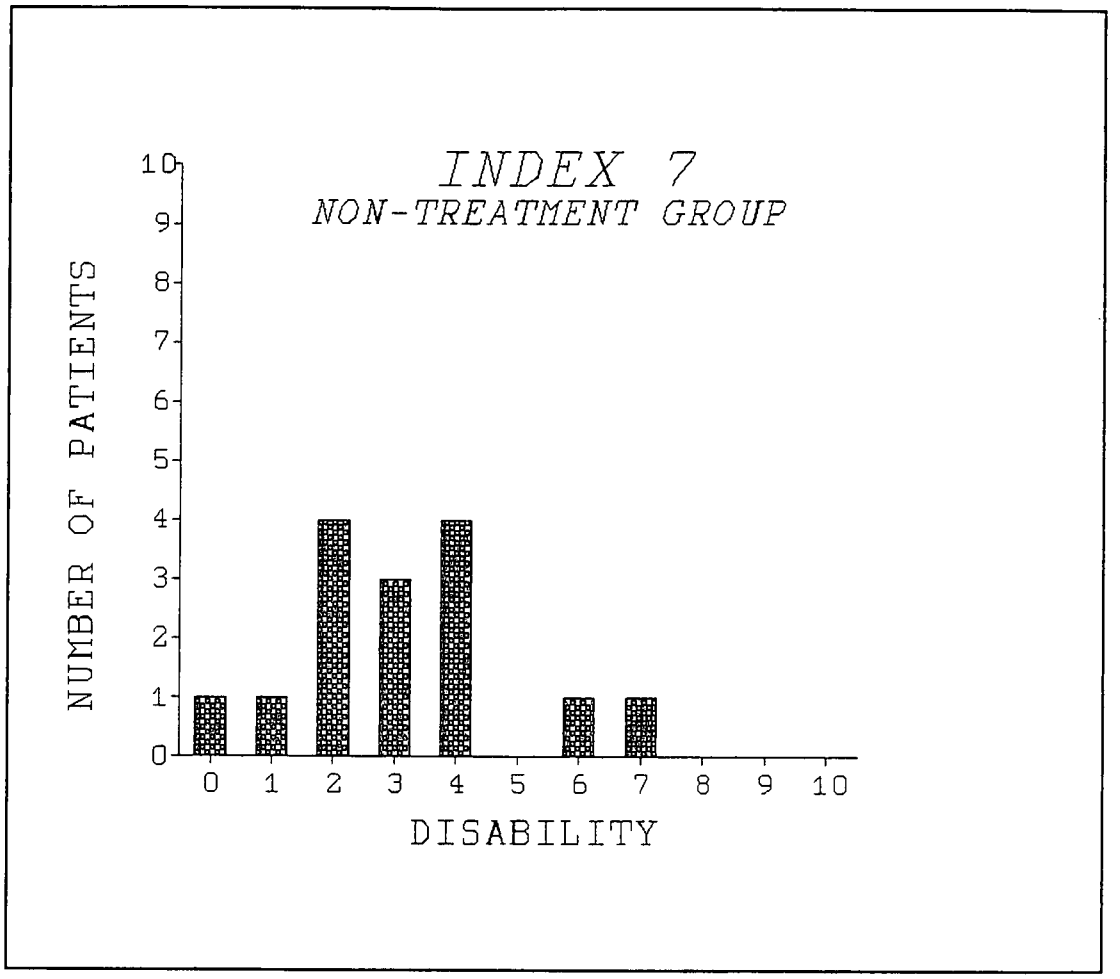
Graph I: The Eighth Disability Index Of The Entire Group



Graph I is a representation of the eighth Disability Index completed by the sample group at the end of their eighth consultation. From this graph it may be seen that the majority of the sample group fell within the 0 to 5 disability range (26 patients). Not one patient experienced a disability greater than 7. The trend of patient numbers from right to left in Index 8, as compared with Index 1, 2 and 3 (baseline study), indicates that patients perceived their asthma to be less disabling after receiving chiropractic care.

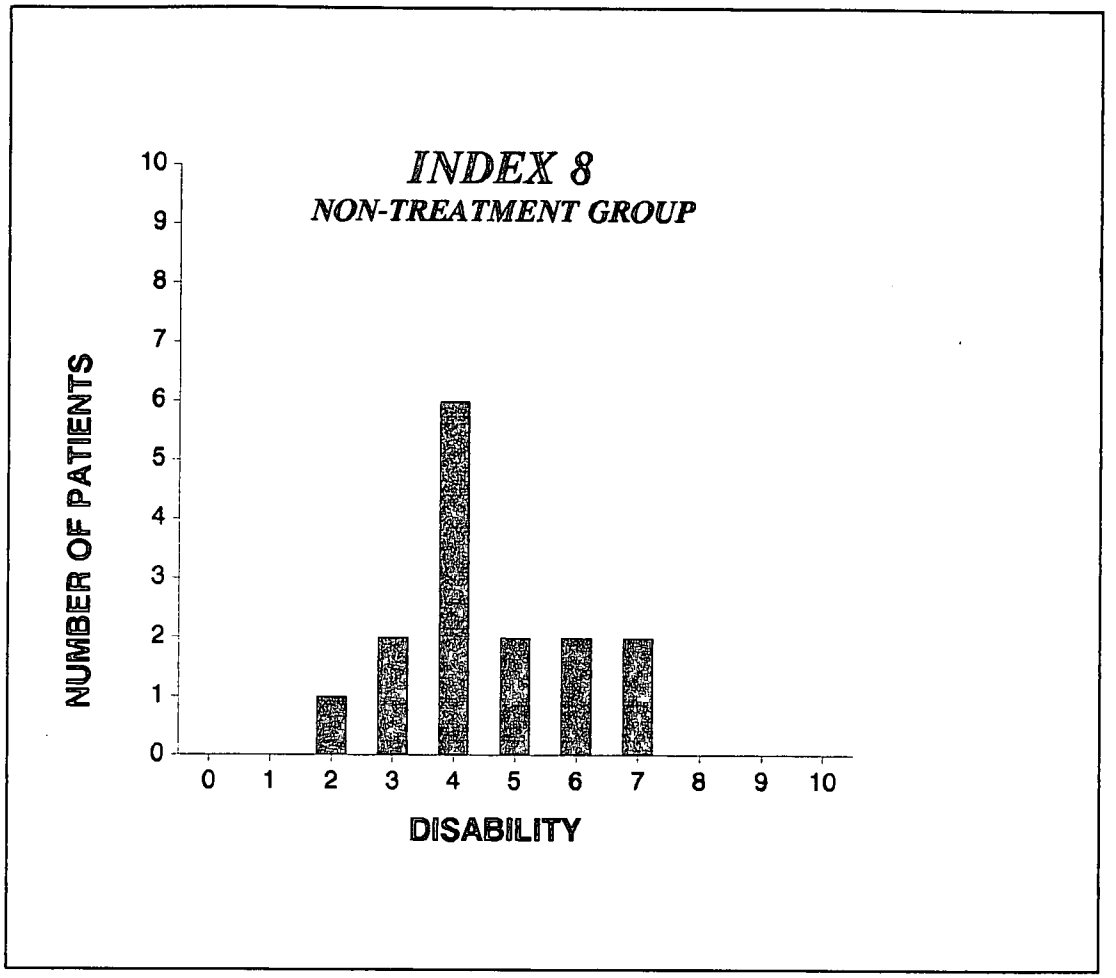
The trend of patient numbers from left to right in Index 8, as compared with Index 7, may indicate that patients perceived their asthma to be more disabling at the end of the follow-up period. This is not a true reflection of the patients' perception of chiropractic care with respect to their asthmatic condition, as half the sample group received a further 4 treatments while the other half did not.
It is thus necessary to look at the treatment and non-treatment groups of the follow-up study individually (as in graphs J, K, L and M) in order to establish a more accurate reflection of the patients' perception of further chiropractic care with respect to their asthmatic condition.

Graph J: The Seventh Disability Index Of The Non-Treatment Group



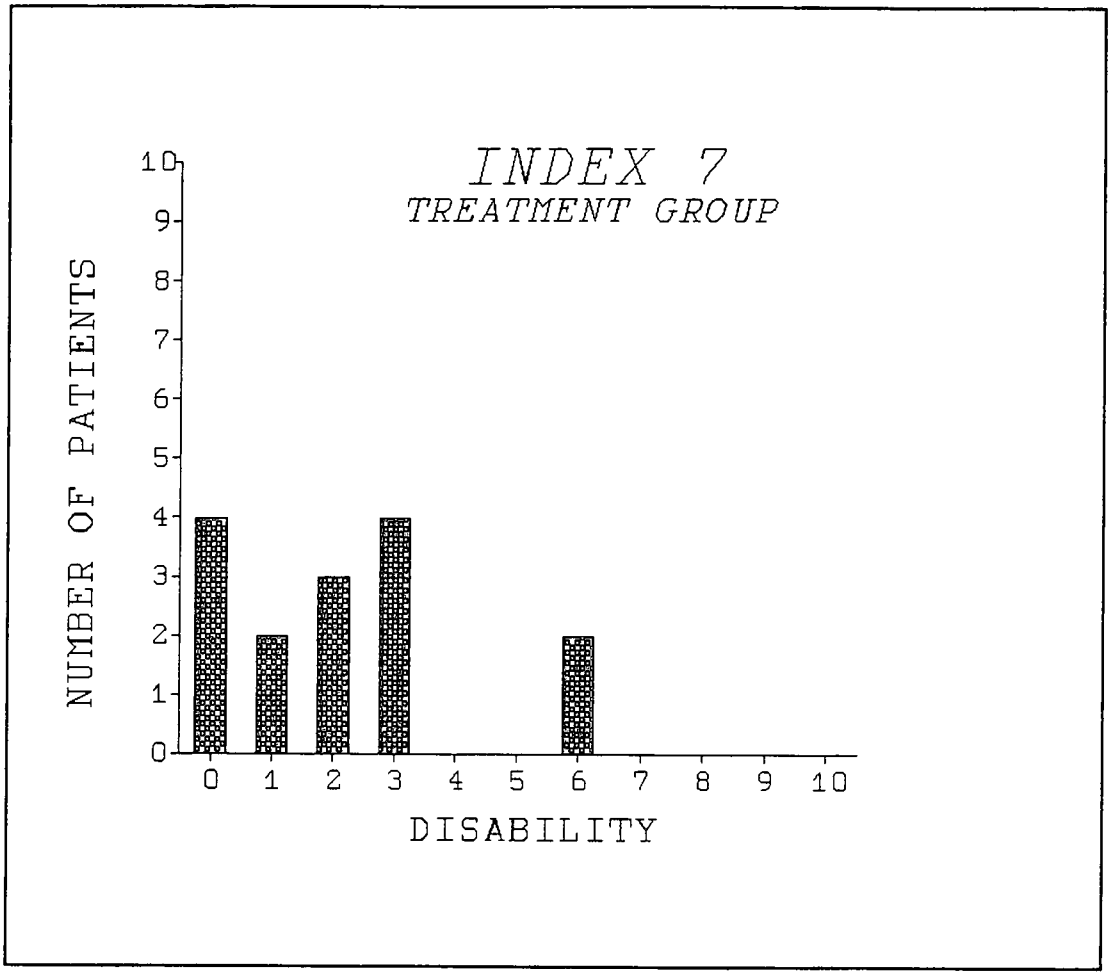
Graph J is a representation of the seventh Disability Index completed by the non-treatment group at the end of their seventh consultation. From this graph it may be seen that the majority of the sample group fell within the 2 to 4 disability range (11 out of 15 patients), while there was a patient in each the 0, 1, 6 and 7 disability groups. Not one patient experienced a disability greater than 7.

Graph K: The Eighth Disability Index Of The Non-Treatment Group



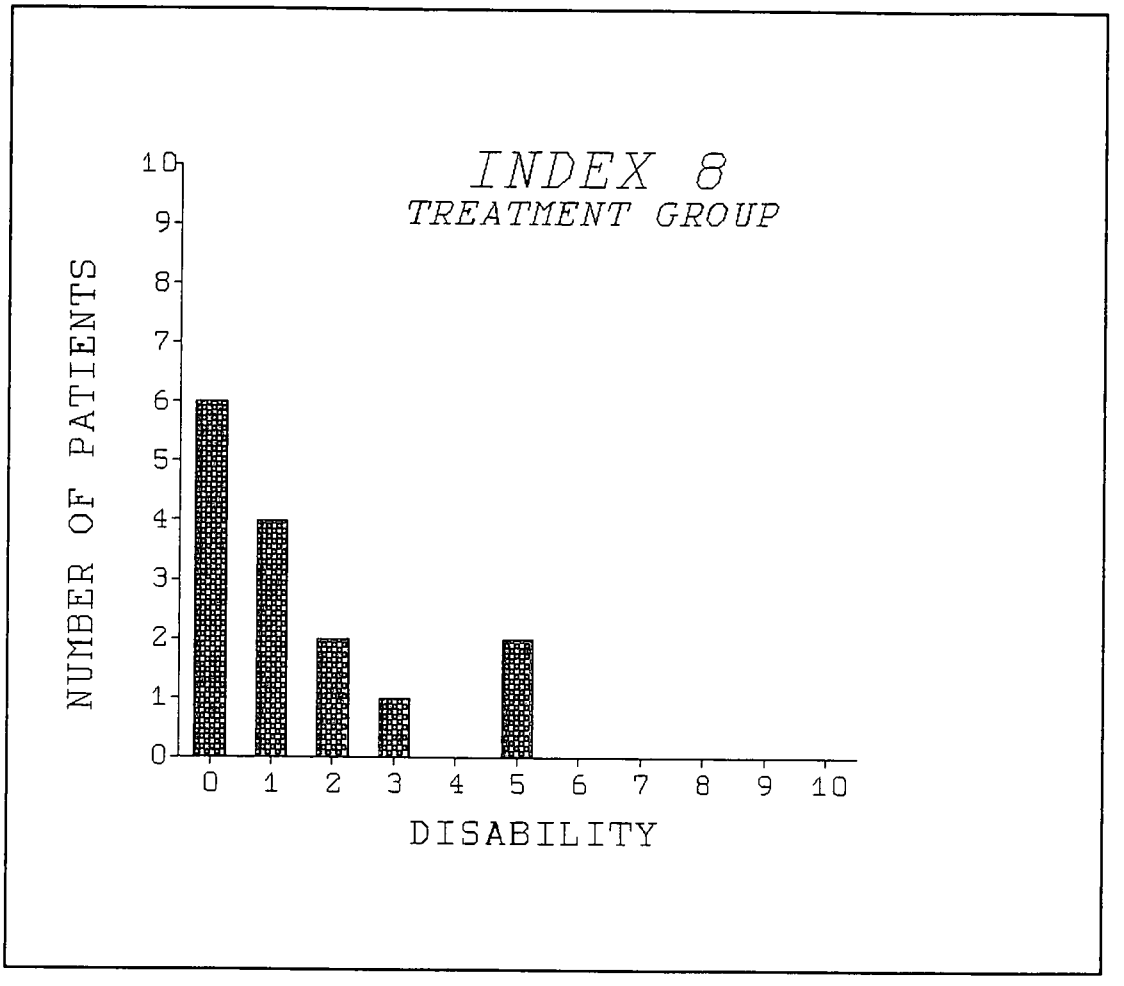
Graph J is a representation of the eighth Disability Index completed by the non-treatment group at the end of their eighth consultation. From this graph it may be seen that patient numbers have moved from left to right as compared to Graph J. This may be interpreted as patients in this group perceiving their asthmatic condition to have regressed once chiropractic care had been stopped. This, in turn, may be interpreted favourably regarding patients' perception of chiropractic care with respect to their asthmatic condition.

Graph L: The Seventh Disability Index Of The Treatment Group



Graph L is a representation of the seventh Disability Index completed by the treatment group at the end of their seventh consultation. Four patients no longer experienced any disability, while 2 patients experienced a disability of 1, 3 patients experienced a disability of 2, 4 patients experienced a disability of 3 and 2 patients experienced a disability of 6. No patients experienced a disability greater than 6.

Graph M: The Eighth Disability Index Of The Treatment Group



Graph M is a representation of the eighth Disability Index completed by the treatment group at the end of their eighth consultation. Six patients no longer experienced any disability, while 4 patients experienced a disability of 1, 2 patients experienced a disability of 2, 1 patients experienced a disability of 3 and 2 patients experienced a disability of 5. No patients experienced a disability greater than 5.

The trend of patient numbers from right to left in Graph M, as compared with Graph L, indicates that patients perceived their asthma to be less disabling after receiving further chiropractic care. This may be interpreted favourably regarding patients' perception of chiropractic care with respect to their asthmatic condition.

4.4 **OBJECTIVE DATA**

4.4.1 Forced Expiratory Volume In 1 Second

TABLE 23 : FORCED EXPIRATORY VOLUME IN 1 SECOND DATA

FEV1	T1	T2	T3	Tm	T4	T5	T6	T7	T8
Pt 1	1.70	1.56	2.09	1.78	2.25	2.47	2.55	2.52	2.58
Pt 2	1.65	1.70	1.70	1.68	2.00	2.14	2.11	2.39	2.42
Pt 3	2.14	2.11	1.76	2.00	2.11	2.20	2.28	2.28	2.09
Pt 4	2.94	2.69	2.80	2.81	3.02	2.97	3.02	3.10	2.99
Pt 5	2.99	3.16	3.10	3.08	2.97	2.88	2.86	2.58	3.16
Pt 6	1.76	2.58	2.42	2.25	1.73	1.59	1.78	1.84	1.40
Pt 7	2.50	1.95	2.39	2.28	2.42	2.22	2.53	2.50	2.55
Pt 8	2.17	2.31	2.49	2.32	2.53	2.22	2.33	2.47	2.32
Pt 9	3.79	3.30	3.27	3.45	4.01	4.15	3.57	3.98	3.54
Pt 10	1.78	2.02	1.87	1.89	1.74	1.81	2.06	1.89	1.89
Pt 11	3.63	3.21	3.41	3.42	2.17	3.16	3.63	3.38	2.91
Pt 12	2.66	2.91	3.21	2.93	3.16	3.05	3.02	2.97	3.16
Pt 13	3.05	2.55	3.46	3.02	2.53	2.61	2.75	2.83	3.05
Pt 14	1.70	1.23	1.54	1.49	2.09	1.76	2.09	1.98	2.09
Pt 15	2.58	2.42	2.28	2.43	2.33	2.94	2.64	2.75	2.94
Pt 16	1.29	1.76	1.61	1.55	1.25	1.29	1.18	1.59	1.62
Pt 17	2.72	2.80	2.44	2.65	2.61	2.86	2.75	2.75	2.44
Pt 18	1.51	1.84	1.56	1.64	0.85	1.12	1.23	1.34	1.11
Pt 19	1.87	1.62	1.87	1.79	1.59	1.95	1.92	2.35	2.44
Pt 20	2.28	2.31	2.31	2.30	2.14	2.22	2.28	2.20	2.25
Pt 21	0.77	2.28	1.92	1.66	1.59	2.11	1.45	1.51	2.29
Pt 22	1.54	1.54	1.65	1.58	1.45	1.67	1.21	1.67	1.45
Pt 23	2.53	2.88	2.69	2.70	2.25	2.91	2.61	3.05	2.25
Pt 24	0.82	0.99	1.37	1.06	1.23	1.48	1.23	1.07	1.07
Pt 25	1.55	0.86	1.20	1.20	2.09	2.83	1.73	2.09	1.98
Pt 26	2.22	1.15	1.81	1.73	2.03	1.56	2.20	1.78	1.84
Pt 27	4.62	4.73	4.78	4.71	4.56	4.31	4.51	4.62	4.45
Pt 28	1.23	1.95	1.62	1.60	1.92	2.17	2.09	2.09	1.62
Pt 29	0.63	1.21	1.92	1.25	1.98	1.15	1.70	1.43	1.81
Pt 30	0.77	2.28	1.92	1.66	1.59	2.11	1.45	1.51	2.29
MEAN	2.11	2.20	2.21	2.20	2.21	2.33	2.29	2.35	2.33

- FEV1 = Forced Expiratory Volume In 1 Second
- FEM = Baseline Mean of FEV1
  = Mean of first 3 FEV1 readings
- FE7T = FEV1 mean of the entire group taken after final treatment of initial treatment period
- FE7n = FEV1 mean of the non treatment group taken after final treatment of initial treatment period
- FE7t = FEV1 mean of the treatment group taken after final treatment of initial treatment period
- FE8n = FEV1 mean of non treatment group taken after final treatment at the end of the follow-up period
- FE8t = FEV1 mean of treatment group taken after final treatment at the end of the follow-up period
- FE8T = FEV1 mean of the entire group taken after final treatment at the end of the follow-up period

The Wilcoxon Signed Rank test was used to analyze the following data :

4.4.1.1 FEM versus FE7T

Large sample test statistic Z=2.58133
Two-tailed probability of equalling or exceeding Z=0.00984218
One-tailed probability is p/2=0.00492109

A statistically significant difference was noted between these 2 sets of data.

4.4.1.2 FE7n versus FE8n

Large sample test statistic Z=0.2446
Two-tailed probability of equalling or exceeding Z=0.806762
One-tailed probability is p/2=0.403381

No statistically significant difference was noted between these 2 sets of data.

4.4.1.3 FE7t versus FE8t

Large sample test statistic Z=1.223
Two-tailed probability of equalling or exceeding Z=0.221329
One-tailed probability is p/2=0.1106645

No statistically significant difference was noted between these 2 sets of data.

4.4.1.4 FEM versus FE8T

Two-tailed probability of equalling or exceeding Z=0.0587
One-tailed probability is p/2=0.02935

A statistically significant difference was noted between these 2 sets of data.

The Mann Whitney U-test was used to analyze the following data :

4.4.1.5 FE8n versus FE8t

Large sample test statistic Z=-1.43403
Two-tailed probability of equalling or exceeding Z=0.151564
One-tailed probability is p/2=0.075782

No statistically significant difference was noted between these 2 sets of data.

4.4.2 **Forced Vital Capacity**

TABLE 24 : FORCED VITAL CAPACITY DATA

FVC	T1	T2	T3	Tm	T4	T5	T6	T7	T8
Pt 1	1.76	1.56	2.13	1.82	2.35	2.61	2.74	2.84	2.90
Pt 2	2.34	1.91	1.88	2.04	2.09	2.53	2.65	2.66	2.72
Pt 3	2.70	2.73	2.24	2.56	2.75	2.77	2.86	2.70	2.68
Pt 4	4.77	4.55	4.35	4.56	4.68	4.76	4.79	4.80	4.82
Pt 5	4.24	4.34	4.21	4.26	4.16	3.90	3.87	3.71	4.34
Pt 6	3.10	3.40	3.36	3.29	2.94	3.06	3.12	3.28	2.93
Pt 7	3.54	2.94	3.35	3.27	3.41	3.56	4.01	3.85	4.19
Pt 8	2.17	2.33	2.49	2.33	2.52	2.26	2.39	2.52	2.37
Pt 9	5.03	4.74	4.90	4.89	5.27	5.50	4.53	5.32	5.12
Pt 10	1.82	2.02	1.90	1.91	1.74	1.86	2.11	1.94	1.89
Pt 11	4.53	3.89	4.22	4.21	3.27	3.87	4.53	3.93	3.63
Pt 12	2.81	3.14	3.32	3.09	3.32	3.16	3.18	3.06	3.32
Pt 13	3.57	2.65	3.76	3.33	3.09	2.78	3.00	2.90	3.57
Pt 14	2.57	1.43	2.33	2.11	3.17	3.07	3.34	3.15	3.12
Pt 15	3.17	2.87	2.50	2.85	2.86	3.05	2.99	2.94	3.05
Pt 16	1.49	1.84	1.61	1.65	1.25	1.34	1.23	1.76	1.75
Pt 17	2.83	3.37	3.06	3.09	3.16	3.28	3.25	3.37	2.83
Pt 18	2.87	3.01	3.19	3.02	1.98	2.81	2.37	3.03	2.80
Pt 19	1.90	1.68	2.12	1.90	1.86	2.31	1.94	2.55	2.51
Pt 20	2.45	2.50	2.44	2.46	2.38	2.35	2.46	2.40	2.31
Pt 21	1.65	3.25	2.89	2.60	2.46	3.10	2.33	2.35	3.24
Pt 22	1.96	1.84	2.06	1.95	1.80	2.08	1.43	2.06	1.80
Pt 23	3.80	3.41	3.66	3.62	3.24	3.98	3.52	3.96	3.23
Pt 24	1.79	1.77	2.22	1.93	1.98	2.23	2.02	1.93	1.92
Pt 25	1.55	0.86	1.20	1.20	2.61	3.88	2.31	2.70	2.41
Pt 26	2.86	1.22	2.06	2.05	2.48	1.59	2.39	1.88	1.88
Pt 27	5.21	5.73	5.59	5.51	5.46	5.21	5.72	5.53	5.47
Pt 28	2.57	2.49	2.39	2.48	2.79	2.72	2.69	2.81	2.72
Pt 29	1.07	1.45	2.32	1.61	2.28	1.67	2.19	1.76	2.21
Pt 30	1.65	3.25	2.89	2.60	2.46	3.10	2.33	2.35	3.24
MEAN	2.79	2.74	2.89	2.81	2.86	3.01	2.94	3.00	3.03

- FVC = Forced Vital Capacity
- FVM = Baseline Mean of FVC
  = Mean of first 3 FVC readings
- FV7T = FVC mean of the entire group taken after final treatment of initial treatment period
- FV7n = FVC mean of the non treatment group taken after final treatment of initial treatment period
- FV7t = FVC mean of the treatment group taken after final treatment of initial treatment period
- FV8n = FVC mean of non treatment group taken after final treatment at the end of the follow-up period
- FV8t = FVC mean of treatment group taken after final treatment at the end of the follow-up period
- FV8T = FVC mean of the entire group taken after final treatment at the end of the follow-up period

The Wilcoxon Signed Rank test was used to analyze the following data :

4.4.2.1 FVM versus FV7T

Large sample test statistic Z=2.67047
Two-tailed probability of equalling or exceeding Z=0.00757469
One-tailed probability is p/2=0.003787345

A statistically significant difference was noted between these 2 sets of data.

4.4.2.2 FV7n versus FV8n

Large sample test statistic Z=1.53748
Two-tailed probability of equalling or exceeding Z=0.124174
One-tailed probability is p/2=0.062087

No statistically significant difference was noted between these 2 sets of data.

4.4.2.3 FV7t versus FV8t

Large sample test statistic Z=0.745241
Two-tailed probability of equalling or exceeding Z=0.456124
One-tailed probability is p/2=0.228062

No statistically significant difference was noted between these 2 sets of data.

4.4.2.4 FVM versus FV8T

Two-tailed probability of equalling or exceeding Z=0.0215
One-tailed probability is p/2=0.01075

A statistically significant difference was noted between these 2 sets of data.

The Mann Whitney U-test was used to analyze the following data :

4.4.2.5 FV8n versus FV8t

Large sample test statistic Z=-1.10076
Two-tailed probability of equalling or exceeding Z=0.270999
One-tailed probability is p/2=0.1354995

No statistically significant difference was noted between these 2 sets of data.

4.4.3 **FEV1/FVC**

TABLE 25 : FEV1/FVC% DATA

FEV1/ FVC%	T1	T2	T3	Tm	T4	T5	T6	T7	T8
Pt 1	97%	100%	98%	98%	96%	95%	93%	89%	89%
Pt 2	71%	89%	90%	83%	96%	85%	80%	90%	89%
Pt 3	79%	77%	79%	78%	77%	79%	80%	84%	78%
Pt 4	62%	59%	64%	62%	65%	62%	63%	65%	62%
Pt 5	71%	73%	74%	72%	71%	74%	74%	70%	73%
Pt 6	57%	76%	72%	68%	59%	51%	57%	56%	48%
Pt 7	71%	66%	71%	69%	71%	62%	63%	64%	61%
Pt 8	100%	99%	100%	100%	100%	98%	97%	98%	98%
Pt 9	75%	70%	67%	71%	76%	75%	79%	75%	69%
Pt 10	98%	100%	98%	99%	100%	97%	98%	97%	100%
Pt 11	80%	83%	81%	81%	66%	82%	80%	86%	80%
Pt 12	95%	93%	97%	95%	95%	97%	95%	97%	95%
Pt 13	85%	96%	92%	91%	82%	94%	92%	98%	85%
Pt 14	66%	86%	66%	73%	66%	57%	63%	63%	67%
Pt 15	81%	84%	91%	85%	81%	96%	88%	94%	96%
Pt 16	87%	96%	100%	94%	100%	96%	96%	90%	93%
Pt 17	96%	83%	80%	86%	83%	87%	85%	82%	86%
Pt 18	52%	61%	48%	54%	42%	40%	52%	44%	40%
Pt 19	98%	96%	88%	94%	85%	84%	98%	92%	97%
Pt 20	93%	92%	95%	93%	90%	94%	93%	92%	97%
Pt 21	47%	70%	66%	64%	64%	68%	62%	64%	71%
Pt 22	79%	83%	80%	81%	81%	80%	85%	81%	81%
Pt 23	67%	84%	73%	75%	70%	73%	74%	77%	70%
Pt 24	46%	56%	62%	55%	62%	66%	61%	55%	55%
Pt 25	100%	100%	100%	100%	80%	72%	74%	77%	82%
Pt 26	78%	94%	88%	84%	82%	98%	92%	95%	98%
Pt 27	89%	83%	86%	86%	84%	83%	79%	84%	81%
Pt 28	48%	78%	68%	65%	69%	80%	78%	74%	60%
Pt 29	59%	83%	83%	75%	87%	69%	78%	81%	82%
Pt 30	47%	70%	66%	64%	64%	68%	62%	64%	71%
MEAN	76%	83%	81%	80%	78%	79%	79%	79%	78%

- FR = FEV1/FVC %
- FRM = Baseline Mean of FEV1/FVC %
  = Mean of first 3 FEV1/FVC % readings
- FR7T = FEV1/FVC % mean of the entire group taken after final treatment of initial treatment period
- FR7n = FEV1/FVC % mean of the non treatment group taken after final treatment of initial treatment period
- FR7t = FEV1/FVC % mean of the treatment group taken after final treatment of initial treatment period
- FR8n = FEV1/FVC % mean of non treatment group taken after final treatment at the end of the follow-up period
- FR8t = FEV1/FVC % mean of treatment group taken after final treatment at the end of the follow-up period
- FR8T = FEV1/FVC % mean of the entire group taken after final treatment at the end of the follow-up period

The Wilcoxon Signed Rank test was used to analyze the following data :

4.4.3.1 FRM versus FR7T

Large sample test statistic Z=0.0360375
Two-tailed probability of equalling or exceeding Z=0.971247
One-tailed probability is p/2=0.4856235

No statistically significant difference was noted between these 2 sets of data.

4.4.3.2 FR7n versus FR8n

Large sample test statistic Z=0.314485
Two-tailed probability of equalling or exceeding Z=0.753148
One-tailed probability is p/2=0.376574

No statistically significant difference was noted between these 2 sets of data.

4.4.3.3 FR7t versus FR8t

Large sample test statistic Z=1.7122
Two-tailed probability of equalling or exceeding Z=0.0868597
One-tailed probability is p/2=0.0434298

A statistically significant difference was noted between these 2 sets of data.

4.4.3.4 FVM versus FV8T

Two-tailed probability of equalling or exceeding Z=0.4432
One-tailed probability is p/2=0.2216

No statistically significant difference was noted between these 2 sets of data.

The Mann Whitney U-test was used to analyze the following data :

4.4.3.5 FR8n versus FR8t

Large sample test statistic Z=-0.0207506
Two-tailed probability of equalling or exceeding Z=0.983439
One-tailed probability is p/2=0.4917195

No statistically significant difference was noted between these 2 sets of data.

4.4.4 **Sputum Eosinophil Levels**

TABLE 26 : SPUTUM EOSINOPHIL LEVELS DATA

	T1	T2	T3	Tm	T4	T5	T6	T7	T8
Pt 1	15%	0%	0%	5%	0%	0%	0%	0%	0%
Pt 2	0%	0%	0%	0%	0%	0%	0%	0%	0%
Pt 3	0%	0%	5%	2%	0%	0%	0%	0%	0%
Pt 4	0%	0%	0%	0%	0%	0%	0%	0%	0%
Pt 5	0%	0%	0%	0%	0%	0%	0%	0%	0%
Pt 6	0%	0%	0%	0%	0%	0%	0%	0%	0%
Pt 7	19%	0%	0%	6%	12%	7%	9%	0%	0%
Pt 8	0%	0%	0%	0%	0%	0%	0%	0%	0%
Pt 9	0%	0%	0%	0%	0%	0%	0%	0%	0%
Pt 10	2%	14%	0%	5%	0%	0%	0%	0%	0%
Pt 11	0%	0%	0%	0%	0%	0%	0%	0%	0%
Pt 12	0%	0%	0%	0%	0%	0%	0%	0%	0%
Pt 13	0%	0%	0%	0%	0%	0%	0%	0%	0%
Pt 14	0%	0%	0%	0%	0%	0%	2%	0%	0%
Pt 15	0%	0%	0%	0%	0%	0%	0%	0%	0%
Pt 16	0%	0%	0%	0%	0%	0%	0%	0%	0%
Pt 17	0%	0%	0%	0%	0%	0%	0%	0%	0%
Pt 18	0%	10%	4%	5%	0%	10%	3%	5%	15%
Pt 19	0%	48%	6%	18%	0%	10%	11%	3%	6%
Pt 20	0%	0%	0%	0%	0%	0%	0%	0%	0%
Pt 21	0%	0%	0%	0%	0%	0%	0%	0%	0%
Pt 22	0%	0%	19%	6%	0%	0%	0%	0%	0%
Pt 23	0%	0	5%	2%	0%	2%	0%	0%	0%
Pt 24	0%	0%	0%	0%	0%	0%	0%	0%	0%
Pt 25	14%	0%	0%	0%	0%	0%	0%	0%	0%
Pt 26	5%	0%	0%	2%	0%	1%	5%	0%	0%
Pt 27	0%	0%	0%	0%	0%	0%	0%	0%	0%
Pt 28	0%	0%	0%	0%	0%	0%	0%	0%	0%
Pt 29	0%	0%	0%	0%	0%	0%	7%	0%	0%
Pt 30	0%	15%	0%	5%	0%	0%	0%	2%	0%
MEAN	1,8%	2.9%	1.3%	1.9%	0.4%	1.0%	1.2%	0.3%	0.7%

- SE = Sputum Eosinophil Level
- SEM = Baseline Mean of SE
  = Mean of first 3 SE readings
- SE7T = SE mean of the entire group taken after final treatment of initial treatment period
- SE7n = SE mean of the non treatment group taken after final treatment of initial treatment period
- SE7t = SE mean of the treatment group taken after final treatment of initial treatment period
- SE8n = SE mean of non treatment group taken after final treatment at the end of the follow-up period
- SE8t = SE mean of treatment group taken after final treatment at the end of the follow-up period
- SE8T = SE mean of the entire group taken after final treatment at the end of the follow-up period

The Wilcoxon Signed Rank test was used to analyze the following data :

4.4.4.1 SEM versus SE7T

Large sample test statistic Z=2.75209
Two-tailed probability of equalling or exceeding Z=0.00592163
One-tailed probability is p/2=0.002960815

A statistically significant difference was noted between these 2 sets of data.

4.4.4.2 SE7n versus SE8n

Large sample test statistic Z=0.267261
Two-tailed probability of equalling or exceeding Z=0.789264
One-tailed probability is p/2=0.394632

No statistically significant difference was noted between these 2 sets of data.

4.4.4.3 SE7t versus SE8t

Large sample test statistic Z=0.267261
Two-tailed probability of equalling or exceeding Z=0.789264
One-tailed probability is p/2=0.394632

No statistically significant difference was noted between these 2 sets of data.

4.4.4.4 SEM versus SE8T

Two-tailed probability of equalling or exceeding Z=0.0625
One-tailed probability is p/2=0.03125

A statistically significant difference was noted between these 2 sets of data.

The Mann Whitney U-test was used to analyze the following data :

4.4.4.5 SE8n versus SE8t

Large sample test statistic Z=0.933333
Two-tailed probability of equalling or exceeding Z=0.350646
One-tailed probability is p/2=0.175323

No statistically significant difference was noted between these 2 sets of data.

CHAPTER 5
DISCUSSION

5.1 Introduction

The results of this study will be discussed under the following headings :
* Demographic data -retrieved from the patients' files.
* Subjective data -this data was retrieved from the asthma questionnaire, disability index and S.O.A.P. notes.
* Objective data -spirometry readings of FEV1 and FVC; calculation of FEV1/FVC % and lastly sputum analysis.

As mentioned earlier, 30 patients completed the study and the data obtained from them was therefore admissible.

5.2 Demographic data obtained from the patients' files

From the demographic data obtained in the patients' files, a number of trends were seen regarding the patients who responded to the study.

Patients' ranged in age from the youngest being 12 years old to the oldest being 75 years old. The majority (20) of the participants in the study were less than 42 years old, while only 10 patients were 42 and older. (Table 1) Whether this distribution is representative of the general distribution among asthma sufferers in Durban or South Africa is not known.

When looking at patient gender distribution it may be noted that 57% of the patients were female.(Table 2) Whether this is a true reflection of the ratio of male to females in the greater Durban area is not known. One theory regarding the greater number of females participating in the study may be found in Table 4 -Patients Occupation- where it may be seen that the majority of participants are home executives (27% of study group), with more flexible time schedules than most other occupations.

Patient race distribution showed a significant majority of the participants in the study being White (66.7%), while the rest of the participants in the study were made up of Indian (20%), Black (10%) and Coloured (3.3%) patients.(Table 3)

It may be clear to see from Table 4 that a quite varied sample existed in terms of occupation, representing a large scope of different people from different backgrounds, whose daily lives differ from one another and the variables that may influence their asthma differ according to their daily life and their surroundings.

Thus this study was afforded the opportunity to assess the effect of chiropractic care in the management of asthma with a broad base. It did however result in the inability to assess exactly in what type and to which extent in each different type of asthma, chiropractic care may play a role in the management of asthma.

Of the 30 patients who took part in the study, 5 were smokers (Diagram A). Although this variable may influence the asthmatic condition of the patients concerned, they were not asked to refrain from smoking in order not to change any preexisting variable, thus ensuring that any changes noted in their asthmatic condition could be deduced to have been as a result of the chiropractic care and not other external agents.

Three of the 5 smokers made up part of the treatment group of the follow-up study while the remaining 2 smokers formed part of the non-treatment group of the follow-up study.

During the history taking at the onset of the study, 2 associated symptoms emerged to be prominent in the asthmatic condition. The first of these symptoms was associated headaches usually present as a preamble to an asthmatic attack. Of the 30 patients who participated in the study, 24 (80%) presented with such headaches (Diagram Ba). On completion of the study only 3 patients still experienced headaches to some degree or another (Diagram Bb). This allows us to conclude that chiropractic care resolved 21 patients (70%) of their headaches.

The second associated symptom to emerge as a preamble to an asthma attack was mid-thoracic pain and/or discomfort. Of the 30 patients participating in this study, 28 (93%) presented initially with such mid-thoracic pain and/or discomfort (Diagram Ca). On completion of the study only 4 (13%) patients still experienced mid-thoracic discomfort (Diagram Cb). From this information one may deduce that chiropractic care resolved 24 patients (80%) of their mid-thoracic pain and/or discomfort.

5.3 Vertebral levels adjusted during the study

As previously discussed, with regards to this study, fixations in the upper cervical (C0-C2) and upper- and mid-thoracic (T2-T7) regions received chiropractic care which consisted of adjustments of the fixated levels and soft tissue therapy.

Although the vertebral levels adjusted were not the main focus of this study, they form an important part of determining a future management protocol for asthmatics.

General consensus over the years has tended towards adjustments of the thoracic spine for respiratory conditions. (Jamison et al. 1986 : 138)

In more recent years, however, a more holistic approach seems to have been adopted with the treatment of the cervical spine as well. (Jamison et al. 1992 : 175)

In the upper cervical (C0-C2) region, the level most frequently found to be fixated in the patients who completed this study was C2. Twenty-eight of the 30 patients presented with this fixation (93%). In the upper and mid-thoracic (T2-T7) regions the levels most often found to be fixated were T4 (87%), T5 (100%) and T6 (77%) (Graph A).

This data, however, stands in conflict with the results obtained by Jamison et al. (1992 : 175) who found in their survey of chiropractors registered in Australia, that the level most frequently adjusted in the cervical spine was C1 and that in the thoracic spine, T3 was most frequently adjusted in the treatment of asthma.

When looking at the result obtained from the study of Jamison et al.(1992:175), it must be stated that when the fixation was classified to be at the C2 level, no distinction was made between whether the fixation was at the apophysial joint between C1 and C2 or the joint between C2 and C3. In not one of the studies discussed above is this point clarified although the norm is to list the upper of the 2 vertebrae involved.

This study identified as well as adjusted the upper of the two segments in the fixated joint.

5.4 Subjective Data

5.4.1 The Asthma Questionnaire

The questionnaire may be divided into two distinct areas. The first section dealt with the patients' perception of their general well being (Question 2a - d Appendix), while the second dealt with the patients' perception of their asthmatic condition (Question 3 Appendix). In both cases, the data was analyzed using frequency tabulations (Tables 5-21).

The first question posed to the patients was to what extent the asthmatic condition interfered with their lives. Before the onset of treatment all patients reported that the condition, to some extent, interfered with their daily lives. However, on completion of the treatment period, 5 patients reported that asthma no longer interfered with their daily lives. Thus this may be interpreted favourably regarding patients' perception of chiropractic care with respect to their asthmatic condition.

The second question posed to the patients was to what extent their condition affected their relationships with others. Prior to the commencement of treatment, 1 patient reported that his asthma severely affected his relationship with others, while 8 patients reported that their asthma only moderately affected their relationships with others.

The rest of the patients reported that their relationships with others were only slightly or not at all affected by their asthma. After completion of the treatment period, there were no patients who reported that their relationships with others were severely affected and only 4 patients stated that their asthma moderately affected their relationships with others, while the rest only reported slight or no affect of their asthma on their relationships with others. The trend of movement of patient numbers from right to left in Table 6 indicates that patients no longer perceived their asthma to affect their relationships with others to the same extent to which it did before receiving chiropractic care.

The patients were then asked to assess their degree of tiredness. Before the onset of treatment, 3 patient reported that they were not at all tired, while the rest of the study group (27) experienced varying degrees of tiredness. On completion of the treatment period, 11 patient reported that they were not at all tired. The trend of movement of patient numbers in Table 7 from right to left allows the assumption to be made that the patients treated in this study believe that chiropractic care results in a reduction in tiredness and thus an improvement in their general well-being.

Table 8 deals with the degree to which patients of this study perceive themselves to be depressed. At the onset of the study 16 patients experienced no depression at all, while 13 patients experienced slight or moderate degrees of depression and 1 patient experienced a very severe degree of depression.

Following the treatment program, 21 patients experienced no depression at all, while 8 patients experienced slight or moderate degrees of depression and only 1 patient experienced severe depression.

Whether it was due to the patients experience of chiropractic care, placebo or due to the alleviation of their asthmatic symptoms is unclear, but by the trend of patient numbers from right to left in Table 8, it may be clear to see that there was an improvement in the patients perception of the degree to which they felt depressed.

Next, patients were asked to assess their levels of anxiety. Initially, 12 patients experienced no anxiety at all, 6 experienced slight, 6 experienced moderate and 3 experienced severe bouts of anxiety. On completion of the study, 17 patients experienced no anxiety at all, 9 experienced slight, 3 experienced moderate and only 1 patient experienced severe bouts of anxiety. Once again, the reasoning behind the change in each patient's perception of the degree to which they felt anxious, is unclear. What is clear to see is the trend of patient numbers from right to left in Table 9, which is indicative of an improved perception among patients regarding their degree of anxiety.

Table 10 deals with the patients' perceptions of their levels of frustration. The primary causative factor behind each patient's degree of frustration was expressed by many patient to be their asthmatic condition.

Clearly it can be seen by the trend of patient numbers from right to left, that an improved perception among patients regarding their degree of frustration exists after receiving chiropractic care.

From the onset of this study, many patients expressed a general lack of drive, due to the presence of their asthma which on more than one occasion had restricted them from enjoying their lives to the fullest. Table 11 reflects the reduction patients experienced in lack of drive, due to their participation in this study. Whether this was due to the chiropractic care they received, placebo or due to their perception of their asthmatic condition on completion of this study, in not clear.

Asthma, by its very nature, restricted 21 of the patients (Table 12), participating in this study, to some extent from performing certain jobs. Such restriction may be due to the causative agents of each patients condition.(Clark et al. 1992 : 7-10 ; Edwards et al. 1991 : 376 -377) On completion of the study, only 18 patients still felt restricted from performing certain jobs, but to a lesser extent than at the onset of the study. One theory offered for this result is that the affect each patient's causative agents had on their asthma was reduced by the chiropractic care they received during this study.
Nevertheless, the above may be interpreted favourably regarding patients' perception of chiropractic care with respect to their asthmatic condition.

Clark et al.(1992 : 9) suggested that exercise-induced asthma covers a large percentage of asthmatics as airways resistance of some type can be seen in all types of asthma patients subjected to exertion.

During this study, 6 patients felt no restriction from exercising. This was the same at the conclusion of the study, although a larger percentage of the patients felt less restricted than at the onset of the study (Table 13).

Following discussions with the patient, it was established that they generally felt apprehensive to exert themselves, as past experiences were unfavourable and they were therefore reluctant to test their capacity for exertion. In addition to their general reluctance to exercise, many if not most of the patients of this study, as a result of their condition, had lead sedentary lifestyles which were not changed. This resulted in the data of Table 13 may not be a true reflection of the degree to which asthma restricted patients from exercising.

It may be difficult to ascertain each patient's perception of socializing, however, the data in Table 14 suggests that whatever these patients perceive to be socializing was restricted to a lesser degree following the treatment they received during this study. Fifty percent (15 patients) felt restricted from socializing to some degree prior to treatment, while at completion of the study only 27% (8 patients) felt some degree of restriction. Whether this was due to the chiropractic care they received, placebo or due to their perception of their asthmatic condition on completion of this study, in not clear.

The majority of patients (17 of the 30), when asked to what degree their asthma restricted them from travelling, expressed that they were not at all affected, while the rest of the sample group (13 patients) expressed varying degrees of restriction to travelling. On completion of the study, 20 patients reported that they no longer felt restricted by travelling and the rest of the sample group expressed only slight or moderate restriction to travelling (Table 15).

This may be interpreted favourably regarding patients' perception of chiropractic care with respect to their asthmatic condition.

This question, however, failed to make the distinction between short and long distance travelling or the mode of transport, which may influence each asthmatic differently and thus change the outcome of the data collected in Table 15.

Tables 16 to 21 deals more directly with patients' perception of the symptomatology they experience due to their asthmatic condition.

Shortness of breath, experienced to some degree and at various times, is one of the tell-tail symptoms of asthma. (Berkow , 1992 : 647 - 648 ; Pearlman et al.1993 : 952 - 953)
At the onset of this study 13 patients experienced shortness of breath at least once per day, the rest of the sample group, bar one, experienced shortness of breath once per week or less (Table 16).

On completion of the study, the frequency with which patients experienced shortness of breath had decreased, leaving only 7 patients experiencing this symptom once per day.

Wheezing is one of the most prominent symptoms experienced by asthmatic patients, in some instances as the preamble to an asthmatic attack while in some individuals wheezing forms a constant part of their daily lives. (British Thoracic Society 1990a : 797 ; Berkow , 1992 : 647 ; Pearlman 1993 : 952 - 953)
The patients presenting for this study all experienced bouts of wheezing to some degree or another and some more frequently than others. Half the sample group experienced wheezing at least once per day while the rest of the group varied from once per week to seldom (Table 17).

On completion of the study the number of patients experiencing wheezing, at least once per day, had been reduced to 6, and 3 patients no longer experienced wheezing at all.

As discussed above, tight chestedness is also experienced by asthmatics.(British Thoracic Society 1990a : 797 ; Berkow , 1992 : 647 ; Pearlman 1993 : 952 - 953)
It may be noted that the trend of patient numbers from right to left, in Table 18, reflects a decrease in frequency of tight chestedness among patients who completed this study.

Coughing up of phlegm is usually associated with the end of an asthma attack, while a dry, non-productive cough is more common in asthmatics in times of remission. (Berkow , 1992 : 647 ; Pearlman 1993 : 952 - 953) From the data collected in this study, it can be seen in Table 19 that the result obtained do not concur with the literature. Twelve of the 30 patients coughed up phlegm on a daily basis and only 2 patients had never coughed up phlegm. One theory offered, is that this may be due to the remission of the inflammatory process and the body is trying to remove the inflammatory by-products. However, no evidence exists to substantiate this theory.

On completion of the study, it was noticeable that only one patient still did not cough up phlegm even though the frequency of the rest of the sample group had decreased. The distinction between phlegm coughed up after asthmatic attacks and that coughed up during periods of remission was not made.

It may be interesting to note that patients expressed a vast increase in phlegm production after the first 3 chiropractic treatments which later subsided.
In terms of the theory discussed above, this may be seen as an improvement of the patients' asthmatic condition.

Table 20 deals with the frequency with which patients suffered from hoarseness. The lack of significant movement of patient numbers either to the right or left is indicative of no change in the frequency with which patients suffered from hoarseness. As a result, it may be concluded that the patients did not perceive chiropractic care to be beneficial in the alleviation of their hoarseness.

The last question posed to the patients was the frequency with which they suffered from sore throats. Although not a vast difference was noted between their frequency before and after the treatment, there was still movement in patient numbers from right to left in Table 21, which indicated a decrease in frequency of sore throats among patients.

The data obtained from question 3 of the asthma questionnaire (Appendix B), as a whole, may thus be interpreted favourably regarding patients' perception of chiropractic care with respect to their asthmatic condition.

5.4.2 Asthma Disability Index

As with the Asthma Questionnaire, the Disability Index afforded the patients the opportunity to assess their perception of their asthmatic condition. With 0 indicating that their asthma was not in the least disabling and 10 indicating that their asthma was severely disabling, patients were asked to assess their perception of their condition at each treatment.(Table 22)

Indices 1, 2 and 3 (Graphs B, C and D) display only negligible changes in the patients' perception of their condition. This outcome was expected, as the data from these indices was collected during the first block period (as discussed in chapter 3).

It was noted from Graphs B, C and D that the majority of the sample group fell within the 3 to 7 disability range, with a few of the patients recording a disability of as high as 10. Once chiropractic treatment commenced, it was noted that for the entire duration of the rest of the study, a disability greater than 7 was not recorded by any of the patients.(Table 22) This trend in itself suggests that the patients no longer perceived their asthma to be as disabling as prior to receiving chiropractic care.

The data, however, shows a substantial change from the fourth index onwards due to the onset of chiropractic care. It becomes clear to see that a general movement of patient numbers exists, from right to left, during the fourth, fifth, sixth and seventh indices. While the majority of the sample group fell within the 3 to 7 disability range during the baseline study, this range shifted to between 2 and 7 after the fourth consultation, to between 2 and 4 after the fifth consultation, to between 1 and 4 after the sixth consultation and to between 0 and 4 after the seventh consultation.

This trend suggests that the patients no longer perceived their asthma to be disabling to the degree to which it was prior to chiropractic care.

When a comparison was made between Graph I (Index 8-Entire Group) and the baseline study (Graphs B, C and D), a movement of patient numbers from right to left is noted, allowing us to assume that the patients perceived their asthma to be less disabling after receiving chiropractic care and may in turn be interpreted favourably regarding patients' perception of chiropractic care with respect to their asthmatic condition.
Index 8 (Graph I) may not, however, be regarded as a true reflection of the sample group's perception of prolonged chiropractic care with respect to their asthmatic condition as half the group received a further 4 treatments while the other half did not. It was thus necessary to look at these two groups individually in order to assess the true reflection of the sample group's perception of prolonged chiropractic care.

Graph J reflects the perception of the non-treatment group regarding the degree to which their asthma was disabling to them at the end of the initial treatment period. From this graph it may be seen that the majority of the sample group fell within the 2 to 4 disability range. In comparison, Graph K, which is a reflection of the non-treatment groups perceived degree of disability at the end of the follow-up study, it may be seen that patient numbers have moved from left to right as compared to Graph J.

This may be interpreted as patients in this group perceiving their asthmatic condition to have regressed once chiropractic care had been stopped. This, in turn, may be interpreted favourably regarding patients' perception of chiropractic care with respect to their asthmatic condition.

Graph L reflects the perception of the treatment group regarding the degree to which their asthma was disabling to them at the end of the initial treatment period.
Four patients no longer experienced any disability, while 2 patients experienced a disability of 1, 3 patients experienced a disability of 2, 4 patients experienced a disability of 3 and 2 patients experienced a disability of 6. No patients experienced a disability greater than 6.
In comparison, Graph M, which is a reflection of the treatment groups perceived degree of disability at the end of the follow-up study, it may be seen that patient numbers have moved from right to left as compared to Graph L.
Six patients no longer experienced any disability, while 4 patients experienced a disability of 1, 2 patients experienced a disability of 2, 1 patient experienced a disability of 3 and 2 patients experienced a disability of 5. No patients experienced a disability greater than 5.
This trend of patient numbers from right to left demonstrates that the patients of this group perceived their asthma to be less disabling following further chiropractic care during the follow-up period.

The above information may thus be summarized as follows:
The entire sample group perceived their asthma to become less disabling following chiropractic care and thus chiropractic care was perceived as being beneficial in treating their asthmatic condition.
Prolonged chiropractic treatment was perceived to further decrease the degree of disability experienced by the patients as a result of their asthmatic condition.

The above information has enabled us to state the following:
1. Patients perceived chiropractic care to be beneficial in treating their asthmatic condition.
2. A treatment protocol of 8 chiropractic treatments, as given to the treatment group, was perceived to be more beneficial in the treatment of asthma than the 4 chiropractic treatments given to the non-treatment group.

How many chiropractic treatments are needed for optimal benefit to asthmatic patients is a study which needs to be addressed in the near future.

Lastly, on analysis of the medication diaries returned at the end of the initial treatment period, it was established that the sample group as a whole reduced their medication intake by 55 %. Whether this was due to the chiropractic treatment needs further investigation.

5.5 Objective Data

Introduction

It is important to grasp the distinction between statistical significance and clinical significance. The analysis of a large body of data might produce evidence of a departure from a null hypothesis which is quite highly (statistically) significant, yet the difference may be of no practical importance, either because the effect is clinically irrelevant or because it is too small. Conversely, another investigation may fail to show a (statistically) significant effect, perhaps because the study is too small or because of excessive random variation, yet an effect large enough to be (clinically) important may be present. (Armitage and Berry 1987:96-97)

5.5.1 Forced Expiratory Volume in 1 Second

Due to the nature of this study, when analysing the data, we are only interested in a one-tailed probability, thus p/2 is taken as the exceedance probability. If, therefore, $p/2 \leq \alpha$ (0.05) the null hypothesis is rejected. This hypothesis states that there is no change in forced expiratory volume in 1 second and this is translated as no change in the patients' asthmatic condition. If $p/2 \leq \alpha$ (0.05) the alternate hypothesis will be accepted. This one-tailed hypothesis may be interpreted as an increase in forced expiratory volume in 1 second and thus an improvement in the patients' asthmatic condition. The data (Table 23) were analyzed using the Wilcoxon Signed Rank test and the Mann Whitney U-test.

5.5.1.1 FEM versus FE7T

The two-tailed probability of equalling or exceeding the critical value Z is 0.00984218. This implies that the one-tailed probability p/2 is 0.00492109. As p/2 is < 0.05, the null hypothesis is rejected and the alternate hypothesis accepted. This alternate hypothesis, that there is a statistically significant improvement in the forced expiratory volume in 1 second of patients in the initial treatment period, is accepted. Thus, it can be stated that there was an improvement in the patients' asthmatic condition at the end of the initial phase of chiropractic treatment. These results indicate that asthmatic sufferers respond favourably to chiropractic care. These results, however, are contrary to those findings made by Jamison et al. (1986) who concluded that no predictable change in spirometry pre- and post-adjustment was found.

It is perhaps due to the very nature of their study, assessing lung function pre- and post-adjustment, without allowing the lungs the opportunity to adjust to corrected nervous stimulation, that resulted in Jamison et al. (1986) obtaining such results. The number and frequency of treatments received by the patients participating in the study performed by Jamison et al. (1986) as compared to the number and frequency of treatments which patients received during this study, may also be one of the contributing factors that resulted in the discrepancy between results being obtained. Lastly, the sample size used by Jamison et al. (1986)(15 patients) as compared to the sample size used by this study in the initial treatment period, may also be one of the contributing factors that resulted in the discrepancy between results being obtained.

5.5.1.2 FE7n versus FE8n

This set of data is a comparison of the forced expiratory volume in 1 second readings of the non-treatment group at the end of their initial treatment period, as compared to their forced expiratory volume in 1 second readings at the end of their follow-up period. The two-tailed probability of equalling or exceeding the critical value Z is 0.806762. This implies that the one-tailed probability p/2 is 0.403381. As p/2 is > 0.05, the null hypothesis is accepted and the alternate hypothesis rejected. From this we may deduce that no statistically significant change in the patients' forced expiratory volume in 1 was noted during the follow-up study. These results were, however, expected as this group of patients received no further treatment after the completion of the initial treatment phase.

Although not statistically analyzed, a comparison of the FEV1 readings of the non-treatment group at the end of the baseline study, with their FEV1 readings at the end of the follow-up period showed that their FEV1 readings were higher at the end of the follow-up period. Due to the fact that no other chiropractic studies had been performed which had a treatment period of longer than 5 weeks, no comparisons could be made with this data.

5.5.1.3 FE7t versus FE8t

This set of data is a comparison of the forced expiratory volume in 1 second readings of the treatment group at the end of their initial treatment period, as compared to their forced expiratory volume in 1 second readings at the end of their follow-up period. The two-tailed probability of equalling or exceeding the critical value Z is 0.221329 .

This implies that the one-tailed probability p/2 is 0.1106645. As p/2 is > 0.05, the null hypothesis is accepted and the alternate hypothesis rejected. From this we may deduce that no statistically significant change in the patients' forced expiratory volume in 1 was noted during the follow-up study. A comparison of the FEV1 readings of the treatment group at the end of the baseline study, with their FEV1 readings at the end of the follow-up period showed that their FEV1 readings were higher at the end of the follow-up period, thus allowing for the conclusion to be drawn that these patients' asthmatic conditions had still benefited from chiropractic care. One of the proposed theories regarding the reason that the data of the treatment group obtained in the follow-up period were not statistically significant may be attributed to the decrease in number and frequency of chiropractic treatments.

No study, however, exists to disclaim this theory. Another theory regarding the results obtained from this data, may be attributed to the small sample size used during the follow-up period and thus similar results were obtained to those obtained by Jamison et al. (1986).

5.5.1.4 FEM versus FE8T

The two-tailed probability of equalling or exceeding the critical value Z is 0.0587. This implies that the one-tailed probability p/2 is 0.02935. As p/2 is < 0.05, the null hypothesis is rejected and the alternate hypothesis accepted. This alternate hypothesis, that there is a statistically significant improvement in the forced expiratory volume in 1 second of patients at the end of the follow-up period, is accepted. Thus, it can be stated that there was an improvement in the patients' asthmatic condition at the end of the follow-up phase of chiropractic treatment.

This improvement may be due to a long lasting effect of the initial treatment phase as half the group did not receive any further chiropractic treatments.

5.5.1.5 FE8n versus FE8t

This set of data is a comparison of the forced expiratory volume in 1 second of the treatment group at the end of their follow-up period, as compared to the forced expiratory volume in 1 second readings at the end of the follow-up period of the non-treatment group. The two-tailed probability of equalling or exceeding the critical value Z is 0.151564. This implies that the one-tailed probability p/2 is 0.075782. As p/2 is > 0.05, the null hypothesis is accepted and the alternate hypothesis rejected. It may therefore be deduced that no statistically significant difference exists between the data obtained from the treatment and non-treatment groups during the follow-up period. This may be attributed to the small sample size (Type II error) used during the follow-up period and thus similar results were obtained to those obtained by Jamison et al. (1986).

When comparing the FEV1 readings of the treatment group with those obtained in the non-treatment group over the follow-up period, it can be seen that the additional chiropractic treatments had further beneficial affects on the patients' asthmatic condition. This may be clearly seen by comparing the p/2 values of the non-treatment group with that of the treatment group of the follow-up period, as discussed above (analyzed by the Wilcoxon Signed Rank test). The tendency for the p/2 of the treatment group to slant more towards the exceedance probability of 0.05, is noted, thus enabling the above conclusion to be drawn. This may be deduced to be clinically significant.

The tendency for the p/2 value for the FE8n versus FE8t set of data (analyzed by Mann Whitney U-test) to lean towards the exceedance probability of 0.05, allows for the theory to be postulated that a larger sample size may have resulted in a statistically significant difference between the treatment and non-treatment groups.

5.5.2 Forced Vital Capacity

Due to the nature of this study , when analysing the data , we are only interested in a one-tailed probability, thus p/2 is taken as the exceedance probability. If, therefore, $p/2 \leq \alpha$ (0.05) the null hypothesis is rejected. This hypothesis states that there is no change in forced vital capacity and thus may be translated as no change in the patients' asthmatic condition. If $p/2 \leq \alpha$ (0.05) the alternate hypothesis will be accepted. This one-tailed hypothesis may be interpreted as an increase in forced vital capacity and thus an improvement in the patients' asthmatic condition. The data (Table 24) were analyzed using the Wilcoxon Signed Rank test and the Mann Whitney U-test.

5.5.2.1 FVM versus FV7T

The two-tailed probability of equalling or exceeding the critical value Z is 0.00757469. This implies that the one-tailed probability p/2 is 0.003787345. As p/2 is < 0.05, the null hypothesis is rejected and the alternate hypothesis accepted. This alternate hypothesis, that there is a statistically significant improvement in the forced vital capacity of patients in the initial treatment period, is accepted. Thus, it can be stated that there was an improvement in the patients' asthmatic condition at the end of the initial phase of chiropractic treatment.

These results, however, are contrary to those findings made by Jamison et al. (1986) who concluded that no predictable change in spirometry pre- and post-adjustment was found. It is perhaps due to the very nature of their study, assessing lung function pre- and post-adjustment, without allowing the lungs the opportunity to adjust to corrected nervous stimulation, that resulted in Jamison et al. (1986) obtaining such results.

The number and frequency of treatments received by the patients participating in the study performed by Jamison et al. (1986) as compared to the number and frequency of treatments which patients received during this study, may also be one of the contributing factors that resulted in the discrepancy between results being obtained. Lastly, the sample size used by Jamison et al. (1986) as compared to the sample size used by this study in the initial treatment period, may also be one of the contributing factors that resulted in the discrepancy between results being obtained.

5.5.2.2 FV7n versus FV8n

This set of data is a comparison of the forced vital capacity readings of the non-treatment group at the end of their initial treatment period, as compared to their forced vital capacity readings at the end of their follow-up period. The two-tailed probability of equalling or exceeding the critical value Z is 0.806762. This implies that the one-tailed probability p/2 is 0.403381. As p/2 is > 0.05, the null hypothesis is accepted and the alternate hypothesis rejected. From this we may deduce that no statistically significant change in the patients' forced vital capacity was noted during the follow-up study.

These results were, however, expected as this group of patients received no further treatment after the completion of the initial treatment phase. Although not statistically analyzed, a comparison of the FVC readings of the non-treatment group at the end of the baseline study, with their FVC readings at the end of the follow-up period showed that their FVC readings were higher at the end of the follow-up period, thus allowing for the conclusion to be drawn that these patients' asthmatic conditions appear to have benefited from chiropractic care. Due to the fact that no other studies had been performed which had a treatment period of longer than 5 weeks, no comparisons could be made with this data.

5.5.2.3 FV7t versus FV8t

This set of data is a comparison of the forced vital capacity readings of the treatment group at the end of their initial treatment period, as compared to their forced vital capacity readings at the end of their follow-up period. The two-tailed probability of equalling or exceeding the critical value Z is 0.456124. This implies that the one-tailed probability p/2 is 0.228062. As p/2 is > 0.05, the null hypothesis is accepted and the alternate hypothesis rejected. From this we may deduce that no statistically significant change in the patients' forced vital capacity was noted during the follow-up study. A comparison of the FVC readings of the treatment group at the end of the baseline study, with their FVC readings at the end of the follow-up period showed that their FVC readings were higher at the end of the follow-up period, thus allowing for the conclusion to be drawn that these patients' asthmatic conditions had still benefited from chiropractic care.

One of the proposed theories regarding the reason that the data of the treatment group obtained in the follow-up period were not statistically significant may be attributed to the decrease in number and frequency of chiropractic treatments. No study, however, exists to disclaim this theory. Another theory regarding the results obtained from this data, may be attributed to the small sample size used during the follow-up period and thus similar results were obtained to those obtained by Jamison et al. (1986), or maybe chiropractic just does not affect this aspect.

5.5.2.4 FVM versus FV8T

The two-tailed probability of equalling or exceeding the critical value Z is 0.0215. This implies that the one-tailed probability p/2 is 0.01075. As p/2 is < 0.05, the null hypothesis is rejected and the alternate hypothesis accepted. This alternate hypothesis, that there is a statistically significant improvement in the forced vital capacity of patients at the end of the follow-up treatment period, is accepted. Thus, it can be stated that there was an improvement in the patients' asthmatic condition at the end of the follow-up phase of chiropractic treatment. This improvement may be due to a long lasting effect of the initial treatment phase as half the group did not receive any further chiropractic treatments.

5.5.2.5 FV8n versus FV8t

This set of data is a comparison of the forced vital capacity of the treatment group at the end of their follow-up period, as compared to the forced vital capacity readings at the end of the follow-up period of the non-treatment group. The two-tailed probability of equalling or exceeding the critical value Z is 0.270999. This implies that the one-tailed probability p/2 is 0.1354995. As p/2 is > 0.05, the null hypothesis is accepted and the alternate hypothesis rejected.

It may therefore be deduced that no statistically significant difference exists between the data obtained from the treatment and non-treatment groups during the follow-up period. This may be attributed to the small sample size (Type II error) used during the follow-up period and thus similar results were obtained to those obtained by Jamison et al. (1986), or maybe chiropractic does not affect this aspect.

When comparing the FVC readings of the treatment group with those obtained in the non-treatment group over the follow-up period, it can be seen that the additional chiropractic treatments had further beneficial affects on the patients' asthmatic condition. This may be clearly seen by comparing the p/2 values of the non-treatment group with that of the treatment group of the follow-up period, as discussed above (analyzed by the Wilcoxon Signed Rank test).
This may be deduced to be clinically significant.

The tendency for the p/2 of the treatment group to slant more towards the exceedance probability of 0.05, is noted, thus enabling the above conclusion to be drawn. The tendency for the p/2 value for the FV8n versus FV8t set of data (analyzed by Mann Whitney U-test) to lean towards the exceedance probability of 0.05, allows for the theory to be postulated that a larger sample size may have resulted in a statistically significant difference between the treatment and non-treatment groups.

5.5.3 Forced Expiratory Volume In 1 Second / Forced Vital Capacity %

Due to the nature of this study, when analysing the data, we are only interested in a one-tailed probability, thus p/2 is taken as the exceedance probability. If, therefore, $p/2 \leq \alpha$ (0.05) the null hypothesis is rejected.

This hypothesis states that there is no change in FEV1/FVC % and this is translated as no change in the patients' asthmatic condition. If $p/2 \leq \alpha$ (0.05) the alternate hypothesis will be accepted. This one tailed hypothesis may be interpreted as an increase in FEV1/FVC % and thus an improvement in the patients' asthmatic condition. The data (Table 25) were analyzed using the Wilcoxon Signed Rank test and the Mann Whitney U-test.

5.5.3.1 FRM versus FR7T

The two-tailed probability of equalling or exceeding the critical value Z is 0.971247. This implies that the one-tailed probability p/2 is 0.4856235. As p/2 is > 0.05, the null hypothesis is accepted and the alternate hypothesis rejected. This hypothesis, that there is no statistically significant improvement in the FEV1/FVC % in the initial treatment period, is accepted.

Thus, it can be stated that there was no improvement in the patients' asthmatic condition at the end of the initial phase of chiropractic treatment. These results are similar to those findings made by Jamison et al. (1986) who concluded that no predictable change in spirometry pre- and post-adjustment was found.

5.5.3.2 FR7n versus FR8n

This set of data is a comparison of the FEV1/FVC % readings of the non-treatment group at the end of their initial treatment period, as compared to their FEV1/FVC % readings at the end of their follow-up period.
The two-tailed probability of equalling or exceeding the critical value Z is 0.753148. This implies that the one-tailed probability p/2 is 0.376574. As p/2 is > 0.05, the null hypothesis is accepted and the alternate hypothesis rejected.

From this we may deduce that no statistically significant change in the patients' FEV1/FVC % was noted during the follow-up study. These results were, however, expected as this group of patients received no further treatment after the completion of the initial treatment phase. Although not statistically analyzed, a comparison of the FEV1/FVC % readings of the non treatment group at the end of the baseline study, with their FEV1/FVC % readings at the end of the follow-up period showed that their FEV1/FVC % readings were higher at the end of the follow-up period, thus allowing for the conclusion to be drawn that these patients' asthmatic conditions had still benefited from chiropractic care. Due to the fact that no other studies had been performed which had a treatment period of longer than 5 weeks, no comparisons could be made with this data.

5.5.3.3 FR7t versus FR8t

The two-tailed probability of equalling or exceeding the critical value Z is 0.0868597. This implies that the one-tailed probability p/2 is 0.0434298. As p/2 is < 0.05, the null hypothesis is rejected and the alternate hypothesis accepted. This alternate hypothesis, that there is a statistically significant improvement in the FEV1/FVC % of patients who received further treatment in the follow-up period, is accepted. Thus, it can be stated that there was an improvement in the patients' asthmatic condition who received further treatment in the follow-up period. These results, however, are contrary to those findings made by Jamison et al. (1986) who concluded that no predictable change in spirometry pre- and post-adjustment was found. Due to the nature of the FEV1/FVC % ratio, an improvement in the patients' asthmatic condition would indicate that a greater improvement in their FEV1 occurred as compared to their FVC.

5.5.3.4 FRM versus FR8T

The two-tailed probability of equalling or exceeding the critical value Z is 0.4432. This implies that the one-tailed probability p/2 is 0.2216. As p/2 is > 0.05, the null hypothesis is accepted and the alternate hypothesis rejected. This hypothesis, that there is no statistically significant improvement in the FEV1/FVC % in the initial treatment period, is accepted.

5.5.3.5 FR8n versus FR8t

This set of data is a comparison of the FEV1/FVC % of the treatment group at the end of their follow-up period, as compared to the FEV1/FVC % readings at the end of the follow-up period of the non-treatment group. The two-tailed probability of equalling or exceeding the critical value Z is 0.983439. This implies that the one-tailed probability p/2 is 0.4917195. As p/2 is > 0.05, the null hypothesis is accepted and the alternate hypothesis rejected. It may therefore be deduced that no statistically significant difference exists between the data obtained from the treatment and non-treatment groups during the follow-up period.

This may be attributed to the small sample size (Type II error) used during the follow-up period and thus similar results were obtained to those obtained by Jamison et al. (1986), or chiropractic had no affect.

5.5.4 Sputum Eosinophil Level

Due to the nature of this study, when analysing the data, we are only interested in a one-tailed probability, thus p/2 is taken as the exceedance probability. If, therefore, $p/2 \leq \alpha$ (0.05) the null hypothesis is rejected.

This hypothesis states that there is no change in sputum eosinophil level and this is translated as no change in the patients' asthmatic condition. If $p/2 \leq \alpha$ (0.05) the alternate hypothesis will be accepted. This one-tailed hypothesis may be interpreted as an decrease in sputum eosinophil level and thus an improvement in the patients' asthmatic condition. The data (Table 26) were analyzed using the Wilcoxon Signed Rank test and the Mann Whitney U-test.

5.5.4.1 SEM versus SE7T

The two-tailed probability of equalling or exceeding the critical value Z is 0.00592163. This implies that the one-tailed probability p/2 is 0.002960815. As p/2 is < 0.05, the null hypothesis is rejected and the alternate hypothesis accepted. This alternate hypothesis, that there is a statistically significant improvement in the sputum eosinophil level of patients in the initial treatment period, is accepted. Thus, it can be stated that there was an improvement in the patients' asthmatic condition at the end of the initial phase of chiropractic treatment. This improvement is seen as a reduction in the inflammatory process of the asthmatic condition, in which the eosinophils are involved. (Honsinger et al. 1972)

Due to the fact that no other chiropractic study has to date been performed using the sputum eosinophil level as an objective measurement, no comparisons could be made with which to compare these results.

5.5.4.2 SE7n versus SE8n

This set of data is a comparison of the sputum eosinophil level readings of the non-treatment group at the end of their initial treatment period, as compared to their sputum eosinophil level readings at the end of their follow-up period.

The two-tailed probability of equalling or exceeding the critical value Z is 0.789264. This implies that the one-tailed probability p/2 is 0.394632. As p/2 is > 0.05, the null hypothesis is accepted and the alternate hypothesis rejected. From this we may deduce that no statistically significant change in the patients' sputum eosinophil level was noted during the follow-up study. These results were, however, expected as this group of patients received no further treatment after the completion of the initial treatment phase. These results thus imply that the effect of spinal adjustments was short-lived.

5.5.4.3 SE7t versus SE8t

This set of data is a comparison of the sputum eosinophil level readings of the treatment group at the end of their initial treatment period, as compared to their sputum eosinophil level readings at the end of their follow-up period. The two-tailed probability of equalling or exceeding the critical value Z is 0.789264. This implies that the one-tailed probability p/2 is 0.394632. As p/2 is > 0.05, the null hypothesis is accepted and the alternate hypothesis rejected. From this we may deduce that no statistically significant change in the patients' sputum eosinophil level was noted during the follow-up study. Therefore, longer term treatment seemed to have no further effect on SE levels.

A comparison of the sputum eosinophil level readings of the treatment group at the end of the baseline study, with their sputum eosinophil level readings at the end of the follow-up period showed that their sputum eosinophil level readings were lower at the end of the follow-up period, thus allowing for the conclusion to be drawn that these patients' asthmatic conditions had still benefited from chiropractic care.

One of the proposed theories regarding the reason that the data of the treatment group obtained in the follow-up period were not statistically significant may be attributed to the decrease in number and frequency of chiropractic treatments. No study, however, exists to disclaim this theory. Another theory regarding the results obtained from this data, may be attributed to the small sample size used during the follow-up period.

5.5.4.4 SEM versus SE8T

The two-tailed probability of equalling or exceeding the critical value Z is 0.0625. This implies that the one-tailed probability p/2 is 0.03125. As p/2 is < 0.05, the null hypothesis is rejected and the alternate hypothesis accepted. This alternate hypothesis, that there is a statistically significant improvement in the sputum eosinophil level of patients in the follow-up treatment period, is accepted. Thus, it can be stated that there was an improvement in the patients' asthmatic condition at the end of the follow-up phase of chiropractic treatment. This improvement is seen as a reduction in the inflammatory process of the asthmatic condition, in which the eosinophils are involved. (Honsinger et al. 1972)

5.5.4.5 SE8n versus SE8t

This set of data is a comparison of the sputum eosinophil level readings of the treatment group at the end of their follow-up period, as compared to the sputum eosinophil level readings at the end of the follow-up period of the non-treatment group.

The two-tailed probability of equalling or exceeding the critical value Z is 0.350646. This implies that the one-tailed probability p/2 is 0.175323. As p/2 is > 0.05, the null hypothesis is accepted and the alternate hypothesis rejected.

It may therefore be deduced that no statistically significant difference exists between the data obtained from the treatment and non treatment groups during the follow-up period. This may be attributed to the small sample size (Type II error) used during the follow-up period as well as the decrease in number and frequency of chiropractic treatments received by the patients, or chiropractic has no longer term effect on SE levels

5.6 Conclusion

The results obtained from this study suggest a number of conclusions.

From the outset it may be seen that there exists little doubt that the sample group experienced a significant improvement in their perception of their asthmatic condition.

Subjectively patients felt that their asthmatic condition had improved due to the chiropractic care they received. It may thus be concluded that the second objective of this study, to evaluate the efficacy of chiropractic treatment in terms of the patient's subjective perception in order to determine how patients experience chiropractic treatment of asthma, has resulted in a favourable outcome.

Furthermore, it can be seen from the objective measurements during the initial treatment in terms of some outcomes, that patients responded well to the chiropractic care which they received during this study. Not only were statistically significant improvements seen in their forced expiratory volumes in 1 second but also in their forced vital capacities and sputum eosinophil levels during the initial treatment period. A reduction in their daily medication intake of as much as 55 % was also noted.

These results are contrary to those of Jamison et al. (1986). The initial part of this study demonstrated that chiropractic care can reduce respiratory obstruction in asthmatics. In addition to this, it can be seen from the reduction of sputum eosinophil levels that the asthmatic condition improved with chiropractic care.

The possibility of committing a Type II error, due to the small sample size, has not been excluded. Haldeman (1992:419) states that falsely accepting the null hypothesis and thus falsely concluding that no difference exists between study groups, is a Type II error and is most commonly made as a result of a small sample size. This type of error may have occurred more so when analysing the treatment and non-treatment groups individually, at the end of the follow-up period, than when the group as a whole was analyzed. It may be this exact error, due to a sample size of 15, which lead Jamison et al. (1986) to conclude that no objective statistically significant evidence exists to suggest that chiropractic care plays a role in the management of asthmatic patients.

During this study, data were analyzed and results compared between the following :

i. The baseline study and end of the initial treatment period.
ii. The end of the initial and follow-up periods.
iii. The end of the follow-up periods for the treatment and non-treatment groups.
iv. The baseline study and the end of the follow-up period.

Although statistically significant results where obtained when the end of the follow-up period as a whole was compared to the baseline study, no statistically significant differences were noted when the treatment and non-treatment groups where compared. This result may be due to the following:

i. A Type II error was incurred due to a small sample size.

ii. The initial chiropractic care had a prolonged effect.

iii. Chiropractic care had no long term effect on the patient's asthmatic condition

One of the objectives of Jamison et al.'s (1986) study was to determine whether the chiropractor has a role to play as a team member caring for the asthmatic patient. This study has concluded that the chiropractor has a role to play as a team member caring for the asthmatic patient. It must, however, be emphasised that until further research proves otherwise, the role of the chiropractor is as a team member and not an individual.

Elimination of researcher/investigator and subject bias is an important goal in any trial. To reduce this bias, some measure of blinding must be introduced. (Haldeman 1992:418) It may thus be concluded that this study could have been made stronger by the inclusion of an objective independent observer to assess patients before, during and after the treatment phase of the clinical trial.

CHAPTER 6

CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusions

The first objective of this study, which proposed to evaluate the patient's objective response to chiropractic treatment in terms of physiological parameters in order to determine whether chiropractic treatment impacts on the treatment of asthma, has resulted in a favourable outcome. That is, a statistically significant improvement in patients' spirometrical evaluation and sputum eosinophil analysis were noted during the initial treatment period as well as the follow-up study. No statistically significant difference was noted between the treatment and non-treatment groups at follow-up. This despite no placebo being used in the non-treatment group during the one month follow-up period. This lack of a statistically significant difference between the treatment and non-treatment groups may be due to a Type II error, as a result of the small sample size, or the lack of reaction to longer term chiropractic care.

The second objective of this study, which proposed to evaluate the efficacy of chiropractic treatment in terms of the patient's subjective perception in order to determine how patients experience chiropractic treatment of asthma, resulted in a favourable outcome. Patients perceived chiropractic to be very beneficial for their asthma.

Lastly, based on the subjective and objective data collected during this study, on the whole, chiropractic care was found to be an important factor in the treatment of asthmatic patients.

6.2 Recommendations

It is without hesitation that the first item to be recommended is further research. As with many studies, more questions usually arise at the end of the study than answers. It is therefore that a list of proposed future studies follows :

i. The age of patients at which chiropractic care is most effective needs to be investigated.
ii. The type of asthma which is most responsive to chiropractic care needs to be identified.
iii. The number and frequency of chiropractic treatments required by different types of asthmatics needs to be ascertained.
iv. The vertebral levels to be adjusted while treating asthmatic patients needs to be clarified.
v. There exists a need to investigate the role chiropractic treatment plays during an asthmatic attack.
vi. The introduction of a placebo into the non-treatment group.
vii. The effect on smokers as apposed to non-smokers in terms of chiropractic care of asthma.
The recommendation may also be made, that in future, studies such as this one could be made stronger if an objective observer assessed the patients before, during and after the treatment phase of the study while the researcher only performed the adjustments. Lastly, a larger sample group is recommended.

With the existence of the above body of knowledge, the final recommendation is that chiropractors world wide continue to play a role in the management of patients suffering from asthma.

LIST OF REFERENCES

Adelroth, E.; Hargreave, F.E. and Ramsdale, E.H. 1986. Do Physicians Need Objective Measurements to Diagnose Asthma? American Review of Respiratory Disease. 34

Aker, P. 1995. Documenting outcome of care. Speaker notes from LACC's 8th Annual Interdisciplinary Symposium, Los Angeles College of Chiropractic, 25-26 March 1995.

Allen, T.W. and Kelso, A.F. 1980. Osteopathic research and respiratory disease. Journal of American Osteopathic Association. 79

American Thoracic Society. 1982. Surveillance for Respiratory Hazards in the Occupational Setting. 126(5):952-956

Anderson, D.M. 1989. Dorland's Pocket Medical Dictionary. 24th edition. Philadelphia: W.B. Saunders Company. 669 p.
ISBN 0-7216-3127-4

Armitage, P. and Berry, G. 1987. Statistical Methods in Medical Research. 2nd Edition. Oxford. Blackwell Scientific Publications. 559 p.
ISBN 0-632-01501-2

Bartlette, G. 1991. B2-Agonist, cause for concern in asthma mortality. Medifile, Johanesburg. SA Pharmaceutical Journal. 5(4)

Berkow, R. 1992. The Merck Manual of Diagnosis and Therapy. 16th edition. Rahway, N.J. Merck Research Laboratories, division of Merck & Co. , Inc.: 2844 p. ISBN 0911910-16-6

Bousquet, J.; Chanez, P.; Lacost, J.Y. et al. 1990. Eosinophilic inflammation in Asthma. New England Journal of Medicine. 323

Brewis, R.A.L. 1977. Practical pulmonary function tests. The Practitioner. 219

British Thoracic Society 1990a. Guidlines to the management of asthma in adults. 2. Acute severe asthma. British Medical Journal. 301

Brown, H.M. 1958. Treatment of chronic asthma with prednisolone. Significance of eosinophils in the sputum. The Lancet. 2

Bucca, C.; Rolla, G.; Brussino, L.; De Rose, V.; Bugiani, M. 1995. Are asthma like symptoms due to bronchial or extrathoracic airway dysfunction? The Lancet. 346

Burney, P.G.J. 1986. Asthma mortality in England and Wales: Evidence for further increase, 1974-1984. The Lancet. 2

Burrows, B.; Hasan, F.M.; Barbee, R.A.; Halonen, M. and Lebowitz, M.D. 1980. Epidemiologic observations on eosinophilia and its relation to respiratory disorders. American Review of Respiratory Disease. 122

Clark, T.J.H. 1992. Definition and Clinical Categories of Asthma. p.1-13. In Clark, T.J.H.; Godfrey, S. and Lee, T.H. Asthma. 3rd edition. London. Chapman and Hall Medical. 662 p.
ISBN 0-443-04092-3

Cole, V.W. 1969. Physiologic Communications and Controles. p.37-59. In Hoag, J.M.; Cole, W.V. and Bradford, S.G.: Osteopathic Medicine. 1st edition. New York. McGraw - Hill. 767p.

Dahl, R.; Venge, P. and Fredens, K. 1992. Eosinophils. p.111-124. In Barnes, P.J.; Rodger, I.W. and Thomson, N.C., ed. Asthma. Basic Mechanisms and Clinical Management. 2nd edition. London. Academic Press. 782p.
ISBN 0-12-079026-2

Daniel, W.W. 1978. Applied Nonparametric Statistics. Boston. Houghton Mifflin Company. 503p.
ISBN 0-395-25795-6

Dhami, M.S.I. and DeBoer, K.F. 1980. Systemic Effects of Spinal Lesions. p.115-135. In Haldeman, S.C., ed. Modern Developments in the Principles and Practices of Chiropractic. New York. Appleton-Century-Croft. 641p.
ISBN 0-8385-6360-0

Donnelly, W.J.; Spykerboer, J.E.; Thong, Y.H. 1985. Are patients who use alternative medicine dissatisfied with orthodox medicine. Medical Journal of Australia. 142

Edwards, C.R.W. and Bouchier, I.A.D. ed 1991. Davidson's Principles and Practice of Medicine. 16th edition. London. Churchill Livingstone. 1032p.
ISBN 0-443-04092-3

Eisenberg, D.M.; Kessler, R.C.; Foster, C.; Norlock, F.E.; Calkins, D.R.; Delbanco, T.L. 1993. Unconventional medicine in the United States. New England Journal of Medicine. 328

Faucret, B.; Mao, W.; Nakagawa, T.; Spurgin, D.; Tran, T. 1980. Determination of bony subluxations by clinical, neurological and chiropractic procedures. Journal of Manipulative and Physiological Therapeutics. 3(3)

Gitelman, R. and Fitz-Ritson, D. 1984. Somatovisceral Reflexes. Journal of American Chiropractic Association. 18

Goldman, S.R. 1969. A structural approach to bronchial asthma. American Chiropractic Association Journal of Chiropractic. 6

Guyton, A.G. 1991. Textbook of Medical Physiology. 8th ed. Philadelphia. W.B.Saunders Company. 1014p. ISBN 0-7216-3994-1

Haldeman, S. 1992. Principles and Practice of Chiropractic. 2nd ed. Connecticut, U.S.A., Appleton and Lange. 641 p. ISBN 0-8385-6360-0

Hoag, J.M. 1972. Musculoskeletal involvement in chronic lung disease. Journal of American Osteopathic Association. 71

Homewood, A.E. 1963. The Neurodynamics of the Vertebral Subluxation. 279p.

Honsinger, R.W.; Silverstein, D. and Van Arsdel, P.P. 1972. The eosinophil and allergy. Why? Journal of Allergy and Clinical Immunology. 49

Hviid, C. 1978. A comparison of the effect of chiropractic treatment on respiratory function in patients with respiratory stress syndrome and patients without. Bulletin of European Chiropractic Union. 26

Jamison, J.R.; Leskovec, K.; Lepore, S. and Hannan, P. 1986. Asthma in a Chiropractic Clinic: A Pilot Study. Journal of Australian Chiropractors' Association. 16(4)

Jamison, J.R.; McEwan, A.P.; Thomas, S.J. 1992. Chiropractic adjustment in the management of visceral conditions: A critical appraisal. Journal of Manipulative and Physiological Therapeutics. 15(3)

Kiss, G.T. 1982. Diagnosis and Management of Pulmonary Disease in Primary Practice. California. Addison-Wesley Publishing Company. 242p. ISBN 0-201-10606-0

Kleijnen, J.; Riet, G.; Knipschild, P. 1991. Acupuncture and asthma: a review of controlled trials. British Medical Journal. 302

Korr, I.M. 1978. The Neurobiologic Mechanisms in Manipulative Therapy. 2nd edition. New York. Plenum Press. 466p. ISBN 0-306-31150-X

Korr, I.M. 1985. Neurochemical and neurotrophic consequences of nerve deformation. p.64-71. In Glasgow, E.F.; Twomey, L.T.; Scull, E.R.; Kleynhans, A.M.; Idczak, R.M., ed. Aspects of Manipulative Therapy. 2nd ed. London. Churchill Livingstone. ISBN 0-443-03036-7

Lane, D.J. and Lane, T.V. 1991. Alternative and complementary medicine for asthma. Thorax. 46

Leach, R. 1986. The Chiropractic Theories - A Synopsis of Scientific Research. 2nd edition. Baltimore. Williams and Wilkins. 234p. ISBN 0-683-04906-2

Lowry, F. 1995. "Scientific" chiropractors hope to improve status of chiropractic within scientific community. Canadian Medical Association Journal. 152(3)

Luksza, A.R.; Jones, D.K. 1982. Comparison of whole blood eosinophil counts in extrinsic asthmatics with acute and chronic asthma. British Medical Journal. 285

Masarsky, C.S. and Weber, M. 1988. Chiropractic management of chronic obstructive pulmonary disease. Journal of Manipulative and Physiological Therapeutics.6

McMinn, R.M.H. 1994. Last's Anatomy - Regional and Applied. 9th Edition. Edinburgh. Churchill Livingstone. 705p. ISBN 0-443-04662-X

Moore, K.L. 1985. Clinically Oriented Anatomy. 2nd Edition. London. Williams and Wilkins. 1101p. ISBN 0-683-06132-1

Murphy, W.; Wilson, P.T. 1925. A study of the value of osteopathic adjustment of the fourth and fifth thoracic vertebrae in a series of twenty cases of asthmatic bronchitis. Boston Medical Surgery Journal. 192

Nagarathna, R.; Nagendra, H.R. 1985. Yoga for bronchial asthma: a controlled study. British Medical Journal. 291

Nicholas, N.S. 1975. Correlation of Somatic Dysfunction with Visceral Disease. Journal of American Osteopathic Association. 4

Nielsen, N.H.; Bronfort, G.; Bendix, T.; Madsen, F. and Weeke, B. 1995. Chronic asthma and chiropractic spinal manipulation: a randomized clinical trial. Clinical and Experimental Allergy. 25

Nilsson, N. and Christiansen, B. 1988. Prognostic Factors in Bronchial Asthma in Chiropractic Practice. Journal of Australian Chiropractors' Association. 18(3)

Pearlman, D.S. and Comer, C.R. 1993. Allergic Disorders. p.943-966. In Hathaway, W.E.; Hay, W.W. Jr; Groothuis, J.R. and Paisley, J.W. ed. Current: Paediatric Diagnosis and Treatment. 11th edition. London. Appelton and Lange. 1226p. ISBN 0-8385-1442-1

Pick, T.P. and Howden, R. editors 1980. Gray's Anatomy. 36th ed. Edinburgh. Churchill Livingstone. 1578p. ISBN 0-443-01505-8

Pride, N.B. 1992. Physiology. p.14-72. In Clark, T.J.W.; Godfrey, S. and Lee, T.H. 1992. Asthma. 3rd edition. London. Chapman and Hall Medical. 662p. ISBN 0-443-04092-3

Reilly, D.T. 1983. Young doctors' views on alternative medicine. British Medical Journal. 287

Sato, A. 1980. Physiological Studies of the Somatoautonomic Reflexes. p.93-105. In Haldeman, S.C., ed. Modern Developments in the Principles and Practices of Chiropractic. New York. Appleton-Century-Croft. 641p. ISBN 0-8385-6360-0

Sibbald, B. 1992. Genetics. p.21-32. In Barnes, P.J.; Rodger, I.W. and Thomson, N.C., ed. Asthma. Basic Mechanisms and Clinical Management. 2nd edition. London. Academic Press. 782p. ISBN 0-12-079026-2

Singh, V.; Wisniewski, A.; Britton, J.; Tattersfield, A. 1990. Effect of yoga breathing exercises (pranayama) on airway reactivity in subjects with asthma. The Lancet. 335

States, A.Z. 1985. States Manual Of Spinal, Pelvic and Extravertebral Technic. 2nd Edition. Edited by Kirk, C.R., Lawrence, D.C., Valvo, N.L., Department of Chiropractic, National College of Chiropractic, Illinois. 245p.

Steyn, A.G.W.; Smit, C.F.; Du Toit, S.H.C. and Strasheim, C. 1994. Modern Statistics in Practice. Pretoria, South Africa. J.L. van Schaik Publishers. ISBN 0-627-01989-7

Suman, O.E.; Babcock, M.A.; Pegelow, D.F.; Jarjour, N.N.; Reddan, W.G. 1995. Airway obstruction during exercise in asthma. American Journal of Respiratory Critical Care Medicine. 152(1)

Tai, E. 1978. Diagnosis of asthma in the adult. Australian Family Physician. 7

Umanzio, C.B. 1969. The Allergic Response. p.685-708. In Hoag, J.M.; Cole, W.V. and Bradford, S.G., Osteopathic Medicine. 1st edition. New York. McGraw-Hill. 767p.

Wardlaw, A.J. 1993. The role of air pollution in asthma. Clinical and Experimental Allergy. 23(2)

Woolcock, A.J.; Peat, J.K. and Cullen, K. 1986. The effect of asthma on rate of decline of lung function: A community study. American Review of Respiratory Disease. 133

APPENDICES

APPENDIX A

TECHNIKON NATAL

P.O. Box 953
Durban. 4000

Berea Campus:
Telephone (031) 204-2111
Facsimile (031) 223-405

City Campus:
Telephone (031) 301-7823/9
301-7848/9
Facsimile (031) 301-8782

Pietermaritzburg Campus:
P.O. Box 11078. Dorpspruit. 3206
Telephone (0331) 42-5426/7, 42-5447
Facsimile (0331) 42-9804

File #:

PATIENT INFORMED CONSENT DOCUMENT

I have been asked to participate in a study to assess the effectiveness of Chiropractic treatment, in order to determine an alternative approach to the treatment of Asthma. In order to obtain this information I am required to adhere to a number of scheduled treatments, complete a number of questionnaires, disability indices, give sputum samples as well as undergo respiratory tests at certain consultations.

All personal information obtained about me during this study (name, address, telephone number) will be treated with the strictest of confidentiality.

I will adhere to all instructions regarding this study, to the best of my ability.

I agree to participate in this study.

....
Print name Witness

....
Signature Date

P.S. Your cooperation is greatly appreciated.

ASTHMA QUESTIONNAIRE

Patient's name :..... File no :.....

Visit no :.....

In order to complete this questionnaire , please select the appropriate number provided in the boxes next to each section and place your choice in the empty boxes provided in the answer column .

ANSWER COLUMN

1. DO YOU SMOKE ?
   - i. HOW MANY PER DAY ?
   - ii. FOR HOW LONG ?

2. THE FOLLOWING QUESTIONS MUST BE ANSWERED USING THIS RATING SCALE :

NOT AT ALL	1
SLIGHTLY	2
MODERATELY	3
SEVERELY	4
VERY SEVERELY	5

   a. TO WHAT EXTENT DOES ASTHMA INTERFERE WITH YOUR LIFE ?
   b. TO WHAT EXTENT DOES YOUR ASTHMA AFFECT YOUR RELATIONSHIP WITH OTHERS ?
   c. DO YOU :
      - i. FEEL TIRED ?
      - ii. FEEL DEPRESSED ?
      - iii. FEEL ANXIOUS ?
      - iv. FEEL FRUSTRATED ?
      - v. HAVE A LACK OF DRIVE ?

   d. HAS YOUR ASTHMA RESTRICTED YOU FROM :
      - i. PERFOMING CERTAIN JOBS ? (e.g. housework)
      - ii. EXERCISING ?
      - iii. SOCIALIZING ?
      - iv. TRAVELING ?

3. THE FOLLOWING QUESTIONS MUST BE ANSWERED USING THIS RATING SCALE :

NEVER	1
SELDOM	2
ONCE PER MONTH	3
ONCE PER WEEK	4
ONCE PER DAY	5

a. DO YOU BECOME SHORT OF BREATH ?
b. DO YOU WHEEZE ?
c. DO YOU BECOME TIGHT CHESTED ?
d. DO YOU COUGH UP PHLEGM ?
e. DO YOU SUFFER FROM HORSENESS ?
f. DO YOU SUFFER FROM A SORE THROAT ?

ASTHMA DISABILITY INDEX

Patient's name : ..... File no :.....

Visit no :.....

10
9
8
7
6
5
4
3
2
1
0

If 0 indicates that your asthma is not in the least disabiling to you and 10 indicates that it severely effect your life , rate your perception of this condition as you have experienced it over the past few days .Place the appropriate number in the empty box provided .

APPENDIX D

PATIENT NAME: _____ VISIT: _____ PAGE: _____

DATE: _____ VISIT: _____ INTERN: _____ CLINICIAN: _____

S:

A:

O:

P:

SPECIAL ATTENTION TO:

NEXT APPOINTMENT:

DATE: _____ VISIT: _____ INTERN: _____ CLINICIAN: _____

S:

A:

O:

P:

SPECIAL ATTENTION TO:

NEXT APPOINTMENT:

DATE: _____ VISIT: _____ INTERN: _____ CLINICIAN: _____

S:

A:

O:

P:

SPECIAL ATTENTION TO:

NEXT APPOINTMENT:

APPENDIX E

TECHNIKON NATAL CHIROPRACTIC DAY CLINIC

CASE HISTORY

Patient:_____ Date 0 _____

File 0:_____

X-ray 0:_____

Age: _____ Sex:_____ Occupation: _____

Intern: _____ Signature: _____

FOR CLINICIAN'S USE ONLY

Initial visit clinician: Signature:

Case History:

Examination:
Previous: TN Current: TN
Other Other

X-ray Studies:
Previous: TN Current: TN
Other Other

Clinical path. lab.:
Previous: TN Current: TN
Other Other

Case status:
PTT: Conditional: Signed off: Final sign out:

Recommendations:

Intern's case history

1. Source of history:

2. Chief complaint: (patient's own words)

3. Present illness:

Location

Onset

Duration

Frequency

Pain (character)

Progression

Aggravating factors

Relieving factors

Associated S & S

Previous occurrences

Past treatment and outcome

4. Other complaints:

5. Past history:

General health status

Childhood illnesses

Adult illnesses

Psychiatric illnesses

Accidents/injuries

Surgery

Hospitalizations

8. Psychosocial history:

Home situation

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 F

[illegible]

[illegible]

Underline abnormal findings in BOLD and elaborate on back of relevant page, if necessary.
Mark "WNL" if normal.

Patient:_____ File #_____

Last name First name

Clinician:_____ Signature:_____

Intern:_____ Signature:_____

Date:_____

Height:_____ Weight:_____ Temp:_____

Rates: Heart:_____ Pulse:_____ Respiration:_____

Blood pressure: Arms: L / R /

Legs: L / R /

General appearance:

STANDING EXAMINATION.

Minor's sign
Skin changes
Posture
  erect
  Adm's
°Ranges of motion:

T/L spine: Flexion: 90 Fingers to floor
Extension: 30
R.lat.flex.: 30 Fingers down leg
L.lat.flex.: 30 Fingers down leg
Rot.to R.: 35
Rot.to L.: 35

Flex.

L.Rot. R.Rot.

L.lat flex. R.lat. flex.

Ext.

/ = pain-free limitation; // = painful limitation.

Romberg's sign.
Pronator drift.
Trendelenburg's sign.
Gait.
  rhythm
  balance
  pendulousness
  on toes
  on heels
  tandem
Half squat.
Scapular winging.
Muscle tone.
Spasticity/Rigidity.

Shoulder:
  skin
  symmetry
  ROM - glenohumeral
        scapulo-thoracic
        acromioclavicular
        elbow
        wrist
Chest measurement
  inspiration
  expiration
Visual acuity

Breast examination:
  Inspection:
    skin
    size
    contour
    nipples
    arms overhead
    hands against hips
    leaning forward.
  Palpation:
    axillary lymph nodes.

SPATED EXAMINATION.

  Spinal posture
  Head
    scalp
    skull
    face
    skin
  Eyes
    conjunctiva
    sclera
    eyebrows
    eyelids
    lacrimal gland
    nasolacrimal duct
    alignment
    corneal reflex
    ocular movement

	L			R		
	III	IV	VI	III	IV	VI

    visual fields
    accomodation
    iris
    pupils
    red reflex
    optic disc

vessels
general background
macula
vitreous
loss

Ears:
auricle
ear canal
drum
auditory acuity
Weber test
Rinne test

Nose:
external
internal
septum
turbinates
olfaction
Sinuses (frontal & maxillary):
tenderness
transillumination
Mouth and pharynx:
lips
buccal mucosa
gums and tooth
roof
tongue
inspection
movement
taste
palpation
pharynx
inspection
[illegible] X
Neck:
posture
size
swelling
scars
discoloration
hair line

ROM:

Flexion:	45	chin to larynx chin to sternum
Extension:	55	forehead parallel to floor
L.lat.flex:	40	
R.lat.flex:	40	
L.rot.:	70	
R.rot.:	70	

Flex.

L.Rot. R.Rot.

L.Lat. flex. R.lat. flex.

Ext.

lymph nodes
trachea
thyroid
carotid arteries (thrills, bruit)

☐ V
☐ VII
☐ VIII (nystagmus)
☐ IX
☐ XI

MM –

Inspection
ROM
deviation
Palpation
crepitus
tenderness

Neurological:
Dermatomes
C5
C6
C7
C8
T1
Tendon reflexes
biceps
triceps
brachioradialis
Muscle strength
C5
C6
C7
C8
T1
Coordination:
point-to-point
dysdiadochokinesia
Thorax:
Chest:
Inspection:
skin
shape
respiratory distress
rhythm (respiratory)
depth "
effort "
intercostal/supraclavicular retraction
Palpation:
tenderness
masses
respiratory expansion
tactile fremitus
Percussion:
lungs (posterior)
diaphragmatic excursion
kidney punch
Auscultation:
breath sounds
vesicular
bronchial
adventitious sounds
crackles (rales)
wheezes (rhonchi)
voice sounds
broncophony
whispered pectoriloquy
egophony

Cardiovascular:
auscultation (aortic murmurs)
Allen's test

SUPINE EXAMINATION

JVP
PMI
auscultation heart (L.lat.recumbent)
respiratory excursion
percussion chest (anterior)
breast palpation
The abdomen:
Inspection:
skin
umbilicus
contour
peristalsis
pulsations
hernias (umbilical/incisional)
Auscultation:
bowel sounds
bruit
Percussion:
general
liver
spleen
Palpation:
superficial reflexes
cough
light
rebound tenderness
deep
liver
spleen
kidneys
aorta
intra-/retro-abdominal wall mass
shifting dullness
fluid wave
Acute abdomen:
where pain began and now
cough
tenderness
guarding/rigidity
rebound tenderness
Rovsing's sign
psoas sign
obturator sign
cutaneous hyperaesthesia
rectal exam
Murphy's sign.

Male genitals and hernias.

Inspection:

skin

prepuce

glans

meatus

nits/lice

scrotum

inguinal/femoral bulges

Palpation:

penis (tenderness/induration)

testes

epididymis

inguinal canal

femoral canal

cremasteric reflex

Auscultation:

scrotal mass.

Peripheral vasculature:

Inspection:

skin

nail beds

pigmentation

hair loss

Palpation:

pulses - radial, brachial, femoral, poplitoal, post.tibial, dorsalis pedis

lymph nodes - epitrochlear, femoral (horizontal & vertical)

temperature (foot & legs)

Manual compression test

Retrograde filling (Trendelenburg) test

Arterial insufficiency test

Musculoskeletal:

ROM

hip

flex. 90/120

ext. 15

abd. 45

add. 30

int rot 40

ext rot 45

knee

flex. 130

ext. 0/15

ankle

plantar flex 45

dorsiflex 20

inversion 30

eversion 20

leg length

Neurological:
  dermatomes
    L1
    L2
    L3
    L4
    L5
    S1
  muscle strength
    hip flexion
    knee extension
    ankle dorsiflexion
    plantar flexion
  tendon reflexes
    patellar
    Achilles
  plantar reflex
Rectal examination:
  Inspection
    sacrococcygeal & perianal area
  Palpation
    sphincter tone
    tenderness
    indurations
    nodules
    prostate
    seminal vesicles

Mental status
  Appearance and behaviour:
    level of consciousness
    posture and motor behaviour
    dress, grooming, personal hygiene
    facial expression
    affect
  Speech and language:
    quantity
    rate
    volume
    fluency
    aphasia (pre)
  Mood
  Thought processes (logical, relevant, organized)
  Memory and attention:
    orientation (time, place, person)
    remote memory
    recent memory
    new learning ability
  Higher cognitive functions:
    information and vocabulary (general & specialized knowledge)
    abstract thinking.

TECHNIKON NATAL

TECHNIKON NATAL CHIROPRACTIC DAY CLINIC.

REGIONAL EXAMINATION -- CERVICAL SPINE.

PATIENT:_____

FILE # :_____ DATE:_____

INTERN/RESIDENT:_____

SUPERVISING CLINICIAN :_____

OBSERVATION :

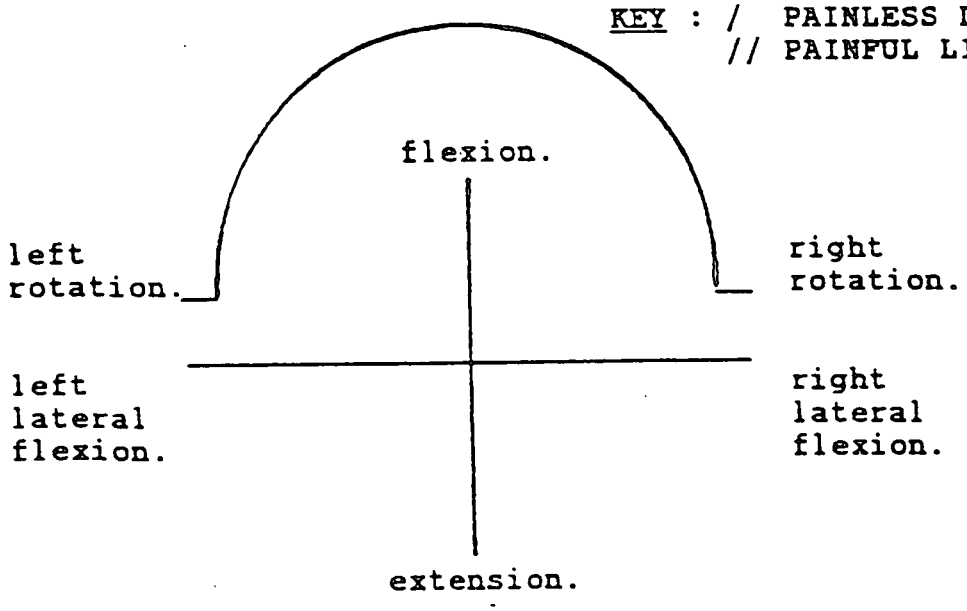
Posture
Swellings
Scars
Discoloration
Hair Line
Bony and soft tissue contours

Shoulder position:
Left =
Right =
Muscle spasm
Facial expression

RANGE OF MOTION:

Flexion = 45 degrees.
Extension = 70 degrees.
L/R Rotation = 70 degrees.
L/R Lateral flexion = 45 degrees.

KEY : / PAINLESS LIMITATION.
// PAINFUL LIMITATION.



PALPATION : lymph nodes.
trachea.
thyroid gland.

ORTHOPAEDIC EXAMINATION :

Tenderness
Active MF Trigger Points :
- SCM.
- Trapezius.
- Scaleni.
- Levator Scapulae.
- Posterior Cervical musculature.

Doorbell Sign
Kemp's Test
Cervical Distraction
Halstead's Test
Hyperabduction Test (Wright's)
Shoulder abduction Test
Dizziness rotation Test
Brachial Plexus Tension

Cervical Compression
Lateral Compression
Adson's Test
Costoclavicular Test
Eden's (traction) Test
Shoulder depression Test.
Lhermitte's Sign
O'Donoghue Manoeuvre

Remarks : _____

_____

_____

_____

NEUROLOGICAL EXAMINATION :

DERMATOMES: Left	Right.	MYOTOMES: Left	Right.	REFLEXES: Left	Right.
C2		C1		C5	
C3		C2		C6	
C4		C3		C7	
C5		C4			
C6		C5			
C7		C6			
C8		C7			
T1		C8			
		T1			

VASCULAR :

	LEFT.	RIGHT.
BLOOD PRESSURE.		
CAROTIDS.		
SUBCLAVIAN ARTERIES.		
WALLENBERG'S TEST.		

COMMENTS: _____

MOTION PALPATION :

Jt.play		Left						Right					Jt.play	
/A	Lat	Fle	Ext	LF	AR	PR		Fle	Ext	LF	AR	PR	P/A	Lat
							C0							
							C1							
							C2							
							C3							
							C4							
							C5							
							C6							
							C7							
							T1							
							T2							
	o| o						T3							
							T4							

APPENDIX H

DATA COLLECTION FORM

PATIENT'S NAME : .....

FILE NUMBER : .....

FORCED VITAL CAPACITY (FVC) :

READING NUMBER :

1	
2	
3	
4	
5	
6	
7	

FORCED EXPIRATORY VOLUME IN 1 SECOND (FEV1) :

READING NUMBER :

1	
2	
3	
4	
5	
6	
7	

FEV1/FVC % :

READING NUMBER :

1	
2	
3	
4	
5	
6	
7	

SPUTUM EOSINOPHIL LEVELS :

READING NUMBER :

1	
2	
3	
4	
5	
6	
7	

DRS. PILLAY, MACKINTOSH & PARTNERS

PATHOLOGISTS — CLINICAL TRIALS

48066 Qualbert, 4078 • 4th Floor
402 Lancet Medical Centre
74 Lorne St., Durban
Fax (031) 309-3503
☎ (031) 309-5210 Emergency (031) 301-37

DEPOT | COLLECTION DATE | YR | MNTH | DAY | TIME | LAB NO.

PLEASE CIRCLE: FASTING | RANDOM

PATIENT DETAILS | COLLECTOR

MR. | MRS. | SURNAME | FILE NUMBER

MS. | CHILD | BABY | FIRST NAME | AGE | YRS | MTHS | WKS | DAYS | SEX | M | F

PLEASE USE A BALL POINT PEN - PRESS HARD | ACCOUNT DETAILS | PATIENTS DATE OF BIRTH | YEAR | MONTH | DAY

PERSON RESPONSIBLE

POSTAL ADDRESS: GILON GODORIN
DEPT OF CHIROPRACTICE
P O BOX 953
TOWN: DURBAN

TELEPHONE (HOME) 225220

TRIAL NAME: ASTHMA | TRIAL NUMBER: NATAL TECHNIK

TRIAL CO. | TELEPHONE

REFERRING DOCTOR: A2079 DR A G TILL | TELEPHONE

COPIES DR(S)

LABCOPY N13375

TESTS

TESTS	CODES	TESTS	CODES
EOSINOPHILS	SPUTUM [ ]		

ADDITIONAL INFORMATION

ANY ENQUIRIES CONTRACT SUREN JUGGERNATH AT 309-5210

APPENDIX I

DO YOU HAVE

ASTHMA ?

Research is presently being conducted at the TECHNIKON NATAL CHIROPRACTIC DAY CLINIC on asthma.

All treatments are FREE OF CHARGE FOR patients selected for this research project .

For further information contact the TECHNIKON NATAL CHIROPRACTIC CLINIC to make an appointment .

Telephone : 225 2205 (8 a.m - 4 p.m)
Address : 11 Ritson Road , Berea .

APPENDIX K

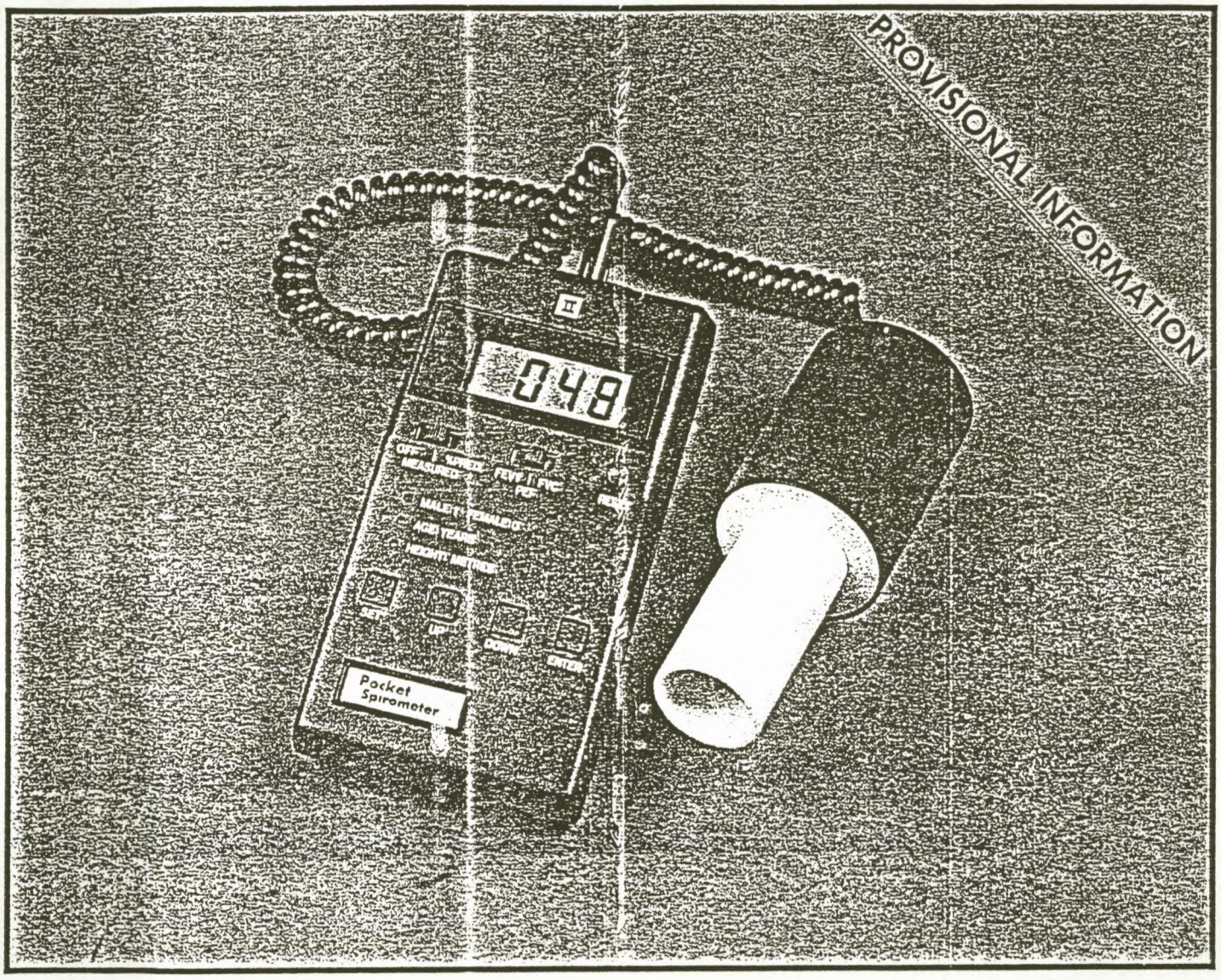
MEDICATION DIARY

DAY 1	2	3	4	5	6	7
DAY 8	9	10	11	12	13	14
DAY 15	16	17	18	19	20	21
DAY 22	23	24	25	26	27	28
DAY 29	30	31	32	33	34	35
DAY 36	37	38	39	40	41	42

Please record the name of the medication , the quantity as well as the number of times it was used on each specified day .

APPENDIX L

Pocket Spirometer II



THE NEW MICRO MEDICAL POCKET SPIROMETER II FOR MEASUREMENTS OF FEV_1, FVC, PEF AND THEIR INDIVIDUAL PERCENTAGE PREDICTED VALUES

The Micro Medical Pocket Spirometer II is based on the successful Micro Medical Pocket Spirometer with its proven accuracy and reliability.

This new Spirometer enhances the original design by the addition of the facility to obtain the patient's Percentage Predicted Values quickly and easily.

The Pocket Spirometer II has been designed specifically for situations where complete Spirometry information needs to be obtained rapidly. The three most common measurements of Lung Function (Forced Expired Volume in One Second (FEV_1), Forced Vital Capacity (FVC) and Peak Expired Flow Rate (PEF)) may be obtained quickly and simply from one forced expiration.

If a comparison to the subject's predicted values is required, simply enter into the Spirometer the appropriate information for Age, Height and Sex either prior to or after testing and the actual percentage of the Predicted Values will be displayed.

This simplified approach is invaluable for the Physician in or away from the Consulting Room or Laboratory and, combined with the proven accuracy of the Micro Medical Digital Volume Transducer, is a powerful diagnostic tool in the assessment of respiratory disorders.

FEATURES:

- ★ *Small, lightweight, battery operated, convenient for use anywhere.*
- ★ *Easy to read liquid crystal display.*
- ★ *Supplied complete in a sturdy carrying case with all necessary accessories.*
- ★ *High resolution, robust digital transducer allowing accurate repeatable measurements.*
- ★ *Easy to use.*
- ★ *Separate Normal Values for Adults and Paediatrics*

SPECIFICATIONS:

Transducer:
Type: Micro Medical Digital Volume Transducer
Resolution: 10 ml
Accuracy: ±2%
Volume Range: 0.1—10 litres.
Flow Range: 0.1—12 Litres/Second

Display:
Liquid Crystal type 3½ digit.

Predicted Values:

ADULTS: All values are according to the E.C.C.S. report.

CHILDREN: FEV_1—ZAPLETAL et al (1977): FVC-ZAPLETAL et al (1982)

PEF-COGSWELL et al (1975)

Power Supply:
9V pp3 Dry Cell.

Dimensions:
Microprocessor Control unit: 40(H) × 77(W) × 140(D) mm
Transducer Head: 86(H) × 48(W) × 48(D) mm.
Weight: Unit 450 grms.
Unit complete with carry case and accessories: 750 grms.

Postal Address

Micro Medical Ltd
PO Box 6
Rochester
Kent ME1 2AZ

National Medway (0634) 43383
International +44 634 43383
Fax (0634) 830814
Telex 8950511 Ref 13630001

Micro Medical

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The Admiral's Offices
The Chatham Historic Dockyard
Chatham
Kent ME4 4TQ

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