

**PERCEPTIONS AMONG CAREGIVERS AND
PHYSIOTHERAPISTS ON THE IMPORTANCE OF CHEST
PHYSIOTHERAPY IN ASTHMATIC CHILDREN ATTENDING
HOSPITALS IN KIGALI, RWANDA**

BY

REMERA MANYWA JEANNE

**A minithesis submitted in partial fulfilment of the requirement for the
degree of Master of Science (Physiotherapy) in the Department of
Physiotherapy, Faculty of Community and Health Sciences, University
of the Western Cape.**

November 2004

Supervisor: Mrs. M. Marais.

DECLARATION

I hereby declare that “*Perceptions among caregivers and physiotherapists on the importance of chest physiotherapy in asthmatic children attending hospitals in Kigali, Rwanda*” is my own work, that it has not been submitted, or a part of it, for any degree or examination in any other university and all the sources I have used or quoted have been indicated and acknowledged by means of complete references.

Remera Manywa Jeanne

Signature.....



November 2004

DEDICATION

I dedicate this minithesis to my husband, Janvier Munyeshuli, to whom I am eternally grateful for his love, patience and support through my life, especially my studies, and to my lovely sons Axel and Alvin, for their patience.



ACKNOWLEDGEMENTS

I thank the Government of Rwanda, through the Ministry of Education, for providing me with a scholarship for further education. I am grateful to my supervisor Mrs. Marais for her guidance, encouragement and commitment that helped me to successfully complete this mini-thesis. I am indebted to Miss Nancy for her guidance on statistical analysis and other inputs.

I extend my grateful thanks to my colleagues and friends Kagwiza, J., Murenzi, J., Mukandoli, K., Twizere, J., Tumusime, D., Uwimana, J., Mukantabana, A., Hategeka, A., Mbayiha, P., Mironko, B., Famille Byusa, V&A and others that I have not mentioned for their support and assistance in one way or the other. I also wish to thank my sister and brothers for their encouragement.



I am sincerely thankful to Dr Nyaruhurira I and Dr Kayibanda, E the director of CHUK for moral and material support provided to me during my study.

ABSTRACT

Childhood asthma is one of the commonest chronic respiratory conditions in developed communities. Chest physiotherapy has traditionally been one of interventions used mainly after an attack and for a relatively short-period on an outpatient basis. The purpose of the study was to determine the perceptions of physiotherapists and caregivers about the importance of chest physiotherapy in asthmatic children in Kigali. To achieve this aim, I attempted to (i) identify the perceived benefits of chest physiotherapy for asthmatic children among caregivers, (ii) determine the perception of physiotherapists about the importance of chest physiotherapy for asthmatic children and (iii) identify the physiotherapists' experiences with doctor's referrals and the caregivers' compliance in the management of asthmatic children. A descriptive cross-sectional study design, using a quantitative method was chosen. One hundred and twenty caregivers and thirty physiotherapists were randomly selected from 3 main hospitals and 6 private clinics in Kigali. Self-administered structured questionnaires were used with the participating physiotherapists, while face-to-face interviews were done with the caregivers of asthmatic children for the completion of the questionnaires. Ethical issues pertaining to permission for conducting the study, informed consent, anonymity, confidentiality of information, voluntary participation and the right to withdraw from the study were observed by the researcher. Data analysis by means of descriptive statistics was used to obtain frequencies, expressed as percentages. In general the perception of caregivers and physiotherapists about chest physiotherapy in asthmatic children was positive. Doctors were the only health professionals who referred the asthmatic children for chest physiotherapy. Most of the caregivers reported that they received advice on caring for the asthmatic child from the physiotherapists. It was also found that most of the

caregivers followed the physiotherapists' advice on a home programme and kept their appointments with the physiotherapists. The cost of chest physiotherapy was identified as one of the barriers to attending chest physiotherapy. The results of this study could help in the planning and implementation of health promotion programs for asthmatic children through chest physiotherapy in Kigali.



TABLE OF CONTENTS

TITLE PAGE	i
DECLARATION	ii
DEDICATION	iii
ACKNOWLEDGEMENTS	iv
ABSTRACT	v
TABLE OF CONTENTS	vii
LIST OF FIGURES	xii
LIST OF TABLES	xiii
ABBREVIATIONS	xiv



CHAPTER ONE: INTRODUCTION

1.1	Background of the Study	1
1.2	Statement of the problem	3
1.3	Research question	3
1.4	The aim of the study	4
1.5	Objectives	4
1.6	Hypothesis	4
1.7	Significance of the study	4
1.8	Definition of terms	5
1.9	Summary of Chapters	7

CHAPTER TWO: LITERATURE REVIEW

2.1	Introduction	8
2.2	Prevalence of Asthma in Children	8
2.3	Morbidity and mortality rates of asthma	9
2.4	Pathophysiology of asthma	10
2.5	Management and asthma	12
2.5.1	Medical management	12
2.5.1.1	Medication	13
2.5.1.2	Patient Education	15
2.5.2	Physiotherapy and asthma	16
2.5.3	Buteyko Method of Eucapnic Breathing.	19
2.6	Predisposing factors to asthma	21
2.7	Impact of asthma on family and society	25
2.8	Caring for asthmatic children	28



CHAPTER THREE: METHODOLOGY

3.1	Introduction	30
3.2	Research setting	30
3.2.1	Centre Hospitalier Universitaire de Kigali (C.H.U.K)	30
3.2.2	King Faisal Hospital	31
3.2.3	Kanombe Military Hospital (K.M.H)	31
3.2.4	Private clinics	31
3.3	Study Design	31
3.4	Research Subjects and Sampling	31
3.5	Study instrument	32

3.5.1	Questionnaire	32
3.5.2	Validity of the questionnaires	33
3.6	Translation of questionnaire for caregivers	33
3.7	Pilot studies	33
3.8	Procedure	34
3.9	Questionnaire procedure	34
3.10	Data analysis	35
3.10.1	Analysis of questionnaire	35
3.11	Ethical considerations	35

CHAPTER FOUR: RESULTS

4.1	Introduction	37
4.1.1	Socio-demographic characteristics of the caregivers	37
4.1.2	Period of receiving treatment.	38
4.1.3	Source of information of chest physiotherapy	39
4.1.4	Opinion of importance of chest physiotherapy	40
4.1.5	Stage of asthma attack and physiotherapy treatment	40
4.1.6	Getting advice from physiotherapist	41
4.1.7	Caregivers' compliance	41
4.1.7.1	Following physiotherapists' advice	41
4.1.7.2	Attendance of physiotherapists' appointments.	42
4.1.7.3	Following home program of chest physiotherapy	43
4.1.8	Experience with chest physiotherapy.	43
4.1.9	Barriers to attending physiotherapy appointments	44
4.1.10	Adjuncts to asthma management	44
4.1.11	Knowledge about adjuncts to chest physiotherapy	45
4.1.12	Effect of chest physiotherapy	46
4.2.1	Demographic profile of physiotherapists	48
4.2.2	Stage of asthma attack and referral	49

4.2.3	Referrals	50
4.2.4	Stage of effectiveness of chest physiotherapy	50
4.2.5	Time of treatment implementation	51
4.2.6	Chest physiotherapy in prevention of recurrent attacks	52
4.2.7	Importance of chest physiotherapy	53
4.2.8	Knowledge of caregivers	53

CHAPTER FIVE: DISCUSSION

5.1	Introduction	55
5.2	PART 1: CAREGIVERS' PERCEPTIONS OF CHEST PHYSIOTHERAPY	55
5.2.1	Caregiver Characteristics	55
5.2.2	Importance of chest physiotherapy	56
5.2.3	Caregivers' Compliance	57
5.2.3.1	Home Programme	58
5.2.3.2	Barriers to Compliance	59
5.2.4	Adjuncts to chest physiotherapy	60
5.3	PART 2: Physiotherapists' Perceptions of Chest Physiotherapy	61
5.3.1	Experience with Patient Referrals	61
5.3.2	Time of Implementation of Chest Physiotherapy	63
5.3.3	Physiotherapists' Opinion on Effectiveness of Chest Physiotherapy	65

CHAPTER SIX: SUMMARY, CONCLUSIONS, LIMITATIONS OF THE STUDY

AND RECOMMENDATIONS

6.1	Introduction	66
6.2	Summary	66
6.3	Conclusions	67
6.4	Limitations of the study	68

6.5 Recommendations

68

REFERENCES

70



APPENDICES

Appendix A: Request to carry out study in hospitals and private clinics

Appendix B: Request to the Ministry of Health to carry out study.

Appendix C: Letter from CHUK

Appendix D: Letter from KHM

Appendix E: Letter from King Faisal Hospital

Appendix F: Letter to Caregivers

Appendix G: Questionnaire in Kinyarwanda for Caregivers

Appendix H: Questionnaire in English for Caregivers

Appendix I: Letter to Physiotherapists in French

Appendix J Letter to Physiotherapists in English

Appendix K: Questionnaire in English for Physiotherapists

Appendix L: Questionnaire in French for Physiotherapists

Appendix M: Map of Kigali Town



LIST OF FIGURES

Figure 4.1	Effects of chest physiotherapy	47
Figure 4.2	Stage of asthma attack and referral	49
Figure 4.3	Referrals	50
Figure 4.4	Stage of effectiveness of chest physiotherapy	51
Figure 4.5	Time of treatment implementation	52
Figure 4.6	Knowledge of caregivers	54



LIST OF TABLES

Table 4.1	Socio-demographic characteristics of the caregivers (n =120)	38
Table 4.2	Period of receiving treatment.	39
Table 4.3	Source of information of chest physiotherapy	39
Table 4.4	Opinion of importance of chest physiotherapy	40
Table 4.5	Stages and physiotherapy treatment	41
Table 4.6	Advice from physiotherapist	41
Table 4.7.1	Following physiotherapists' advice	42
Table 4.7.2	Attending appointments	42
Table 4.7.3	Following home program of chest physiotherapy	43
Table 4.8	Benefits of chest physiotherapy	43
Table 4.9	Barriers to attending physiotherapy appointments	44
Table 4.10	Adjuncts to asthma management	45
Table 4.11	Knowledge about adjuncts to chest physiotherapy	45
Table 4.12	Demographic profile of physiotherapists	48



ABBREVIATIONS

CHUK Centre Hospitaliere Universitaire de Kigali

CO Carbon monoxide

COPD Chronic Obstruction Pulmonary Disease

EIB Exercise-Induced Bronchospasm

CPT Chest Physiotherapy

IgE Immunoglobulin E

KMH Kanombe Military Hospital

PCPs Primary Care Physicians



RSV Respiratory Syncytical Virus

SA South Africa

UK United Kingdom

USA United States of America

CHAPTER ONE: INTRODUCTION

1.1 Background of the Study

Childhood asthma is one of the most common chronic respiratory conditions in developed communities (Luyt & Green, 1994). Beginning in the 19th century and continuing through the 20th century, industrialization has produced a vast change in the way people live and, correspondingly, in the nature of their health problems (McGinnis & Foege, 1993). Asthma is a significant health problem in children of all ages; it is the leading cause of school absenteeism and the most common reason for hospitalization of children (Bheekie, 1996). In 1993, asthma accounted for an estimated 198,000 hospitalizations and 342 deaths in persons under the age of 25 years. Approximately 2-10% of children in the United States of America suffer from asthma (Vielhaber, 1998). According to Weinberg (1994), asthma is also becoming a significant problem in the developing countries, possibly as a result of rapid urbanization and the effects of industrialization. In addition, a global increase in asthma has occurred in both children and adults in recent decades (Bheekie, 2001). In many areas the rise of asthma has been seen as communities adopt Western lifestyles and become urbanized. With the projected increase in the urban proportion of the world's population from 45% today to 59% in 2025, the increase in asthma is likely to continue over the next two decades. It is estimated that there may be an additional 100 million persons with asthma by 2025 (www.newscast). It is in this context that the study on asthma in children was undertaken in Rwanda. In the past, Rwanda experienced a low level of urbanization. The urban population was estimated, at the most, as 10% of the total population. After the recent war in 1994, urban areas underwent a very rapid population growth. In Kigali, the population shifted from 235 664 in 1991 to 358 200 in 1996 and to 600 000 inhabitants in 2000 (Rwandan Ministry of Finance, 2001). Migration to urban areas

resulted in poor living conditions for the migrants who were seeking employment and security.

Poverty, with its multitude of associated problems, is a major obstacle to effective asthma care, especially with regard to access to health services and the inadequate use of preventive strategies. In addition, poverty remains an important co-factor for recurrent respiratory infections in both developed and developing countries. Overcrowding and poor nutrition, which are common among the poor, increase both exposure and susceptibility to infectious disease agents which may trigger asthma attacks.

The word *asthma* is derived from the Greek word *azomatos* (“meaning to breathe hard”), in other words, gasping or panting (Haubrich, 1997). Although there is no universally accepted definition for asthma, Bheekie (1996) regards asthma as a common and chronic inflammatory condition of the airways in which the cause is not completely understood.

The motivation for this study arose from the researcher’s own professional experience with children referred for chest physiotherapy. Chest physiotherapy was found to be beneficial during the various stages of the asthma, especially when the asthmatic children came early for the treatment. The goals of physiotherapy in the management of asthmatic children are firstly, to assist the medical team in restoring normal blood gases through optimum ventilation of the lungs during the acute asthmatic attack that is characterized by expiratory wheezing, dyspnoea and anxiety. Such an attack can be life threatening. The second goal is to remove pulmonary secretions from the lungs and clear the airways. Finally, physiotherapy aims, through education of the child and caregiver, to minimize and control future asthmatic attacks in order to allow the child to live an active life with his or her condition. The following are some of the physiotherapy techniques that Campbell, Van der Linden & Palisano (1994) suggest in achieving the

aforementioned goals. They include relaxation, increasing or maintaining range of motion and muscle strength, improving thoracic mobility and posture, improving breathing pattern and bronchial hygiene, and improving cardiovascular and physical fitness.

These techniques would be applicable in all ages, although different goals and outcomes may be stressed at different points in the life cycle.

1.2 Statement of the problem

Children with asthma could benefit from early physiotherapy interventions if there were adequate interdisciplinary collaboration between health professionals. It is the opinion of the researcher that physiotherapy, as an adjunct to the conventional medical management of children with asthma, is not being utilized sufficiently by health professionals such as medical doctors. As a consequence, parents may not be aware of the role of the physiotherapist in the treatment of asthmatic children. Also, in Rwanda, there is lack of research pertaining to asthma in children

1.3 Research question

The study, therefore, sought to address the following two research questions, namely:

1. What are the perceptions of physiotherapists regarding chest physiotherapy among asthmatic children in Kigali?
2. What are the perceptions and experiences of caregivers regarding the benefits of chest physiotherapy for asthmatic children?
3. What are the experiences of physiotherapists with patient referrals for chest physiotherapy from health professionals?

1.4 The aim of the study

The purpose of the study was to determine the perceptions of physiotherapists and caregivers about the importance and benefits of chest physiotherapy among asthmatic children in Kigali, Rwanda.

1.5 Objectives

In order to achieve the purpose of the study, the following objectives were determined:

1. To identify the perception of caregivers of asthmatic children about the importance of chest physiotherapy
2. To determine the perception of physiotherapists about the importance of chest physiotherapy for asthmatic children
3. To identify the physiotherapists' experience with doctors' referrals and caregivers' compliance in the management of asthmatic children.

1.6 Hypothesis

It is hypothesized that the perceptions about the importance of chest physiotherapy in asthmatic children still need to be improved among health professionals and caregivers in Kigali, Rwanda.

1.7 Significance of the study

The goal of physiotherapy is to enable the child to remain physically active between asthmatic attacks and to prevent the number and severity of future attacks. Immediately after an asthmatic attack, physiotherapy is important to clear the airways of tenacious

sputum. In this way, secondary chest infections and the need to prescribe expensive antibiotics are prevented. The second goal of physiotherapy is to prevent or minimize the activity limitation and participation restriction experienced by asthma sufferers. It is therefore essential for health professionals and caregivers to understand the role of physiotherapy in the management of children with respiratory conditions. The results of the study may assist in the planning and implementation of health promotion programmes related to chest physiotherapy for asthmatic children in Kigali. It may also be used to inform health professionals and caregivers about the importance of chest physiotherapy for the effective management of children with asthma in Rwanda at all levels of healthcare delivery. Furthermore, it may assist in formulating protocols and policies for insuring the rendering of improved service for asthmatic children and their caregivers.



1.8 Definition of terms

In the context of this particular study, namely, the perception of physiotherapists and caregivers about the importance and benefits of chest physiotherapy among asthmatic children in Kigali, Rwanda, the terms used are defined below. These terms are also generic/universal.

Physiotherapy: Physical therapy is a group of services provided by a healthcare professional that uses specialized physical interventions such as manual therapy, exercise therapy, electrotherapy etc. in the management of musculoskeletal, movement, cardiorespiratory and developmental disorders. It can help restore physical health that has been lost due to injury, disease, or other causes. The goals are to relieve pain and promote fitness and health (Campbell et.al, 1994).

Caregiver: The person who has the responsibility of taking care of the asthmatic child. She or he may be a parent, relative or paid worker.

Chest Physiotherapy: involves the use of techniques to improve the function of the lungs; these include postural drainage, breathing exercises for relaxation and improving ventilation to atelectatic areas, percussion and vibration to the chest for increasing mucociliary clearance, and forced expiratory techniques (FETs) such as coughing to clear pulmonary secretions from the airways (Tecklin, 1989).

Child: Means a human being from birth up to the age of 14 years (Cambridge, Dictionary 2002).

Perception: Is the process of acquiring, interpreting, selecting, and organizing sensory information in order to execute appropriate responses (Cambridge Dictionary, 2002).

Postural drainage: Is defined as positioning the patient to allow gravity to assist the drainage of secretions from specific areas of the lungs.

Peak flow meter: Is a device for measuring airway resistance to airflow during forced expiration after maximum inspiration. It indicates the severity of bronchospasm and can predict an asthmatic episode, as well as show the effects of the bronchodilator medication, and allows a caregiver or health professional to see how the patient is progressing after an asthma attack. Many clinicians encourage its use in adults and children over the age of five because the instructions are fairly easy to follow (Donohue, 1996).

Exercise-induced bronchospasm: is described as a transitory increase in airway resistance that occurs following vigorous exercise (Brukner & Khan, 2001).

1.9 Summary of Chapters

Chapter one describes the background of the study. The circumstances after the Rwandan civil war in 1994 have contributed to a high level in chronic respiratory conditions in childhood, especially asthma. The population has had to move from rural to urban areas because of a need for employment and security. Asthma has become a significant problem in developing countries because of urbanization. The significance of the study and its objectives are indicated. An outline of the remaining chapters in the mini-thesis is given below.

Chapter two presents the literature review on studies of the prevalence of asthma in children, pathophysiology, predisposing factors and the management of asthma. The literature review provided the background information for the study. Chapter three describes the methodology used in this study. The research setting, study design, research subjects, and sampling are explained. Furthermore, the chapter describes the study instrument used and the data collection method employed in order to acquire unbiased information. Finally, to conclude this chapter, statistical analysis and ethical considerations are described.

Chapter four presents the results of the study. Descriptive statistical findings demonstrate a general picture of the current study. Chapter five discusses and interprets the findings and results of the study and makes comparisons showing the relationships and contradictions of the study with other studies. Chapter six presents the summary, conclusion, limitations, and recommendations based on the results of the study.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

This literature review gives an overview of research on the prevalence of asthma globally, with specific reference to African countries. It also covers aspects such as the medical manifestations, the management of asthma sufferers and the psychosocial effects of the condition. However, the literature available could not give sufficient information on chest physiotherapy in asthmatic children.

2.2 Prevalence of Asthma in Children

Numerous studies worldwide indicate variations in the prevalence of asthma. The variations in the data appear to be due to differences in the diagnostic criteria used, the methodology, the population studied, and the geographical location of the study (Burkholter & Schiffer, 1995). Furthermore, many studies have shown that the prevalence rate for asthma has increased worldwide over the years. The highest European prevalence for asthma has been reported in Great Britain (Bheekie, 1996).

In Europe, apart from Great Britain, the prevalence of asthma generally ranged from 1.4% to 10.6% (Burkholter & Schiffer, 1995). In England, one study indicated that the prevalence of asthma among Croydon school children increased from 11.1 % to 12.8%, in the period between 1978 and 1991 (Anderson, Butland & Strachan, 1994). Among Danish children, the prevalence ranged between 0.6% and 2.1% in the 1980's to 4.4% in 1994 (Timonen, Pekkanen, Korppi & Salonen, 1995). The prevalence of asthma in the United Kingdom is about 10%-15% of children and 5%-10% of adults (Murphy & Williams, 2004). In the other countries such as Canada, the prevalence of childhood

asthma has risen from 2.5% of children under 15 years in 1978-1979 to 11.2% of children under 15 in 1994-1995, with the Atlantic region reporting the highest prevalence (Millar & Hill, 1998).

In the United States, the number of individuals affected by asthma has increased from 6.7 million in 1980 to 17.3 million in 1998; approximately one million of these individuals are children.

Information on the prevalence of asthma in Africa is limited, except in some countries such as South Africa (S.A), where selected studies on the different racial groups have been conducted. Asthma prevalence among the urban and rural Xhosa in S.A children was reported to be 3.17% and 0.14% respectively (Van Niekerk, Weinberg, Shore & Van Schalkwyk, 1979) and 4.05% and 5.87% among “coloured” and “white” children respectively, in Cape Town (Terblanche & Stewart, 1990). A study by Perzanowski, Ng’ang’a, Carter, Olhiambo, Ngari, Vaughan, Chapman, Malcolm & Plats-Mills (2002) indicated that in Gambia, Ethiopia, Kenya, and South Africa, the prevalence of asthma is higher in urban communities in comparison with rural communities.

The prevalence rates in South Africa appear to be low when compared to overseas countries. A likely reason is that the South African studies were confined to a limited number of children and may not be a true reflection of the prevalence of asthma in the general South African population (Bheekie, 1996).

2.3 Morbidity and mortality rates of asthma

In the past two decades, the prevalence, mortality and morbidity of asthma in the USA have increased. Conservative estimates indicate that of the approximately 80 million Americans that suffer from chronic diseases, 10-15 million suffer from asthma.

Furthermore, the rate of asthma morbidity in the USA, as estimated by the Centre for Disease Control and Prevention, Atlanta, increased by 45% from 1.3 per 100 000 to 1.9 per 100 000 between 1980 and 1990 (Hajjar, 1999). In New Zealand asthma mortality was the highest in the world in the 5-34 years age group, averaging 2.3 per 100 000 per year in the mid-1980's (Pearce, Beasley, Crane, Burgess & Jackson, 1995). In South Africa, according to Zar, Stickelss, Toerien, Wilson, Klein, & Bateman (2001), 1,506 deaths (mean age 56 yrs) from asthma were reported; 39% and 3% occurred in people under 55 and 15 years respectively. Average annual asthma mortality rate (8.1±1.9 per 100,000 populations) was highest amongst people of mixed race (10.1±2.0), followed by blacks (6.8±3.1) and whites (5.0±1.9). Asthma mortality declined by 0.28 deaths per 100,000 of the populations per year, and rates decreased in all ethnic groups.

2.4 Pathophysiology of asthma



“The main problem in asthma is bronchial hyper-reactivity, where the smooth muscle in the bronchial wall overreacts to normal stimuli causing bronchoconstriction. This leads to hypertrophy of smooth muscle in the bronchial wall and an inflammatory response in the mucosa and submucosa. There is also hypertrophy of the mucus glands leading to mucus plugging. These changes cause airway obstruction which may become chronic and severe” (Pryor & Webber, 1998:360).

The lower airways are divided into the conductive airways (the trachea and bronchi) and the gas-exchange compartment (alveoli). The tracheobronchial tree consists of several divisions and sub-divisions within each lung. First are the lobar bronchi that divide into segmental and sub-segmental bronchi. Up to this level cartilage is found in the bronchi to keep them patent. The sub-segmental bronchi then divide into bronchioles, which have no cartilage in their walls. These bronchioles remain patent through the elastic

recoil of the surrounding smooth muscle and the pressure in the alveoli. The bronchioles develop into terminal bronchioles, which become respiratory bronchioles. These are considered as the passage between the conducting airways and the gas-exchange airways. Finally, the respiratory bronchioles lead into alveolar ducts and alveolar sacs and then the alveoli where oxygen and carbon dioxide exchange takes place (Smeltzer & Bare, 2004:465).

The inner surface of an alveolus is covered by surfactant, a phospholipid membrane secreted by epithelial cells. In healthy individuals, the membrane continues at least up to bronchiolar level. The phospholipid membrane, epithelial cells, and tight capillary network form the alveolar wall, supported by elastic fibers. The surfactant membrane itself is also an important alveolar support structure. Mucous glands in the bronchi secrete a mucus layer onto membranes, and this layer is moved towards the trachea and larynx by epithelial cilia. Macrophages, lymphocytes, protease inhibitors and antioxidants derived from circulating blood protect most peripheral airways against microbes, allergens, and chemical hazards in healthy individuals. Alveoli contain very few neutrophilic leukocytes (Laitnen & Koskela, 1999).

Asthma may be categorized as extrinsic or intrinsic asthma according to the precipitating causes. Extrinsic bronchial asthma (or allergic asthma) refers to attacks that follow exposure to allergens such as grass pollen, polluted air, perfumes, etc. This form of asthma usually begins as a result of an antigen-antibody response. This special antibody is called Immunoglobulin E (IgE), which is a hereditary allergic mechanism and represents a true allergic reaction. Increased levels of IgE in the blood are indicative of hypersensitivity to a variety of allergens.

Intrinsic bronchial asthma (non-allergic) does not have easily identifiable allergens and is triggered by many internal disorders, such as the common cold or upper respiratory infection, or even exercise. This form of asthma usually begins in adults over the age of 35 years. Clients with intrinsic asthma may also have nasal polyps and aspirin allergy. In both forms of asthma, the airways are hyper-reactive. Once the airway is in spasm, mucus plugs the airways, trapping distal air. Hyperventilation eventually occurs as the lung attempts to respond to the increased volume and pressure (Goodman & Snyder, 1995: 157). In addition, in the case of exercise, the bronchoconstriction does not occur during the first few minutes of exercise but rather begins during the first few minutes of recovery. Two separate theories have been proposed to explain how the airway is protected from bronchoconstriction during exercise but susceptible after exercise. In both theories, the primary stimulus for bronchoconstriction is the evaporation of water lining the airways secondary to the increased level of ventilation. The protection against bronchoconstriction throughout the exercise period has been attributed to the bronchodilating effect of circulating catecholamines; however, this explanation fails to account for why the bronchoconstriction associated with isocapnic hyperventilation is often delayed until ventilation returns to normal (Brukner & Khan, 2001).

2.5 Management and asthma

2.5.1 Medical management

The International Consensus Report (in Bheekie, 1996) on the diagnosis and management of asthma is aimed at all healthcare personnel involved with the treatment and prevention of asthma. It established specific goals to decrease the prevalence and/or severity of asthma, reduce hospital admission, and improve the understanding of asthma by both doctors and patients.

According to Mesters, Van Nunen, Crebolder & Meertens (1995) asthma cannot be cured. This indicates that management over time by healthcare providers, in collaboration with patients, is required. For asthma, it is expected that early detection and adequate treatment might prevent or reduce future symptoms.

Research and clinical data indicate that effective treatment exists for children with asthma. The goals of asthma management are to “maximize functional status of children as indicated by their ability to participate in normal activities, maximize symptom relief (i.e., minimize frequency of attacks, maximize pulmonary function), facilitate child and family empowerment by maximizing self-efficacy in symptom control and treatment regimens, and limit side effects of treatments and interventions” (Beard, 1999:3). According to Murphy (2004), the aims of asthma management are the control of symptoms, including nocturnal symptoms and exercise-induced asthma, prevention of exacerbations, and the achievement of the best possible pulmonary function with minimal side effects. Individual patients will have different goals and may wish to balance these aims against the potential side effects or inconvenience of taking the medication that is necessary to achieve "perfect" control. It is essential to individualize each patient's treatment.

2.5.1.1 Medication

According to Leflein, Szeffler, Murphy, Fitzpatrick, Rivera, Miller & Smith (2002), current asthma treatment guidelines state, “inhaled corticosteroids are the most potent and effective long-term anti-inflammatory medications for asthma and recommend their use in treating infants and young children with persistent asthma of any severity”. Furthermore, the British Thoracic Society/Scottish Intercollegiate Guidelines adopted a

"stepwise" approach to treatment that aims to abolish symptoms as soon as possible and to optimize peak flow by starting at a level most likely to achieve this.

Stepping up treatment as necessary and stepping down when control is good can maintain control. The pharmacological management plan is supported by avoidance of trigger factors as far as possible, patient education, compliance checks, inhaler technique instruction, and the development of self-action plans. All are potential roles for community pharmacists (Bheekie, 2001).

The management of chronic asthma follows different steps: it is started by administering short-acting beta 2 agonists such as salbutamol and terbutaline; after the introduction of regular preventive therapy, inhaled corticosteroids are given, followed by add-on therapy using a long-acting beta 2 agonist such as formoterol or salmeterol (Murphy, 2004).



Children with severe acute asthma require expeditious treatment, close observation, and serial measurement of physical signs, oxygen saturation, and lung function. The goals of treatment are to relieve hypoxemia, to quickly reverse airway obstruction, and to prevent early relapse. First-line treatment, therefore, consists of supplementary oxygen, aggressive use of bronchodilators, and systemic corticosteroids (Fitzgerald, Ernst, Boulet & O'Byrne, 2001: 264).

In the management of asthma, a peak expiratory flow meter is used as a tool to determine the severity of the asthma, assess the degree of diurnal variation in acute lung conditions, monitor exacerbation, and identify asthma triggers to assist in the planning of long-term therapy. Self-monitoring of peak flow at home can help the patient anticipate worsening airways obstruction and thus help prevent a crisis (Donohue, 1996).

Furthermore, McEwen, Johnson, Neatherlin, Millard & Lawrence (1998) state that peak-flow reading allowed children and their parents to adjust the dosages of asthma medications in accordance with a plan developed by their physicians, measure effectiveness of those medications, and identify patterns of asthma symptom development.

2.5.1.2 Patient Education

Education has been recognized as a part of management of asthma. According to Fitzgerald et al. (2001: 275), patient education has been defined as “a planned learning experience using a combination of methods such as teaching, counseling, and behavior modification techniques which influence patients’ knowledge and health behavior and involving an interactive process which assists patients to participate actively in their health care”. Asthma patient education is recommended as a key component of many asthma-management guidelines. Fitzgerald et al. (2001) advise the use of written information and not to give verbal information alone.

According to Bheekie (1996) education of asthmatic patients has several advantages. These are their ability to modify their treatment without the continuous need for the services of their physician and the development of a partnership between the patient and their physician. Furthermore, education leads to an improved control of asthma as well as a reduction in the number of attacks. For education to be successful a permanent and co-ordinated relationship between health care professionals and the asthmatic patient is essential.

2.5.2 Physiotherapy and asthma

The purpose of physical therapy is to prevent secondary difficulties resulting from the recurrent asthma attack. Chest physiotherapy has been incorporated in the management of lung conditions since the early 1900s. Chest physiotherapy includes postural drainage, breathing exercises for relaxation and improving ventilation to atelectatic areas, percussion and vibration for increasing mucociliary clearance, and coughing. This combination of techniques was accepted as the standard daily physiotherapy management for patients regardless of the severity of pulmonary disease. Now, it is known as conventional or multimodality physiotherapy (Williams, 1994).

Respiratory physiotherapy involves the use of a package of physical techniques directed at problems identified by individual assessment. These problems may include breathlessness, excess bronchial secretions, decreased exercise tolerance, and diminished gas exchange (Mulholland, Lennon & Graham 1994). Anxiety and fear also exacerbate an asthmatic attack. Children with asthma have problems because the secretions in their lungs thicken and block off one or more of the airways. According to Milner (1984), the air in the lung beyond the blockage will then be absorbed and the affected area will collapse.

Tecklin (1989:163) indicated that due to the greatly increased residual volume and decreased expiratory reserve volume in the lungs, the child with asthma often develops a shallow, rapid respiratory pattern that uses the accessory muscles of inspiration. Simultaneously, due to the obstruction to expiratory airflow, which is usually passive in normal breathing, expiration in an asthmatic attack becomes active through abdominal muscle and internal intercostals muscle contraction. Therefore, in order to alleviate the breathlessness, the main role of breathing exercises is to teach the child how to control

his/her breathing so that in future attacks he/she does not panic and can concentrate on breathing control.

According to Tecklin (1989: 162), breathing training with relaxation techniques has been suggested for improvement of respiratory patterns in children with asthma, including exercise-induced bronchospasm (EIB). Generally, breathing exercises consist of encouraging the use of the lower part of thorax and vibrations to the chest wall on expiration with encouragement to cough, if the latter does not cause an increase in wheezing. According Laitnen & Koskela (1999) the primary aim of physiotherapy in mild to moderate COPD is to instruct and motivate the patient to take physical exercise and to use correct breathing techniques at rest and during exercise. Changing from the 'chest out–stomach in' type of breathing to a technique involving correct use of the diaphragm and intercostal muscles should be achieved.

This is a long-term process requiring independent daily practice by the patient. Muscle exercises can help increase the strength of the diaphragm and accessory respiratory muscles. In severe COPD, patients need to know what they are capable of, but also what their limitation is. The aim is to find solutions to problems encountered in coping with daily tasks at home. The patient should learn to control breathing even under difficult conditions such as exertion or exacerbation of disease.

Relaxation and breathing techniques and pursed-lip breathing can be used to improve lung function and reduce airways resistance. In addition, postural drainage techniques are taught to the parents and should be carried out by the child after the asthma attack until the cough is unproductive” (Shepherd, 1995:353).

Goodman & Snyder (1995) state that physical therapists working with asthmatic clients should encourage them to maintain hydration by drinking fluids to prevent mucus plugs from hardening and to take prescribed medication before exercises which may cause hyperventilation-induced asthma attacks. Exercise - or hyperventilation-induced asthma can potentially be prevented by exercising in a moist, humid environment and by grading exercise, i.e. starting with exercises demanding less effort, according to client tolerance to diaphragmatic exercises.

Veldhoven & Vermeer (2001) reported that in the management of children with asthma, physical activity could be of great importance for improving endurance, enhancing physical competence by raising the subject's perceived level of physical performance and expectations to cope with asthma through problem-solving and emotion-regulating strategies in exercise situations. Most children will derive some benefits from a carefully planned programme of treatment, particularly in improving their breathing patterns and exercise tolerance. It is also important to remember two factors; namely, that the lungs of a young child are still developing as he/she grows. However, a large number of children diagnosed with asthma appear to grow out of it by the time they reach adolescence.

It is therefore important that the child's breathing pattern and respiratory efficiency are maintained at as normal a level as possible during these essential years of development (Shepherd, 1995:354).

In the above section, the conventional medical and physiotherapy approaches used in management of asthma were explained. However, another technique, not widely used, is the Buteyko method, which is described below.

2.5.3 Buteyko Method of Eucapnic Breathing.

A Russian physician of this name developed the Buteyko method in the 1960's. This method is reasonably well known in Russia. It was introduced to the West in the early 1990's (Courtney, 2003). According to this method asthmatics have a tendency to over-breathe, and this leads to a loss of carbon dioxide from the alveoli. The aim of eucapnic breathing is thus to normalize levels of carbon dioxide by controlling breathing. Carbon dioxide acts as a bronchodilator of the airways. When the amount of alveolar carbon dioxide, relative to the alveolar oxygen, drops too low, the lungs of those prone to asthma respond by bronchoconstriction, increased mucus production and subsequently, lowering of oxygen levels. The need to get more oxygen results in breathing faster or more deeply.

In asthmatics that are already over-breathing, breathing more will actually decrease the amount of oxygen that is available to essential body tissue like the brain, organs and muscles. The ability of the tissues to utilize oxygen is dependent on the levels of carbon dioxide in the blood. A physiological fact, called the Bohr Effect, states that the ability of hemoglobin to release oxygen is dependent on the amount of carbon dioxide in the blood. When carbon dioxide drops too low, due to over-breathing, the person feels breathless because of the spasm that develops in the airways and the decreased oxygen available to body tissues.

Another reason why asthmatics have low levels of oxygen is because areas of the lungs that are highly ventilated do not have good blood flow moving through the capillaries. These areas of over-inflated lung, which can comprise up to 75 percent of lung area, create pressure on blood vessels, increasing the resistance to blood flow through these

areas of lungs. This results in a ventilation/perfusion mismatch with oxygen not being picked up by the network of blood vessels around the alveoli.

Eucapnic breathing teaches people to decrease their ventilation levels when they are breathless. They are taught to breathe small, gentle breaths through the nose, while at the same time keeping the abdomen and diaphragm relaxed. They are also taught to use posture and small episodes of breath-holding to raise carbon dioxide so that it can act as a local bronchodilator. Breathing through the mouth is discouraged because it can lead to over-breathing which aggravates the loss of carbon dioxide. Another disadvantage of mouth-breathing is that the inhaled air is not warmed, humidified and filtered the way it is with nose-breathing. Thus the emphasis is placed on teaching nose-breathing to asthmatic sufferers. At first they may not want to do it, and children will need frequent reminding. When children, accustomed to mouth breathing, first begin to breathe through the nose, they may feel slightly breathless or even panicky. However, if one can get them to persist for a few minutes, perhaps by sitting with them and reading a storybook, the nose will begin to clear, and their breathing will become easier in about three to ten minutes. Breathing through the nose becomes easier because it reduces respiratory rate and ventilation levels and raises carbon dioxide levels. This results in improved release of oxygen to the tissues as part of the Bohr Effect. According to Courtney (1998) the more children breathe through their noses, the better their asthma will be.

An Australian controlled clinical trial evaluating the Buteyko breathing re-training protocol showed that asthmatics utilizing this method were able to achieve a 90% reduction in bronchodilator or asthma relief medication and a 50% reduction in steroid medication (Courtney, 2003). Furthermore, supporters of the method claim that once

learnt, the technique can dramatically reduce patients' reliance on their bronchodilators and anti-inflammatory steroids, and in some cases, even avoid their use altogether. The study described the example of Dr Gerald Spence, a general practitioner in Glasgow (UK), who has cut his asthma drug bill by two-thirds as a result of teaching this breathing technique to patients who responded unfavourably to their existing medication. "The simple fact is that 34 patients, prior to Buteyko, were costing £15,000 for their asthma medication. After Buteyko, they were costing £5000" (Bradley, 1998:289 - 290)

2.6 Predisposing factors to asthma

Asthma is a chronic inflammatory disorder of the respiratory system. Complex interaction occurs between various cells and cellular elements, resulting in recurrent episodes of shortness of breath, chest tightness, and coughing. Asthma has a variety of stimuli, which are classified as extrinsic or intrinsic.

Extrinsic or allergic stimuli include pollen, mold, animal dander, cigarette smoke, foods, drugs, and dust. Intrinsic or non-allergic stimuli include viral infections, inhalation of irritating substances, exercise, emotional stress, and environmental factors such as the weather or climate changes. An individual may be sensitive to either type of stimuli or to both types (Campbell et al, 1994).

The risk factors for asthma are both genetic and environmental. Most children who develop asthma have a family history of allergies. Early damage to the lungs caused by cystic fibrosis, premature birth, artificial ventilation in an intensive care unit, and certain viral illnesses can also cause a predisposition to asthma (Vielhaber, 1998). According to

Klennert, (2000), it is now accepted that the development of asthma involves a genetic predisposition combined with exposure to environmental factors, namely:

- Respiratory viral infections -- Clinical studies have demonstrated that the onset of asthma is often preceded by respiratory infections.
- Specific antigens -- Antigens from dust mites, molds, animal dander, and cockroaches may stimulate a classic antibody response involving immunoglobulin antibodies.
- Non-antigenic irritants -- Although smoke is the predominant substance in this category, a wide range of air pollutants may directly affect bronchial receptor systems or act through potentiating allergic mechanisms.
- Emotional stressors -- Stress may lead to increased bronchial sensitivity or inhibit the immune response.



In addition, biological factors known to be associated with wheezing in infants, including pre-maturity, perinatal smoke exposure, low birth weight and young maternal age are often more prevalent among low-income families. Acute wheezing among infants younger than the age of two has been related primarily to viruses, especially respiratory syncytial virus (RSV), and to passive smoke exposure, measured by salivary nicotine, whereas acute wheezing in children older than the age of two was associated with evidence of allergy. However, some studies have reported that early exposure to allergens was associated with infant wheeze. Wheezing symptoms in the first years of life may signify the initial manifestations of childhood asthma; therefore, the probability of developing persistent asthma goes up with the development of atopy, a history of parental asthma, and increasing frequency of early wheezing (Klennert, Price, Liu & Robinson, 2003).

Allergy has been found to be a significant trigger in wheezing attacks, particularly in the older child. A high proportion of the population has allergic tendencies. It was shown through skin tests that between 30% and 50% of all children have an abnormal reaction to at least one allergen. This is far in excess of the numbers who actually have wheezing attacks brought on by an allergy. When a child has an allergic reaction to something, his/her normal defense mechanisms have gone wrong. (Milner, 1984).

Our survival in our environment that contains a wide range of viruses and bacteria depends to a large extent on the presence of cells known as lymphocytes, which are scattered throughout the body (Milner, 1984). The range of substances or allergens which produce an asthma attack is very wide. Of particular importance are the scales and droppings of a microscopic creature, the house dust mite. This creature lives on flakes of human skin, which are most abundant in the bed. They thrive particularly well in damp conditions. It is likely that the house dust mite is a contributory factor in at least 50% of children with asthma. Many children also have sensitivity to grass and tree pollens, which are likely to make asthma worse during the late spring and early autumn.

There are many studies providing evidence that house dust mites are an important cause of asthma in many parts of the world. There is an ecologic relationship between the level of house dust and the prevalence of sensitization. In places with a hot and humid climate, mite allergen levels are high, and the prevalence of house dust mite sensitization and asthma are high (Fitzgerald et al, 2002).

In addition, Shima, Nitta, Ando & Adachi (2002) showed that the prevalence of asthma has been increasing and air pollution is considered a potential risk factor for asthma. An increase in automobile traffic in Japan has resulted in a considerable increase in the concentrations of atmospheric nitrogen dioxide and particulate matter less than 10

microns in diameter. The potential effect of those pollutants on the health of residents in urban areas remains a matter of concern. According to Lin, Chen, Burnett, Villeneuve & Krewski (2003), in Canada exposure to outdoor air pollution is a potential risk factor for the development or exacerbation of asthma, and although ongoing efforts are being made to improve air quality, the persistent growth in car ownership continues to threaten the ambient air quality in industrialized countries. Carbon monoxide (CO), nitrogen dioxide, sulphur dioxide, and ozone represent major constituents of gaseous outdoor pollutants arising from motor vehicle exhausts in most urban areas.

Other allergens are mould spores, animal furs, and feathers (Milner, 1984). Tobacco smoke is irritating to the airways in several ways. Smoke is made up of chemicals and very small pieces of ash that remain in the air long after the cigarette, pipe, or cigar is out. When a child with asthma breathes in these airborne chemicals and ash, they cause the muscles around the airways to squeeze tight, making it difficult for the child to breathe. Coughing, wheezing, and a tight feeling in the chest are frequent complaints of children forced to breathe second-hand smoke. The smell of smoke on clothes and furniture and in the car can trigger an acute asthma episode for a child with sensitive airways. Breathing second-hand smoke as a child can affect the lungs throughout life (McKesson, 2002).

A study by Finkelstein, Fuhlbrigge, Lozano, Grant, Shulruff, Arduino & Weiss (2002) found exposure to environmental triggers was frequent in 30% of households surveyed; at least one family member smoked cigarettes, including 17% of mothers, and 71% of parents expressed worry about their child's exposure to tobacco smoke. In households, 59% had pests such as cockroaches or rodents, and furry pets such as cats and dogs. Other exposure to potential environmental triggers included bedroom carpeting and the

forced-air heat of the household. Most children did not have a plastic cover on their mattresses or pillows.

A variety of foods and drugs including cow's milk products, eggs, and preservatives can also provoke attacks in a small number of children (Milner, 1984). The asthmatic child is also likely to have wheezing attacks in any situation where the air is contaminated enough to cause coughing in even the healthy, unaffected person. These conditions include dust, smoke, fog, smog, or other acrid fumes. This probably just represents an increase in the normal protective mechanisms of the airways. Emotional factors obviously play a part in the child's symptoms. The asthma is likely to be worse at examination times, when the child is excited, or when there are emotional stresses and personality clashes at home or at school (Milner, 1984).

2.7 Impact of asthma on family and society



Asthma is one of the chronic childhood health conditions that have a significant impact on children and their families (Donnelly, 1994). Children who suffer from severe episodes of asthma have been found to experience increased amounts of stress and anxiety over their illness and have difficulty in maintaining a sense of well-being. Research indicates that asthma has many psychosocial effects on the child and that these children feel restricted socially, are embarrassed about taking medication, perceive themselves to be different from other children, and are fearful about attacks and death (Kurnat, 1999).

According to Sawyer, Spurrier, Kennedy & Martin (2001), it has been recognized that asthma has the potential to adversely affect the psychological and social adjustment of children. The family plays a pivotal role in the child's adjustment to the illness. Hence,

the family unit and lives of individual family members are often affected by the presence of a child with a chronic illness. To adhere to the many strict requirements of asthma management, familial relationships must be supportive and understanding. Family conflict is frequently a direct result of the stress of a child's chronic illness and management condition. Frequently, this can lead to emotional problems in the child and can serve to increase the severity and frequency of acute exacerbations (Moore, Weiss & Sullivan, 1996).

Quality of life for families is often compromised by changes in the home environment and/or lifestyle, increased housework, sleepless nights, absenteeism from work, increased financial demands, increased emotional stress, and uncertainty. Frequent visits to professionals' offices and the increased use of inpatient and outpatient services place great demands on the healthcare system. In the United States, the total annual economic cost for asthma is approximately \$11.3 billion (McCarthy, Herbert, Brimacombe, Hansen, Wong & Zelman, 2002).

In addition, as with other chronic conditions, asthma presents a financial burden to the family, restricts the child's physical activities and development, impairs the child's development of social connections and adaptive resources, and contributes to a general disruption in the family (Murphy & William, 1999).

Asthma is a chronic disease, and in children, it is a cause of school absenteeism, which creates activity limitation. For caregivers, it creates participation restriction in their lives when they spend long periods visiting the hospital.

Asthma has a major impact on the national economy. Direct and indirect costs for the family and society multiply if more than one child in a family is affected by asthma.

Direct cost would include health-insurance premiums, co-payments for doctors' visits and prescriptions, and non-reimbursed expenses. Durable medical equipment, such as a home nebulizer, may not be covered by medical insurance and becomes an additional out-of-pocket expense for the family. Direct costs most commonly arise from use of health services and medicines, change required in working environment, and health education directed towards patients and population as a whole. Indirect costs would include days missed from school, caregiver expenses, travel expenses, and travel to and waiting times at hospitals (Moore et al, 1996). Indirect costs related to asthma have a significant impact. Untreated asthma can be very expensive. It may lead to frequent days of disability due to shortness of breath, wheezing, coughing, loss of sleep, or travel to a clinic or hospital. Children are unable to go to school, perform in all school activities, or help with family chores and thus contribute to the family's economic productivity. Adults lose productivity. In addition, indirect costs are associated with loss of working efficiency and capacity for work, sick leave, restrictions on daily functional abilities of patients, and adverse social and psychological effects (Laitnen & Koskela, 1999). Indirect costs may range from 50 to 100 percent of direct costs (Beard, 1999: 27). In quantifying the impact of asthma on society in the USA in 1994, Schwartz (2004) reports that an estimated 477,000 patients were hospitalized for asthma, with a total estimated cost of \$10.7 billion. Direct costs due to hospitalizations, emergency room visits, outpatient care, physician services, and medications accounted for \$6.1 billion. Indirect costs due to lost school days and lost workdays approximated \$4.6 billion.

Asthma may cause changes in the family's lifestyle. Opportunities may be lost or plans may have to be changed depending on the current status of the child with asthma (Schwartz, 2004).

2.8 Caring for asthmatic children

According to Palmer (2001), the family is an interrelated system that experiences ripple effects if the child has asthma exacerbations. Most parents are understandably upset upon hearing that their child has asthma. Doctors often have considerable difficulty in answering parents who want to know why their child is affected (Milner, 1984). Families sometimes do not know how to manage the child during an asthmatic attack. According to Palmer (2001), lack of knowledge is dangerous in the early stage of asthma.

A study by Greaves et al, cited by Osman (2002), suggests that there may be "good" and "bad" denial of asthma symptoms. It is good for patients with well-controlled asthma to be confident in their control and not to be fearful about their asthma, and this may be a form of "positive denial". Equally, lack of confidence in patients with stable asthma is not a good sign. Lack of confidence may be associated with depression and poor quality of life. In order for families to feel empowered and capable of handling asthma, they need the knowledge to do so. In addition, parents need to know how to manage their child calmly and authoritatively and may need professional guidance on the best ways to do this when their child is showing symptoms of asthma (Calam, Gregg, Simson, Morris, Woodcock & Custovic, 2003).

According to Shepherd (2000) p355, the physiotherapist can teach the child to relax emotionally, thereby reducing the extra workload that is put on the tense respiratory muscles.

It is beneficial if the physiotherapist sees the child when he or she is in the early stages of an attack. It is during this time that the physiotherapist's attitude and manner of

talking to the child to dispel his/her fears may succeed in convincing the parents and the child of the usefulness of this approach.

Chapter two reviewed the literature about issues pertinent to the current study, including the prevalence of asthma in children, medical management and asthma, the role of physiotherapy and asthma, predisposing factors, impact of asthma on family and society, and caring for asthmatic children.



CHAPTER THREE: METHODOLOGY

3.1 Introduction

In this chapter, the research method used for the study will be described. It describes the research setting, study design, and procedure. The research subject, sampling, and study instrument are described.

The data-collection procedure is explained. The data analysis that was carried out is given, as well as a description of the pilot studies. The ethical considerations are also stated.

3.2 Research setting

The study was carried out in three state hospitals and six private clinics in Kigali, the capital city of Rwanda. The choice of the hospitals was based on their large numbers of children admitted with a variety of pediatric conditions, including asthma. The hospitals selected were Centre Hospitalier Universitaire de Kigali, Kanombe Military Hospital, and King Faisal Hospital. In order to make the study more representative and increase the size of the study sample, it was also carried out in six private clinics offering physiotherapy services.

3.2.1 Centre Hospitalier Universitaire de Kigali (C.H.U.K)

This university hospital is situated in Nyarugenge, a district in the center of Kigali province. It is a national teaching and referral hospital to which most of the patients from rural areas are referred for treatment.

3.2.2 King Faisal Hospital

The King Faisal Hospital is situated in the Kacyiru district, approximately 10 km from the center of Kigali. A large number of children are treated at this hospital with its well-equipped physiotherapy department.

3.2.3 Kanombe Military Hospital (K.M.H)

Kanombe Military Hospital is situated in Kanombe district, approximately 15km from C.H.U.K. Kanombe Military Hospital is mainly a referral hospital for the military, but it also meets the needs of the civilian population. In comparison with the other hospitals, it employs a large number of physiotherapists. Children of military personnel are treated at the K.M.H.



3.2.4 Private clinics

The six selected private clinics are situated in different areas in Kigali Province.

3.3 Study Design

The study design chosen was a cross-sectional descriptive study, which utilized a quantitative research method. According to Tergeson and King (2002), this study design is appropriate for the collection of data from a large number of participants.

3.4 Research Subjects and Sampling

The study population was physiotherapists and the caregivers of children with asthma.

A non-probability, convenient sampling method was used to recruit participants for this particular study. By using this method, it was anticipated that the prospective

participants would be practicing physiotherapists and caregivers of asthmatic children. The latter were identified from the inpatient and outpatient children's hospital records after obtaining permission from the hospital authorities. All the physiotherapists working in pediatrics in the selected hospitals were recruited to participate in the study.

One hundred and fifty people were approached to participate in the study; thirty physiotherapists, and one hundred and twenty caregivers. According to De Vos (2002), this sampling method has the advantage of concentrating the study field in a specific section of the greater geographical area, and thus helps save costs and time.

3.5 Study instrument

Questionnaires were used for both groups of participants. The physiotherapist completed a self-administered questionnaire for collecting their data. The advantages of using a self-administered questionnaire are anonymity and avoiding interviewer bias. In addition, the respondent can complete the questionnaire when it is convenient and can check personal records if necessary. Assistance was provided to the parents and caregivers for the completion of their questionnaires.

3.5.1 Questionnaire

Separate questionnaires were developed for the physiotherapists and the caregivers. The questionnaire was structured as follows: It consisted of a section for the socio-demographic details of the participants. The second section for physiotherapists and caregivers consisted of questions requesting information on their perception of and experience with chest physiotherapy in asthmatic children. The research assistant helped caregivers who were unable to read and write to complete the questionnaires. All questions were close-ended.

3.5.2 Validity of the questionnaires

The questionnaires were piloted to establish content and face validity. In the absence of standardized questionnaires for this study, the questionnaires were designed around the objectives of the study which depended mainly on the physiotherapists' and caregivers' current knowledge and some recall. Thus, it was an assessment of the situation at present.

3.6 Translation of questionnaire for caregivers

The questionnaire for the caregivers was translated from English to Kinyarwanda, and from English to French for the physiotherapists. Two professional translators, one French and the other Kinyarwanda, did this. In order to ensure that the translated questionnaires in Kinyarwanda and French expressed what the English version intended to assess, another independent translator translated the questionnaire from Kinyarwanda back to English, and from French back to English. This was done to eliminate the possible loss of meaning of the initial English questionnaire.

3.7 Pilot studies

A pilot study was carried out in one of the hospitals and one of the private clinics that had the same characteristics as those included in the study. The five physiotherapists and five caregivers who were used for the study were not included in the main study. The aim was to identify how well respondents understood the questions and how long it took to answer the questions. It was also a means of establishing the validity of the instrument and whether it needed improvement.

The pilot study took two days. The first day, the questionnaires were handed to the physiotherapists and verbal explanations were given on how to complete them. The next day, the research assistants collected the questionnaires. The research assistants helped the caregivers with the completion of the questionnaires, as most were illiterate. No changes to the questionnaires were required.

3.8 Procedure

The research assistants were practising physiotherapists who were not employed in the selected hospitals and clinics. Their training took two days and was about the aim of the study, the nature of the study, and ethical behavior. The fieldwork started with the distribution of questionnaires to the physiotherapists who had agreed to participate in the study. In the case of the caregivers, the research assistants had to assist them with completing the questionnaires. A criterion for inclusion was that the caregiver should be the parent or a person who was mainly responsible for the child's well-being for the greatest part of the day.

3.9 Questionnaire procedure

The first phase was to seek permission to administer the questionnaires. At one of the hospitals, I had to present my proposal to the research committee of the hospital. The other hospitals requested a written copy of my research proposal and questionnaire. In the second phase, the research assistants distributed questionnaires in the three hospitals and six private clinics to the participants.

After one week, the research assistant returned to the hospitals to remind all participants who had not completed their questionnaires to complete them in order to increase the return rate. Neuman (2000) recommends the first letters of reminder should be delivered

one week after distributing the questionnaire. Only some questionnaires had been returned after three weeks. The research assistants returned to the hospital and private clinics two days later to give the second reminder to the participants. After one week, all questionnaires were collected. Some caregivers could complete the questionnaires on their own and handed them back to the research assistant immediately.

3.10 Data analysis

Quantitative data was analyzed using descriptive statistical methods.

3.10.1 Analysis of questionnaire

Data was first coded manually. Excel software was used to obtain a profile of the study population. The perceptions of physiotherapists and caregivers about the importance and benefits of chest physiotherapy among asthmatic children, details of referral, the stages of asthma attacks, and figures relating to advice, experience, and home-programmes were presented using frequency tables.

3.11 Ethical considerations

The researcher obtained ethical clearance for the study from the Senate Higher Degrees Committee of the University of the Western Cape. Permission to carry out the study in the institutions was requested from the Minister of Health and from the Director of Hospitals and Privates Clinics (appendix **A, B, C, D, & E**). In each case, an informed consent was obtained orally or in writing before carrying out the study.

The purpose of the study was explained to the participants. Anonymity and confidentiality of information was ensured. Participation was voluntary and subjects

could withdraw from the study at any time, without prejudice. The result of the study would be available to the participants and the directors of hospitals upon request.



CHAPTER FOUR: RESULTS

4.1 Introduction

In this chapter the data are presented using univariate and multivariate descriptive analyses. Tables are used where appropriate and the main trends in the data are described.

4.1.1 Socio-demographic characteristics of the caregivers

Table 4.1 shows that the majority of the caregivers (65%) were mothers, while the fathers and others each represented (15.8%) and (19.1%) respectively. Those caregivers categorized, as others were either other relatives or guardians. It was also not surprising to find that the majority of the caregivers were females (81.7%). The majority of caregivers (80.7%) were in the 24-38 year age group.



Table 4.1 Socio-demographic characteristics of the caregivers (n =120)

Variable measured	Characteristics	Frequency	Total
Caregivers	Father	19	15.8%
	Mother	78	65%
	Others	23	19.1%
Gender	Male	22	18.3%
	Female	98	81.6%
Age	19 to 23years	9	7.5%
	24 to 28years	33	27.5%
	29 to 33years	36	30%
	34 to 38years	27	22.5%
	39 to 44years	15	12.5%
	45 to 49years	4	3.3%
	Greater than 49	3	2.5%

4.1.2 Period of receiving treatment.

Table 4.2 shows that most of the caregivers (34.1 %) reported that the children had been receiving chest physiotherapy (CPT) for between 7 and 12 months, followed by a slightly smaller number who received CPT for more than a year (32.5%).

Table 4.2 Period of receiving treatment.

Variable	Period of chest physiotherapy	Frequency	%
Time of receiving chest Physiotherapy	Less than 1 month	25	20.8
	1 to 6 months	15	12.5
	7 to 12 months	41	34.1
	> 12 months	39	32.5
Total		120	100

4.1.3 Source of information of chest physiotherapy

Most of the caregivers obtained information about CPT from the doctor (80%) (Table 4.3). The low percentages from the nurse (1.6%) and physiotherapists (0.8%) as a source of information were not surprising, because the physiotherapists usually make first contact with child when he/she is seen and referred by doctors.

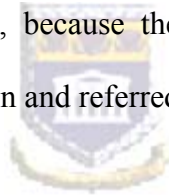


Table 4.3 Source of information of chest physiotherapy

Caregivers	Doctor	Friends	Nurse	PT	Medical & Friend	%
Father	(11)	(4)			(4)	(19)
	57.8%	21.05%			21.05%	100
Mother	(64)	(7)	(2)		(5)	(78)
	82. %	8.9%	2.5%		6.4%	100
Others	(21)	(1)		(1)		(23)
	91.3%	4.3%		4.3%		100
Total	(96) 80%	(12) 10%	(2) 1.6%	(1) 0.8%	(9) 7.5%	(120) 100

() = frequency % = percentage

4.1.4 Opinion of importance of chest physiotherapy

The majority of caregivers (94.1 %) rated CPT as “very important” and “important” (Table 4.4). It was interesting to note that all fathers in the study reported that CPT was very important in the management of their asthmatic children. A small proportion indicated the opposite, with the least 1.6% indicating that they did not know the importance of chest physiotherapy.

Table 4.4 Opinion of importance of chest physiotherapy

Caregivers	Very important	Important	Not important	Not known	%
Father	(18) 94.7%	(1) 5.2%			(19) 100
Mother	(58) 74.3%	(14) 17.9%	(5) 6.4%	(1) 1.2%	(78) 100
Others	(12) 52.1%	(10) 43.4%			(23) 100
Total	(88) 73.3%	(25) 20.8%	(5) 4.1%	(2) 1.6%	(120) 100

() = Frequency % = percentage

4.1.5 Stage of asthma attack and physiotherapy treatment

For this question the caregivers could give more than one response. The majority of caregivers (40.8%) reported that CPT was given “during” the attack while (25.8%) stated “during and after” the attack (Table 4.5). This is to be expected because physiotherapists usually have a significant role to play in those different stages. A small percentage (14.1%) also took their children for CPT before the attack was fully developed.

Table 4.5 Stages and physiotherapy treatment

Caregivers	Before	During	After	Before & During	Before & After	During & After	%
Father	(3) 15.7%	(7) 36.8%	(2) 10.5%		(1) 5.2%	(6) 31.5%	(19) 100
Mother	(10) 12.8%	(36) 46.1%	(6) 7.6%		(7) 8.9%	(19) 24.3%	(78) 100
Others	(4) 17.3%	(6) 26 %	(4) 17.3%	(1) 4.3%	(2) 8.6%	(6) 26%	(23) 100
Total	(17) 14.1%	(49) 40.8%	(12) 10%	(1) 0.8%	(10) 8.3%	(31) 25.8%	(120) 100

() = frequency % = percentage

4.1.6 Getting advice from physiotherapist

In table 4.6 most of the caregivers (73.3%) indicated that they were given advice by the physiotherapists on caring for the asthmatic child. The number of caregivers who were not given advice (26.6%) is a concern because of the life-threatening nature of an asthmatic attack.

Table 4.6 Advice from physiotherapist

Caregivers	Advice	Non Advice	%
Father	(15) 78.9%	(4) 21. %	(19) 100
Mother	(55) 70.5%	(23) 29.4%	(78) 100
Others	(18) 78.2%	(5) 21.7%	(23) 100
Total	(38) 73.3%	(32) 26.6%	(120) 100

() = frequency % = percentage

4.1.7 Caregivers' compliance

4.1.7.1 Following physiotherapists' advice

A close similarity is observed between the majority who received advice (73%) in table 4.6 and those who followed the physiotherapists' advice (70.8%) in table 4.7.1 The same

observation is noted in those who did not receive advice and did not follow advice.

Compliance is thus good in informed caregivers.

Table 4.7.1 Following physiotherapists' advice

Caregivers	Following	Not Following	%
Father	(14) 73.6%	(5) 26.3%	(19) 100
Mother	(54) 69.2%	(24) 30.7%	(78) 100
Others	(17) 73.9%	(6) 26.%	(23) 100
Total	(85) 70.8%	(35) 29.1%	(120) 100

() = Frequency % = percentage

4.1.7.2 Attendance of physiotherapists' appointments.

Overall, attendance of appointments was good (90%), with a small percentage (10%) not complying with appointments (Table 4.7.2).

Table 4.7.2 Attending appointments

Caregivers	Attending	Not Attending	%
Father	(18) 94.7%	(1) 5.2%	(19) 100
Mother	(70) 89.7%	(8) 10.2%	(78) 100
Others	(20) 86.9%	(3) 13%	(23) 100
Total	(108) 90%	(12) 10%	(120) 100

() = Frequency % = percentage

4.1.7.3 Following home program of chest physiotherapy

The table below shows that the majority of caregivers (83.3%) followed a home program and a small group (16.6%) did not follow a home program.

Table 4.7.3 Following home program of chest physiotherapy

Caregivers	Following	Not Following	%
Father	(16) 84.2%	(3) 15.7%	(19) 100
Mother	(63) 80.7%	(15) 19.2%	(78) 100
Others	(21) 91.3%	(2) 8.6%	(23) 100
Total	(100) 83.3%	(20) 16.6%	(120) 100

() = Frequency % = percentage



4.1.8 Experience with chest physiotherapy.

Again, the majority (95%) found that chest physiotherapy was helping their children (Table 4.8). The fathers, although they represented a small percentage in the sample, were very positive.

Table 4.8 Benefits of chest physiotherapy

Caregivers	CPT helping	CPT not helping	%
Father	(19) 100%		(19) 100
Mother	(73) 93.5%	(5) 6.4%	(78) 100
Others	(22) 95.6%	(1) 4.3%	(23) 100
Total	(114)	(6)	(120)

95%	5%	100
------------	-----------	------------

() = Frequency % = percentage

4.1.9 Barriers to attending physiotherapy appointments

The minority (10%) of caregivers reported that they are not attending follow-up physiotherapist' appointments (Table 4.9). Reasons given by the 12 caregivers in this group were the cost of chest physiotherapy (58.3%), followed by not benefiting from chest physiotherapy (33.3%) and lack of time as indicated by (8.3%).

Table 4.9 Barriers to attending physiotherapy appointments

Caregivers	Expensive	Lack of time	CPTnot helping	%
Father	(1) 100%			(1) 100
Mother	(5) 62.5%		(3) 37.5%	(8) 100
Others	(1) 33.3%	(1) 33.3%	(1) 33.3%	(3) 100
Total	(7) 58.3%	(1) 8.3%	(4) 33.3%	(12) 100

() = Frequency % = percentage

4.1. 10 Adjuncts to asthma management

Table 4.10 shows that most of the respondents indicated that the children used the nebuliser (24.1%), followed by asthma medicine (20.8%) and inhaler (small pump) (13.3%) A relatively similar proportion used none of the adjuncts (19.1%). The parents mentioned that the nebuliser was administered by the physiotherapists and it became clear from the responses that the child did not have his/her own nebuliser. This was not

specifically asked in the questionnaire. Also, the majority of caregivers were not aware of the use of the peak flow meter.

Table 4.10 Adjuncts to asthma management

Caregivers	None	Use nebuliser	Use small pump	Use asthma medicine only	Use peak flow meter	Use nebuliser & small pump	Use nebuliser & asthma medicine	Use small pump with asthma medicine	%
Father	(2) 10.5%	(8) 42.1%	(3) 15.7%	(2) 10.5%	(1) 5.2%	0	(1) 5.2%	(2) 10.5%	(19) 100
Mother	(14) 17.9%	(16) 20.5%	(9) 11.5%	(21) 26.9%	(2) 2.5%	(2) 2.5%	(2) 2.5%	(12) 15.3%	(78) 100
Others	(7) 30.4%	(5) 21.7%	(4) 17.3%	(2) 8.6%		(1) 4.3%		(4) 17.3%	(23) 100
Total	(23) 19.1%	(29) 24.1%	(16) 13.3%	(25) 20.8%	(3) 2.5%	(3) 2.5%	(3) 2.5%	(18) 15%	(120) 100

() = Frequency % = percentage

4.1.11 Knowledge about adjuncts to chest physiotherapy

Table 4.11 shows that the majority of caregivers indicated that they had sufficient knowledge (70%) about the use of adjuncts. However, lack of knowledge in the (30%) can have disastrous consequences if the asthmatic child is not given the life-saving bronchodilator in a non-invasive manner at the appropriate stage of the asthma attack.

Table 4.11 Knowledge about adjuncts to chest physiotherapy

Caregivers	Sufficient knowledge	Insufficient knowledge	%
Father	(16) 84.2%	(3) 15.7%	(19) 100
Mother	(56) 71.7%	(22) 28.2%	(78) 100

Others	(12) 52.1%	(11) 47.8%	(23) 100
Total	(84) 70%	(36) 30%	(120) 100

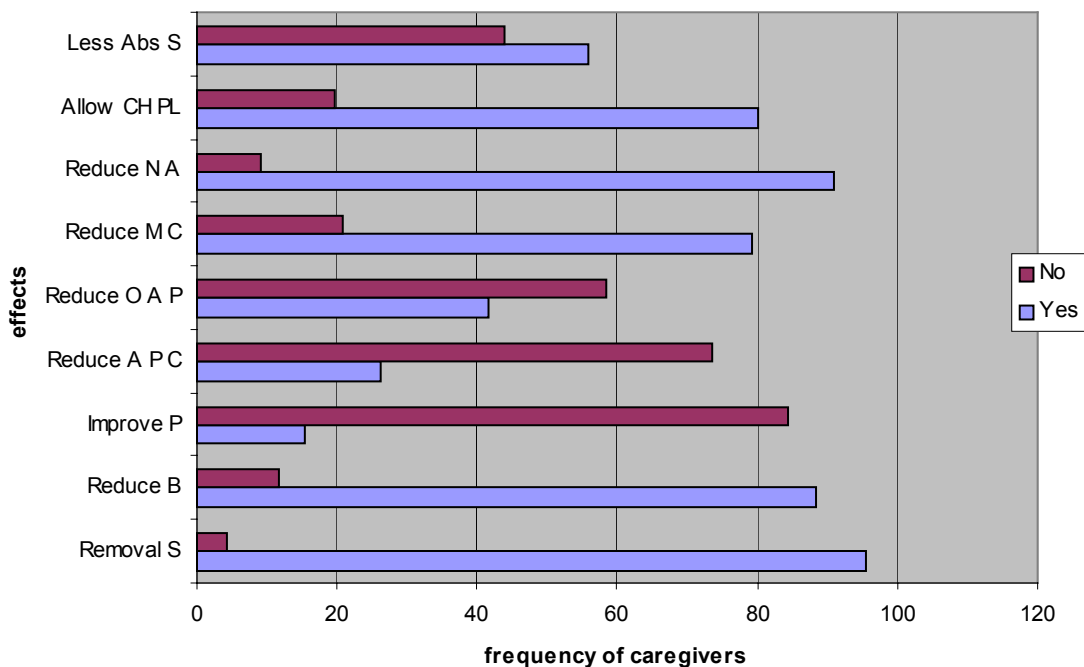
() = Frequency % = percentage

4.1.12 Effect of chest physiotherapy

Caregivers stated how CPT helped their asthmatic children (Figure 4.1). The benefits of CPT observed by most of the caregivers are shown in order from highest to least benefits. These were, removal of sputum from the lungs, reduces the number of attacks, reduces breathlessness, allows child to play, reduces medical costs and reduces absenteeism from school. On the other hand a large percentage of caregivers did not observe an improvement in posture or experience reduced anxiety and panic in the child and in themselves.



Figure 4.1 Effects of chest physiotherapy



Removal S: Removal sputum:

Reduce B: Reduce breathlessness

Improve P: Improve posture

Reduce APC: Reduce anxiety and panic in child

Reduce OAP: Reduce own anxiety and panic

Reduce MC: Reduce medical cost

Reduce NA: Reduce number of attacks

Allow CH PL: Allow child play

Less Abs S: Less absent from school.

The second part of the study deals with the analysis and interpretation of the data collected from the physiotherapist who participated in the study. Their responses relating to their experiences with referral, carers' knowledge, and compliance to CPT

physiotherapy, as well as their own experiences with CPT in asthmatic children are described in the sections that follow.

4.2.1 Demographic profile of physiotherapists

Table 4.12 represents the demographic profile of the participants. Thirty physiotherapists participated in the study. Their ages ranged from 26 to 60 years. Most of the physiotherapists had 1-5 years experience as clinicians. The sample consisted of an equal number of female and male physiotherapists.

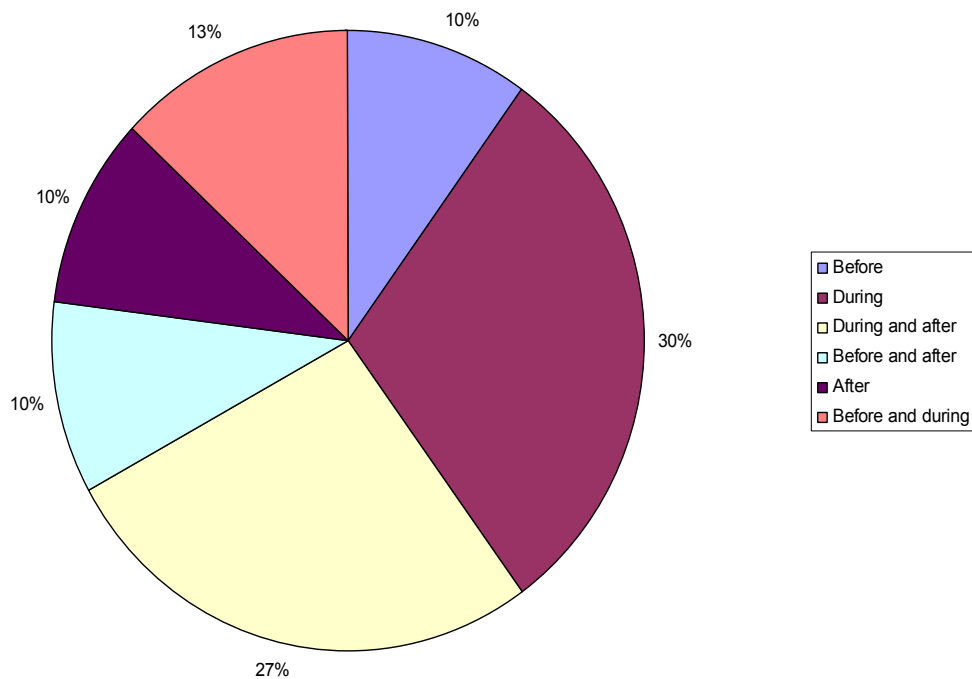
Table 4.12 Demographic profile of physiotherapists

Variable measured	Characteristics	Frequency	Total
Gender	Female	15	50%
	Male	15	50%
Age	26 to 30 years	11	36.6%
	31 to 35 years	6	20%
	36 to 40 years	4	13.3%
	41 to 45 years	5	16.6%
	> 45	4	13.3%
	Experience of practice	Less than 1 year	7
	1 to 5 years	14	46.6%
	6 to 10 years	5	16.6%
	11 to 15 years	2	6.6%
	16 to 20 years	1	3.3%
	> 20	1	3.3%
		120	100

4.2.2 Stage of asthma attack and referral

The figure below shows the stage at which the asthmatic children were referred to the physiotherapists. The majority (30%) of physiotherapists got the asthmatic children “during” the attack. A slightly lower percentage (27%) of the physiotherapists saw the children “during and after” the attack, while the minority (10%) saw the children “before and after” the attack, while the minority (10%) saw the children “before and after” the attack.

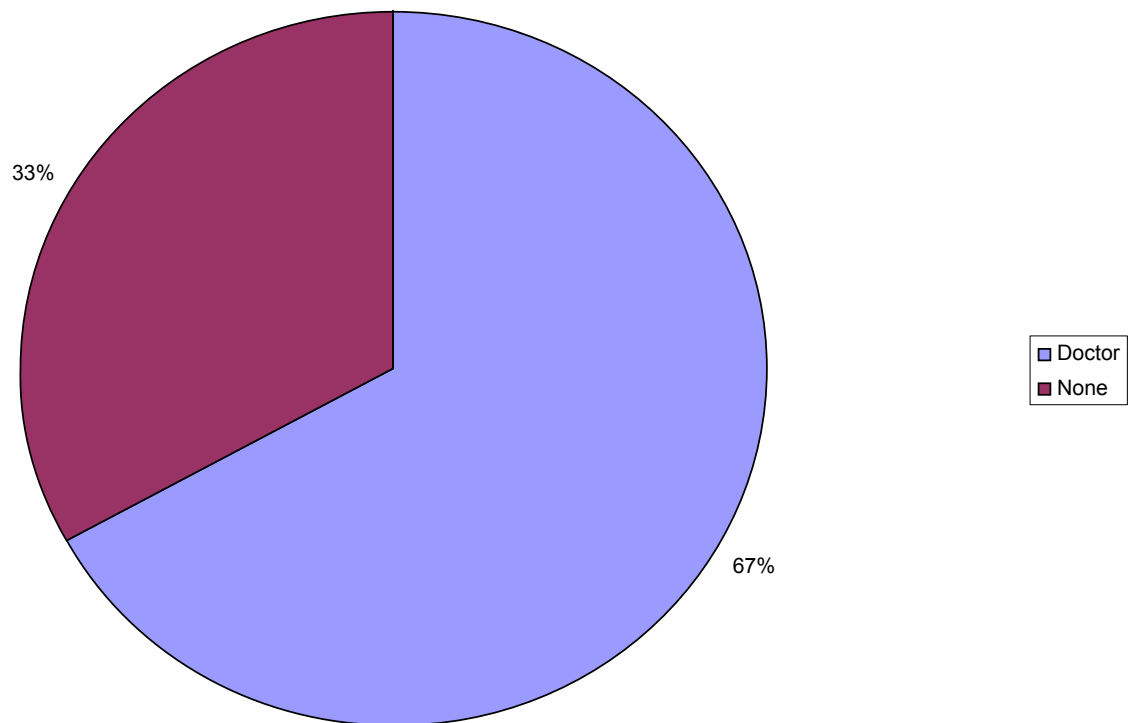
Figure 4.2 Stage of asthma attack and referral



4.2.3 Referrals

Figure 4.3 shows that 67% of the physiotherapists reported that they received their referrals from the medical doctors. The remaining 33% of the physiotherapists in the study did not indicate any source of referral. However, it is rather unusual for caregivers to bring their children to the physiotherapist as the first contact practitioner. They are probably caregivers who have not brought their children for CPT for the first time.

Figure 4.3 Referrals

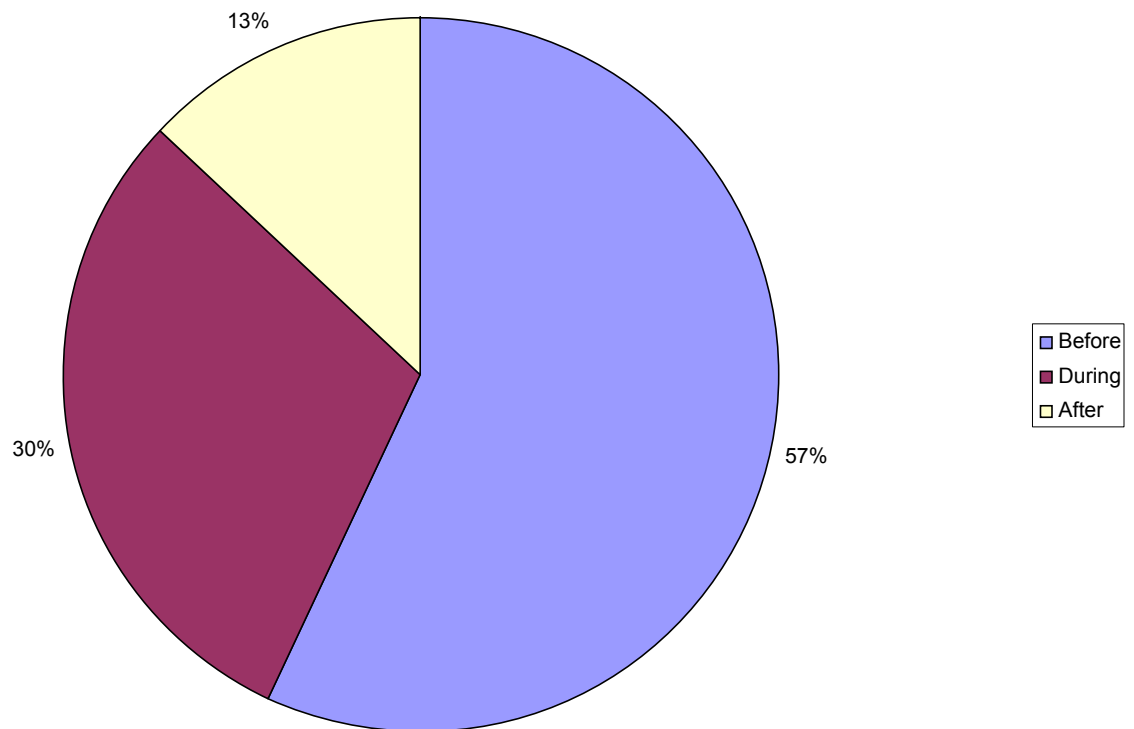


4.2.4 Stage of effectiveness of chest physiotherapy

Figure 4.4 shows the stage at which the physiotherapists perceived chest physiotherapy as effective. The majority of physiotherapists (57%) stated that CPT is more beneficial in the stage “before” the attack is fully developed with wheezing, bronchospasm,

respiratory distress and anxiety. However a small group (13%) indicated that the usefulness of chest physiotherapy was in the stage “after” the attack. This result is questionable because physiotherapists usually get the referral for chest physiotherapy from the doctor after the child has been stabilized in the emergency room.

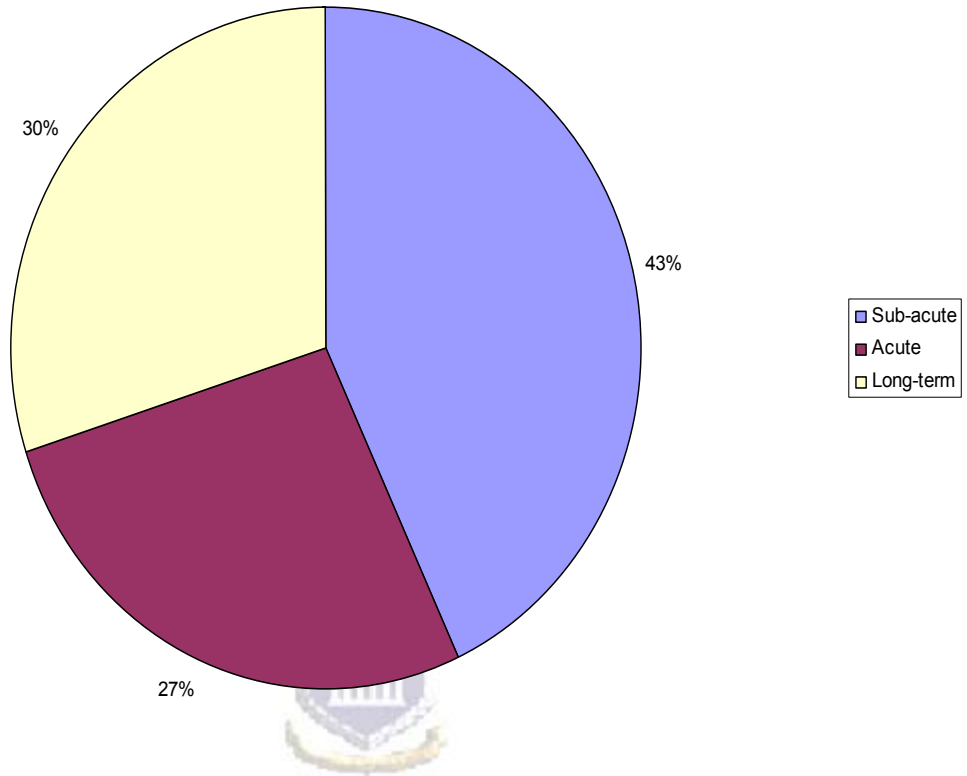
Figure 4.4 Stage of effectiveness of chest physiotherapy



4.2.5 Time of treatment implementation

Figure 4.5 shows at which phases the physiotherapists treated the asthmatic children. The majority are involved in the sub-acute (43 %) management and less in the long-term phase. Fewer physiotherapists stated their involvement in the acute stage (27 %). This finding is usually acceptable because in the acute stage the asthmatic children are seen by the doctors as medical emergencies.

Figure 4.5 Time of treatment implementation



4.2.6 Chest physiotherapy in prevention of recurrent attacks

The majority of physiotherapists (86.67%) stated that CPT was beneficial in the prevention of recurrent asthma attacks (Table 4.13). A small group (13.33%) found that chest physiotherapy was not of benefit and this group was the physiotherapists who had 1-10years of experience.

Table. 4.13 Chest physiotherapy and prevention of asthmatic attacks

Years of Experience	Not beneficial	Beneficial	%
1-10years	(4) 15.3%	(22) 84.6%	(26) 100
More than11years		(4) 100	(4) 100
Total	(4) 13.3%	(26) 86.6%	(30) 100



4.2.7 Importance of chest physiotherapy

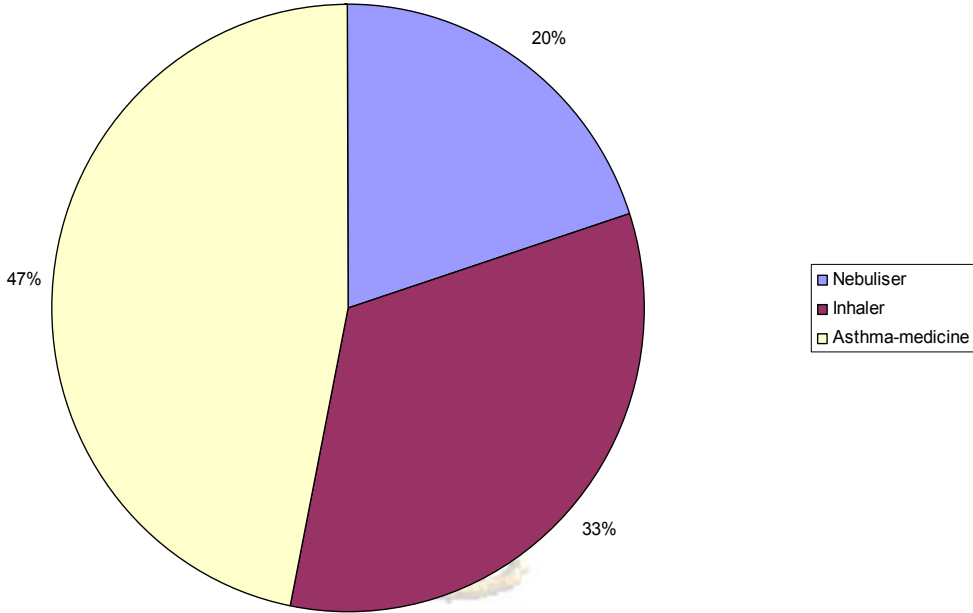
All physiotherapists were of the opinion that chest physiotherapy was very important in the management of asthmatic children, although a small minority did not think that CPT is beneficial for the prevention of asthmatic attacks. This finding can be seen as contradictory.

4.2.8 Knowledge of caregivers

Figure 4.6 (p.49) shows the physiotherapists' perception of the caregivers' knowledge about the use of adjunct to CPT in the management of their asthmatic children. Less than 50% of the physiotherapists felt that caregivers had sufficient knowledge about asthma medicine, followed by knowledge of the use of the inhaler (small pump). A smaller

number of physiotherapists (20%) stated that parents had sufficient knowledge of the use of the nebuliser.

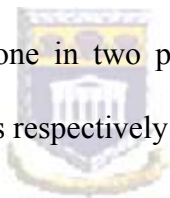
Figure 4.6 Knowledge of caregivers



CHAPTER FIVE: DISCUSSION

5.1 Introduction

The first objective of this study was to identify the perceptions of caregivers of asthmatic children about the importance of chest physiotherapy; the second was to determine the perceptions of physiotherapists about the importance of chest physiotherapy for asthmatic children, and the third was to identify the physiotherapists' experience with doctors' referrals and caregivers' compliance in the management of asthmatic children. This chapter discusses the findings of the current study and relates them to the results of other studies. However, the discussion on the importance of chest physiotherapy is based on the findings of this current study and personal experience, since the researcher hardly obtained sufficient information on chest physiotherapy from other studies. The discussion is done in two parts; namely, those pertaining to the caregivers and to the physiotherapists respectively.



5.2 PART 1: CAREGIVERS' PERCEPTIONS OF CHEST PHYSIOTHERAPY

5.2.1 Caregiver Characteristics

The majority of caregivers in the sample were parents, with mothers being the largest proportion (66%). This is not surprising because, universally, it is usually the mother who accompanies the child to the hospital. This is similar to the observation made in a study of caregivers whose children were presented to St. Louis Children's Hospital emergency unit with acute exacerbation of asthma. Of the 150 subjects who participated in the study, 90% were mothers (Smith, Highstein, Jaff, Fisher & Strunk, 2002).

Most of the caregivers in the study (66.7%) indicated that the children have been attending chest physiotherapy for more than seven months. From the researcher's personal experience with asthmatic children, this situation is not unusual, considering that asthma is a chronic disease that requires asthmatic children to visit a physiotherapist for a relatively long period. Also, when the children suffer from repeated asthmatic attacks per year, they need regular chest physiotherapy. According to the objectives of chest physiotherapy, which are to minimize and control future attacks, to improve the posture, and to remove the pulmonary secretions from the lungs, the asthmatic children who need to achieve those objectives have to see the physiotherapist for a long period.

5.2.2 Importance of chest physiotherapy

It was observed that the majority of caregivers of asthmatic children stated that they found chest physiotherapy for the children beneficial and rated it as very important. The benefits indicated by them were in the following order: removal of sputum from the lungs, reduction in the number of attacks, reduction of breathlessness, allowing the child to play, reduction in medical costs, less often absent from school, reduction in their own anxiety and panic, reduction in anxiety and panic in the child and improvement in posture.

Caregivers state that chest physiotherapy helps asthmatic children to remove the secretions when the lungs are full, enables them to control their attacks, and minimizes anxiety. Griez (1999) states that panic-disorder patients have an increased prevalence of respiratory disorders in childhood, while patients with asthma and COPD may have an increased incidence of panic. At the same time, there seems to be a link between a history of disordered breathing and panic disorders. In contrast, in their study, De Godoy & De Godoy (2003) reported that the role of physical exercise in altering COPD

patients' anxiety and depression was ambiguous: physical exercises alone could not significantly reduce the levels of anxiety and depression in those patients who did not have psychotherapy sessions.

Other benefits indicated by the caregivers were a reduction in the taking of medication and the duration of hospitalization. The reduction in the use of medication means lower costs to parents and reduces the risk of non-compliance with taking the medication. Volovitz et al. (2000) reported that many current pharmacological therapies for treating chronic asthma are effective but their limitations include poor adherence, difficulty with inhaler technique, and possible adverse effects. As few as 50% of asthmatic children take their inhaled medication as prescribed, and up to 90% fail to adhere to their prescribed asthma treatment regimens at least some of the time. Chest physiotherapy is one of the interventions used in conjunction with medication to minimize the severity of the asthma attack so that the duration of hospitalization is reduced. Herbert, Maher & Moseley (2001) agree that rehabilitation in asthmatics may reduce the duration of hospital stay but not the number of medical consultations.

5.2.3 Caregivers' Compliance

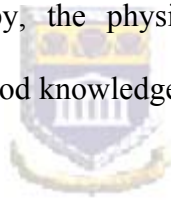
Overall, the majority of the caregivers were positive towards chest physiotherapy. Their positive perception was possibly influenced by the majority of caregivers who received advice from the physiotherapists and found physiotherapy beneficial for their asthmatic children. These factors, in turn, had a favorable effect on their compliance to the prescribed home programme and keeping up with physiotherapy appointments.

According to Bassett (2003), the success of physiotherapy management depends on the attendance at and respect for appointments given by physiotherapists for the asthmatic

children. The degree to which patients adhere to the clinic- and home-based treatment requirements is considered to be responsible in some part for the success of physiotherapy programmes.

Another crucial part of management of asthma is education of the child and parents about the condition and treatment. It is important that the physiotherapist is part of the team involved in that education (Pryor & Webber, 1998). Furthermore, patient and caregiver education has been found to increase the knowledge of the disease (Krishna, Boren & Balas, 2000). Physiotherapists usually spend more time with asthmatic children than do other health professionals, so they play a major role in the education of asthmatic children.

For successful chest physiotherapy, the physiotherapists have to give advice to caregivers because the latter need good knowledge and skills on how to deal with severe attacks of asthma.



5.2.3.1 Home Programme

With the majority of caregivers indicating a positive perception of chest physiotherapy, it could mean that they are satisfied with what physiotherapy has done for their asthmatic children. It could also be one of the reasons why the majority of caregivers reported that they followed the home programme prescribed by physiotherapists.

Home-based asthma health education is associated with significant reductions in parental information needs and concerns related to asthma, as well as improved perception of their child's condition. Shortened hospital stays, limited effectiveness of written educational materials and the various barriers encountered by families most in

need of community services suggest that the demands for asthma education will not decrease in the foreseeable future (Dolinar, Kumar & Coutu-Wakulczyk, 2000).

5.2.3.2 Barriers to Compliance

In this study, a small group of caregivers (10%) encountered some barriers to keeping appointments for chest physiotherapy. The cost of chest physiotherapy, which is an additional “out-of-pocket” expense, is a major barrier. The expenses patient incur for acute asthma care impose a substantial burden on low-income families, especially on those who do not have health insurance. Since expenses tend to be large in proportion to income, it appears likely that families’ visits to the Emergency Department (ED) are driven by perceived need (McGhee, Sherbourn & Lara, 2004).

Lack of motivation was the second barrier observed in this study; some caregivers stated that the chest physiotherapy did not help their asthmatic children. Time constraints have also been cited as a barrier to attendance at chest physiotherapy, as asthma is a chronic disease and it demands a long period of regular treatment. Chest physiotherapy forms the latter part of asthma management and demands regular attendance at appointments. In the light of these barriers, it is thus essential to equip these caregivers with good knowledge about asthma and its management; in particular, knowledge of chest physiotherapy. Even though a small proportion of caregivers (10%) identified barriers to compliance with chest physiotherapy, the asthmatic children should not be disadvantaged further by the risk of suffering life-threatening asthma attacks because caregivers do not have the necessary knowledge to deal with them.

5.2.4 Adjuncts to chest physiotherapy

Adjuncts to chest physiotherapy are frequently used, depending on the stage of the asthma attack. The study showed that the majority of caregivers had knowledge of how to use the adjuncts, such as the nebuliser, the small pump (metered-dose inhaler), and asthma medicine. Only a very low proportion (2.5%) of the caregivers used a peak-flow meter. This should be seen as a concern because peak-flow meters are simple to use by physiotherapists and caregivers. The equipment is invaluable in monitoring the effects of the medication on the airflow through the child's airways. It can therefore alert the caregiver to signs which indicate the need for medical attention when bronchospasm is worsening. Concerning the use of the inhaler, a study by Sweeney, McMullen, Yoos & Kitzman (2003) found that the parents seemed relatively comfortable with inhaled steroid use and had more concerns with oral steroid use. In most circumstances, the greatest bronchodilation is achieved fastest and with fewest side effects by using the aerosol route of delivery. This allows a higher concentration of active drug to reach the target airway cells with a lower total dose than is possible by other routes of delivery.

Although only a small minority of caregivers does not have sufficient knowledge about the adjuncts to chest physiotherapy, this can have disastrous consequences for asthmatic children. If the doctor's instructions on the use of medication are not followed, or if they do not know how to use the small pump (inhaler), it will be difficult to achieve success with chest physiotherapy.

Studies by Moosa & Henly (1997) and Warscburg, Shwerin, Buchholz & Petermann (2003) state that the parents were most knowledgeable about aetiology and symptomatology. They were less informed about asthma therapy, asthma prognosis, and general medical knowledge.

Moosa & Henly (1997) and Warsburg et al. (2003) confirmed that evidence suggests that parents are not well informed about how to use the asthma medication or the necessary inhalation devices or in administering preventive medication. On the contrary, the physiotherapists in the study confirmed that the caregivers had knowledge about administration of asthma medicine and utilization of inhalers (small pumps). However, the physiotherapists acknowledged that the caregivers did not have knowledge about the utilization of nebulisers. This could be due to the fact that caregivers indicated that the nebuliser is used only by the physiotherapists and their children did not have their own nebulisers.

5.3 PART 2: Physiotherapists' Perceptions of Chest Physiotherapy

The majority of the physiotherapists who participated in the study had a positive perception of chest physiotherapy for asthmatic children. This result is not surprising because one would find a general bias in favor of chest physiotherapy for a variety of respiratory conditions. Chest physiotherapy forms a large part of the undergraduate curriculum; thus, the belief that chest physiotherapy is beneficial for people suffering from asthma is based on experience. There is obviously a need for well-designed research in order to obtain the best evidence for practice in the area of chest physiotherapy.

5.3.1 Experience with Patient Referrals

In this study, the majority of referrals came from the doctors. This was expected because the doctor is usually the first person to be consulted when a child has an asthma attack. Similar trends have been reported in a study by Raheison, Tunon-de-Lara, Vernejoux &

Taytard (2000). They found that children and adolescents used health services for managing their asthma. Most children and adolescents made regular visits to a doctor who was a general practitioner.

Access to physical therapy in many states in the USA is dependent on the decision of the physician to refer or not to refer the child to a physiotherapist. However, other states have enacted legislation enabling consumers to obtain physical therapy without referral by a physician. Those opposed to direct access to physiotherapists cite potential over-utilization of services, increased costs, and inappropriate interventions (Michele & Lissovoy, 1997). Comparatively, in the Netherlands, as in many other countries, primary-care physicians (PCPs), also called "general practitioners" or "family doctors", occupy a pivotal position in the provision of healthcare. Their role is to make a medical diagnosis and to provide medical intervention, prevention, continuity of care, and referral of patients to other levels of health professionals. In Rwanda, it is required by the medical insurance that referrals to physiotherapy be made via the doctor. A similar policy exists at state hospitals. This ruling could thus have accounted for a large proportion of referrals (67%) of asthmatic children from the medical practitioners. Understanding the referral process is critical to navigating the managed-care organization. Managed-care organizations require patients to obtain a referral from the primary-care physician (the doctor responsible for a patient's total healthcare) in order to see a specialist. A referral is like a permission slip from the primary-care physician. It allows patients to seek treatment from a specialist when the primary-care physician is unable to treat the patient's problem. This is one way to keep health insurance costs down (Levechuck, Kosek & Droban, 2000).

However, the smallest proportion had access to physiotherapy services without referral in the event of recurring asthma attacks. This is a group who had their asthmatic children previously assessed and are known to the physiotherapists over a long time. So, when the child has an episode of wheezing and chest tightness, it depends on the phase of the attack and the caregiver's knowledge and experience whether they go directly to the physiotherapist or to the doctor.

5.3.2 Time of Implementation of Chest Physiotherapy

Asthma management requires a significant effort on the part of children and families to maintain the treatment schedule on a day-to-day basis. Over years, many programmes have been developed in an attempt to provide the necessary knowledge about asthma and appropriate skills for its management (Krishna et al, 2000).

The study showed that a high proportion of physiotherapists found chest physiotherapy to be more beneficial in the sub-acute stage of the asthma attack because, in this stage, the physiotherapists can use more techniques than in the acute phase. These interventions are breathing exercises for relaxation and improving ventilation to atelectatic areas and exercises to improve the posture. It is more desirable to treat the child and educate the caregiver during this stage because the physiotherapist can communicate easier with an asthmatic child when he/she is not having an attack and anxiety and fear are reduced. Furthermore, chest physiotherapy aids in the removal of secretions from the pulmonary airways, and the child is taught how to deal with future attacks.

Lack of sufficient information to the caregivers about the different steps in managing an exacerbation of asthma might explain the children's behavior, such as feelings of panic

during the attack. This might prevent them from taking appropriate action in the management of the child's asthmatic attack. Failure to manage the attack in its initial stage might result in them seeking further help from the doctor. There is thus a need to teach children and caregivers a stepwise approach to managing an asthma attack (Pradel, Hartzema & Bush, 2001).

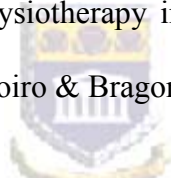
It was not unusual to find that a relatively smaller proportion of physiotherapists (27%) treated children in the acute stage of the asthmatic attack. Under normal circumstances, the doctor in the emergency room primarily deals with the child's respiratory distress. During this stage, the child requires expeditious treatment, close observation, serial measurement of physical signs, oxygen saturation, and improvement to lung function (Fitzgerald, et al 2001). Here, the role of chest physiotherapy is minimal. It may sometimes be necessary for the physiotherapists to use interventions such as postural drainage, where gravity is used to assist the drainage of secretions from areas of the lungs.

Asthma is characterized by intermittent acute attacks caused by a chronic inflammation of the airways. The variability of the disease's severity and the reversibility of the acute symptoms underline the importance of patients' self-management skills. The current treatment approach does not only rely on the use of medications to control acute exacerbations of asthma and chronic inflammation but also the education of the patient. Self-management involves the control of triggers, symptom monitoring, and medications for dealing with acute worsening of symptoms and managing chronic inflammation. It includes all activities that the child or parents as caregivers perform to prevent and treat asthma attacks. In young children, patient education programmes often focus on parents as caregivers (Warsburg et al 2003).

In this stage, the patient needs to know what he or she is capable of and what their limitations are. Laitnen et al. (1999) reported that the aim of the management is to find solutions to problems encountered in coping with daily tasks at home. The patient should learn to control breathing even under difficult conditions such as exertion or exacerbation of disease. Relaxation and breathing techniques such as pursed-lip breathing can be used to improve lung function and reduce airway resistance.

5.3.3 Physiotherapists' Opinion on Effectiveness of Chest Physiotherapy

The majority of physiotherapists reported that chest physiotherapy is effective before an attack becomes severe. Also, from the researcher's own experience, chest physiotherapy before an attack helps in limiting the progression of the signs and symptoms into a severe episode of asthma. Early physiotherapy intervention is supported by Paolucci, Antonucci, Gasso, Morelli, Troisi, Coiro & Bragoni (2000).



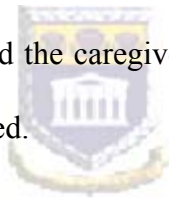
CHAPTER SIX: SUMMARY, CONCLUSIONS, LIMITATIONS OF THE STUDY AND RECOMMENDATIONS

6.1 Introduction

This chapter gives a summary of the study. It highlights the important findings and concludes with recommendations based on the results.

6.2 Summary

The current study attempted to determine the perceptions of caregivers and physiotherapists about the importance of chest physiotherapy for asthmatic children attending hospitals and private clinic in Kigali, Rwanda. The physiotherapists' experience with doctors' referrals and the caregivers' compliance in the management of asthmatic children were also examined.



Generally the management of asthma seems to be depending mainly on medication and physiotherapy did not play a major role in the management of it. This observation was strengthened by the fact that the researcher found minimal literature on clinical studies in physiotherapy for asthma, even in developed countries. In Rwanda physiotherapy is a relatively new health profession practiced mainly in hospitals and private clinics after the 1994 civil war. Thus, it was hypothesized that other health care professionals and the Rwandan public are not sufficiently aware of the roles of a physiotherapist. Also, according to the experience of the researcher a few doctors are now referring asthmatic children to physiotherapists for treatment. Although the Rwandan health sector has improved its services in controlling some children diseases such as polio, malnutrition and diarrhea, no programmes have addressed respiratory problems in the population.

The latter should be recognized as a major contributor to disability, handicap, morbidity and mortality.

The hospital and private clinics were used as research settings for the study. The participants were physiotherapists who worked in those hospitals and private clinics; the caregivers were the persons who accompanied the asthmatic children to the physiotherapists and who were caring for the child for the greatest part of the day.

The study found that the majority of the caregivers and physiotherapists realized the importance of chest physiotherapy in asthmatic children. Doctors were the main source of referral for chest physiotherapy. This could be an indication that doctors are realizing the role of the physiotherapist in the management of asthmatic children. Most of the physiotherapists treated the children during the sub-acute phase of the asthmatic attack. The cost of physiotherapy was the greatest barrier for attendance of chest physiotherapy.

6.3 Conclusions

The findings of this study point out that the majority of caregivers who accompanied the asthmatic children stated that chest physiotherapy helped their asthmatic children. They also indicated that they had sufficient knowledge of the use of the prescribed medication and adjuncts used by the physiotherapists. However, according to the physiotherapists, there is still room for improving the caregivers' knowledge pertaining to the use of the nebuliser, the inhaler, and the peak-flow meter. The physiotherapists and caregivers in the study had positive perceptions of CPT in asthmatic children. These were expected, as argued in chapter five. From the trends observed in the results the hypothesis could not be supported. However, given limitations of the study, this conclusion was not proven statistically.

6.4 Limitations of the study

It is important to note the limitations and weaknesses of this study. Firstly, the caregivers who participated in the study were those who brought their asthmatic children for chest physiotherapy in the selected hospitals and private clinics. Most of them tend to live in urban areas in Rwanda. Therefore the result cannot be generalized to all caregivers who have asthmatic children in Rwanda.

Another limitation of this study was the limited or non-existent documented clinical research pertaining to outcomes with chest physiotherapy and the paucity of literature on chest physiotherapy in asthma.

The questionnaire could only obtain subjective responses with many of them depending on the memory of the participants. It only assessed the perception of caregivers and physiotherapists about chest physiotherapy in asthmatic children and not the effectiveness of chest physiotherapy in asthmatic children in a more objective manner.

The possibility of subject bias could not be ruled out, especially among the participating physiotherapists. The “halo effect” could have occurred where people believe in the beneficial effects of an intervention without having objective evidence.

6.5 Recommendations

1. Marketing of chest physiotherapy and its role in the management of asthma, including treatment, education, prevention, health promotion, and rehabilitation of asthma suffers, needs to be promoted.

Physiotherapists should promote and give information about their professions through their departments in the workplace, doctor’s consulting rooms, and also provide continuous professional development courses for doctors and nurses.

2. Education should be given to the parents of asthmatic children on how to use the nebuliser, inhaler, and peak-flow meter. Physiotherapists should visit the families with asthmatic children and make sure that the home programmes are well conducted, as were planned.

3. Both national government and local governments need to support physiotherapy services in their programmes for effectiveness of the asthma management; moreover, the government needs to increase the availability and accessibility of physiotherapy in other provinces because a large number is concentrated in the capital city, Kigali.

4. More research by physiotherapists in this field is recommended. A longitudinal study using a relatively larger sample should be done on the same cohort to determine the effectiveness of chest physiotherapy in asthmatic children in the different stages of attack. There is a serious need for evidence-based research to determine outcomes of chest physiotherapy in the management of asthma. Future research would be beneficial to complete the existing study with a larger sample size in order to increase the power of the study by obtaining more information on the perceptions of caregivers and physiotherapists about the importance of chest physiotherapy. Other medical professionals such as doctors and nurses should be included in future studies.

Perceptions of caregivers and physiotherapists about chest physiotherapy may vary in different parts of the country. More studies in other settings should be carried out to obtain adequate information about the importance of chest physiotherapy in asthmatic children.

REFERENCES

Anderson, H.R., Butland B.K & Strachan D.P. (1994). Trend in the prevalence and severity of childhood asthma. *British Medical Journal*. **308**: 1600-1604.

Bassett, S.F. (2003). The assessment of patient adherence to physiotherapy rehabilitation. *New Zealand Journal of Physiotherapy*.**31**:60-66.

Beard, S. (1999). Asthma management: Clinical pathways, guidelines, and patient education. Health & Administration Development Group.P3. Aspen publishers, United States of America.

Bheekie, A. (1996). *Screening and monitoring of asthmatic patients at community pharmacies*. Master's Thesis. Bellville: University of the Western Cape. (Unpublished).

Bheekie, A. (2001). *Pharmacist Educational Outreach for Improved Primary Care of Asthma in Children*. Doctoral Thesis. Bellville: University of the Western Cape. (Unpublished).

Bradley, D. (1998). Dramatic asthma treatment. *Pharmaceutical Science & Technology Today*. **1**: 289-290.

Brukner, P. & Khan, K. (2001). *Clinical Sports Medicine*, Second Edition: 744-745. Sydney: The McGraw-Hill Companies.

Burkholter, D. & Schiffer, P. (1995). The epidemiology of atopic diseases in Europe. *ACI News* **7**: 113-125.

Calam, R., Gregg, L., Simpson, B., Morris, J., Woodcock, A. & Custovic, A. (2003). Childhood asthma, behavior problems and family functioning. *Journal of Allergy and Clinical Immunology*. **112**: 499-504.

Cambridge International Dictionary of English (2002). London.

Campbell, S.K., Van der Linden, D.W. & Palisano, R.J. (1994). Physical therapy for children. United States of America.

Courtney, R. (1998). Asthma and children: A new approach. *Mothering*. P34-35.

Courtney, R. (2003). Breathing therapies for asthma: Buteyko and Eucapnic breathing training. *Townsend letter for doctors and patients*. P62-65.

De Godoy, D.V. & De Godoy, R.F. (2003). A randomized controlled trial of the effect of psychotherapy on anxiety and depression in chronic obstructive pulmonary disease. *Archives of Physical Medicine and Rehabilitation*. **84**:1154-1157.

De Vos, A.S. (2002). *Research at grass roots: For the Social Sciences and Human Service Professionals*. Pretoria, South Africa: Van Schaik Publishers.

Dolinar, R., Kumar, V., Coutu-Wakulzyk, M. & Rowe, B.H. (2000). Pilot-Study of a home-based asthma health education program. *Patient Education Counseling*. **40**: 93-102.

Donnelly, E. (1994). Parents of children with asthma: An examination of family hardiness, family stressors and family functioning. *Journal of Pediatric Nursing*. **9**: 398-407.

Donohue, J. F. (1996). Asthma: Indication, benefits and pitfalls of Peak Flow monitoring. *Consultant*. **36**: 2589-2595

Finkelstein, J., Fuhlbrigge, A., Lozano, P., Grant, E., Shulruff, R., Arduino, K. & Weiss, K. (2002). Parent-reported environmental exposures and environmental control measures for children with asthma. *Archives of Pediatrics & Adolescent Medicine*. **156**:258-265.

Fitzgerald, J. M., Ernst, P., Boulet, L. & O'Byrne, P. M. (2001) Evidence-Based Asthma Management. London. P263-273.

Goodman, C.C. & Snyder, T.E. (1995). Differential Diagnosis in Physical Therapy. United States of America: W.B. Saunders Company.

Griez, E.J.L. (1999). Panic disorder and the respiratory system. *Biological Psychiatry*. **42**:197-198.



Hajjar, M. (1999). Behavioural interventions as aids for asthmatic patient: a review. **5**:583-588.

Haubrich, W.S. (1997). Medical meaning. A glossary of word origins. American College of Physicians. Philadelphia. United States of America.

Hendriks, E.J.M., Kerssens, J.J., Dekker, J., Nelson, N. R., Oostendorp, R.A. & Van der Zee, J. (2003). One-time physical therapist consultation in primary health care. *Physical Therapy*. **83**:918-932.

Herbert, R.D., Maher, C. & Moseley, A.M. (2001). Effective physiotherapy. *British Medical Journal*. **323**:316.

Klennert, M.D. (2000). Psychosocial stress may predict the early onset of asthma in children. *The Brown University Child and Adolescent Behavior letter*. **16**:1.

Klennert, M.D., Price, M.R., Liu, A.H. & Robinson, J.L. (2003). Morbidity patterns among low-income wheezing infants. *Pediatrics*, **112**: 49-58.

Krishna, S., Boren, S.A. & Balas, E.A. (2000). Evaluation of a Web-based Interactive Multimedia Pediatric Asthma Education Program. *Health Management and informatics and school on Nursing*.

Kurnat, E.L. (1999). The impact of a chronic condition on the families of children with asthma. *Pediatric Nursing* **25**:288.

Laitinen, L.A. & Koskela, K. (1999). Chronic bronchitis and chronic obstructive pulmonary disease: Finnish National Guidelines for prevention and treatment 1998-2007. *Respiratory Medicine*. **93**: 297-332.

Leflein, J.G., Szeffler, S.J., Murphy, C.J., Fitzpatrick, S., Rivera, M.C., Miller, C.J. & Smith, J.A. (2002). Nebulized Budesonide inhalation compared with Cromolyn Sodium nebulizer solution for asthma in young children: Result of a randomized outcomes trial. *Pediatrics*. **109**: 866-873.

Levchuck, C. M., Kosek, J.K. & Droban, M. (2000). *Health Care Systems*

Lin, M., Chen, Y., Burnett, R.T., Villeneuve, P.J. & Krewski, D. (2003). Effect of short-term exposures to gaseous pollution on asthma hospitalization in children. *Journal of Epidemiology & Community Health*, **57**: 50-56.

Luyt, D. & Green, R. (1994). Prevalence of asthma in Southern African children: a review. *Current Allergy and Clinical Immunology* **7**:4-7.

McCarthy, M. J., Herbert, R., Brimacombe, M., Hansen, J., Wong, D. & Zelman, M. (2002). Empowering parents through asthma education. *Pediatric Nursing*, **28**: 465-475.

McEwen, M., Johnson, P. Neatherlin, J., Millard, M. & Lawrence, G. (1998). School-based management of chronic asthma among inner-city African-American schoolchildren in Dallas, Texas. *Journal of School Health*. **68**: 196-202.

McGhee, S. A., Sherbourn, C. & Lara, M. (2004). The financial impact of an acute asthma emergency department visit on low-income families in Los Angeles. *Journal of Allergy and Clinical Immunology*. **113**: 82.

McGinnis, J. & Foege, W. H. (1993). Actual causes of death in the United States. *Journal of the American Medical Association*. P 2207-2212.

McKesson, J.R (2002). Tobacco smoke and children with asthma. *Clinical Reference Systems. Annual*, P 2002: 3257.

Mellinger, A. K., Powell, K. E., Iatridis, T. & Bason, J. (2003). Prevalence and impact of asthma in children, Georgia, 2000. *American Journal of Preventive Medicine*. **24**: 242-248.

Mesters, I., Van Nunen, M., Crebolder, H. & Meertens, R. (1995). Education of parents about paediatric asthma: Effects of a protocol on medical consumption. *Patient Education and Counselling*. **25**:131-136.

Millar, W. & Hill, G. (1998). Childhood asthma. *Health Reports*. **10**: 9-19

Milner, A.D. (1984). *Asthma in childhood*. Edinburgh: Churchill Livingstone P35

Mitchele, J.M. & Lissovoy, G. (1997). A comparison of resource use and cost in direct access versus physician referral episodes of physical therapy. *Physical Therapy*. Washington. **77**: 10

Moore, B., Weiss, K. & Sullivan, S. (1996). Epidemiology and socioeconomic impact of severe asthma. In S. Szefler S.J. *Severe asthma: Pathogenesis and clinical management*. 1-29. New York: Marcel-Dekker.

Moosa, S.E. & Henley, L.D (1997). An evaluation of parental knowledge of childhood asthma in a family practice setting. *South African Medical Journal*. **87**: 42-45

Mulholland, C., Lennon, S. & Graham, R. (1994). Physiotherapy Theory and practice. *British Medical Associations*. **10**: 223-233.

Murphy, S. H. & William, K. (1999). Pediatric asthma, *Lung Biology in Health and Disease* **126**: 215-216.

Neuman, W.L. (2000). *Social Research Methods; Qualitative and Quantitative Approaches*. Boston: Ally and Bacon, A Pearson Education Company, USA. P 58

Osman, L. M. (2002). Psychological factors in asthma control and attack risk: The risk of asthma episodes may depend on a complex relationship between psychological factors and experiences of a recent attack: *Thorax: British Medical Association*. **57**:190-192.

Palmer, E. (2001). Family Caregivers' Experiences with Asthma in School-age Children. *Pediatric Nursing*. **27**:75.

Paolucci, S., Antonucci, C., Grasso, M.G., Morelli, D., Troisi, E., Coiro, P. & Bragoni, M. (2000). Early versus delayed inpatient stroke rehabilitation: A matched comparison conducted in Italy. *Archives of Physical Medicine Rehabilitation*. **81**:695-700.

Pearce, N., Beasley, R., Crane, J., Burgess, C. & Jackson, R. (1995). End of the New Zealand asthma mortality epidemic. *The Lancet*. **345**: 41-43

Perzanowski, M.S., Ng'ang'a L.W., Carter, M.C., Olhiambo, J., Ngari, P., Vaughan, J.W., Chapman, M.D., Malcolm W. K. & Plats-Mills, T.A. (2002). Atopy, asthma and antibodies to *Ascaris* among rural and urban children in Kenya. *Journal of Pediatrics*. **140**:582-8.

Pradel, F.G., Hartzema, A.G. & Bush, J.P. (2001). Asthma self-management: The perspective of children. *Patient Education and Counseling*. **45**:199-209.

Pryor, J. A. & Webber. B. A. (1998). *Physiotherapy for respiratory and cardiac problems*. Second Edition. Toronto: Churchill Livingstone. P 360

Raherison, C., Turnon-de-lara, J.M., Vernejoux, J.M. & Taytard, A. (2000). Practical evaluation of asthma exacerbation: Self-management in children and adolescents. *Respiratory Medicine*. **94**:1047-1052.

Rwandan Ministry of Finance. (2001). *L'enquete integrale sur les conditions de vie des menages*, Rwanda. (Unpublished).

Sawyer, M.G., Spurrier, N., Kennedy, D. & Martin, J. (2001). The Relationship Between the Quality of Life of Children with Asthma and Family Functioning. *Journal of Asthma*. **38**: 279-284.

Shepherd, R. (1995). *Physiotherapy in pediatrics*. Oxford: Butterworth Heinemann. London P 352-355.

Shima, M., Nitta, Y., Ando, M. & Adachi, M. (2002). Effects of air pollution on the prevalence and incidence of asthma in children. *Archives of Environmental Health*. **57**: 529-536.

Smeltzer, S. C & Bare, B.G (2004). *Medical of Surgical Nursing*. Lippincott Williams & Wilkins. P465.

Smith, S.R., Highestein, G.R., Jaffe, D.M., Fisher, E.B. & Strunk, R.C. (2002). Parental impressions of the benefits and barriers of follow-up care after an acute emergency department visit for children with asthma. *Pediatrics*. **110**: 328-336.

Sweeney, K.P., MCMullen, A., Yoos, U.L. & Kitzman, H. (2003). Parent perceptions of their child's asthma : Management and medication use. *Journal of Pediatric Health Care*. **17**: 118-125.

Schwartz, J. (2004). Air pollution and children's health. *Paediatrics*. **3**: 1037-1044.

Tecklin, J.S. (1989). *Pediatric Physical Therapy*. J. B. Lippincott Co, Philadelphia. P 160-164.

Terblanche, E. & Stewart R.I. (1990). The prevalence of exercise-induced bronchoconstriction in Cape Town schoolchildren. *South African Medical Journal*. **78**: 744-747.

Tergerson, J.L. & King, K.A., (2002). Benefits and barriers to physical activity differ between male and female adolescents? *Journal of School Health*, **72**:374-381.

Timonen, K.L., Pekkanen, J., Korppi, M. & Salonen, R. (1995). Prevalence and characteristics of children with chronic respiratory symptoms in Eastern Finland. *Journal of European Respiratory*. **8**: 1155-1160.

Van Niekerk.,C.H Weinberg E.G.,Shore, SC. & Van Schalkwyk DJ. (1979). Prevalence of asthma: a comparative study of urban and rural Xhosa children. *Clinical Allergy*. **9**: 319-324.

Veldhoven, V. & Vermeer, A. (2001). Children with asthma and physical exercise: effects of an exercise programme. *Clinical Rehabilitation*. **15**: 360-370.

Vielhaber, M. M. (1998). Asthma. *The Gale Encyclopedia of Childhood and Adolescence*.

Volovitz,B., Dueñas-Meza, E., Chmielewska-Szewczyk, D.A., Kosa, L., Astafieva, N.G., Villaran, C Pinacho-Daza, C., Laurenzi, M., Jasan, J., Menten, J. & Leff, J.A. (2000). Comparison of Oral Montelukast and Inhaled Cromolyn with Respect to Preference, Satisfaction, and Adherence: A Multicenter, Randomized, Open-Label, Crossover Study in Children with Mild to Moderate Persistent Asthma. *Current Therapeutic Research*. **61**: 490-506.

Warren E. (2000). *Management of asthma*. Update June. P 20-25

Warsburg, P., Schwerin, A.D., Buchholz, H.T. & Petermann, F.(2003). An educational program for parents of asthmatic preschool children: short- and medium-term effects. *Patient Education and Counselling*. **51**:83-91.

Weinberg, E.G. (1994). Problems of childhood asthma in a developing society. *South African Medical Journal*. **12**: 17-27.

Williams, M.T. (1994). Chest Physiotherapy in cystic fibrosis. Why is the most effective form of treatment still unclear? *Chest* **106**: 1872-1882.

www.newcast.mappibiz.com/mpelembe/asthma_report_25.oct.2004.

Zar, H.J., Stickells, D., Toerien, A., Wilson, D., Klein, M.& Bateman, E.D. (2001). Changes in fatal and near-fatal asthma in an urban area of South Africa from 1980-1997. *European Respiratory Journal*. **18**:33-37.

