

**A PROFILE OF BURN INJURIES AMONG CHILDREN AGED 0-12 YEARS
AT THE BLACK LION HOSPITAL, ADDIS ABABA, ETHIOPIA (1996-2001)**

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**A mini-thesis submitted in partial fulfilment of the requirements for
the degree of Magister Scientiae (Physiotherapy) in the Faculty of
Community and Health Sciences, University of the Western cape.**

WESTERN CAPE

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MAY 2003

ABSTRACT

Millions of patients with burns require medical attention each year. Impairments, disabilities and handicap due to burn injuries among children are increasing. One possible reason could be that burn injury prevention were not given as much attention as infectious diseases such as leprosy, and tuberculosis (TB). The purpose of the study was to compile a profile of burn injuries among children aged 0-12 years, who were treated at the Black Lion Hospital (BLH) between 1996 and 2001 in Ethiopia. A retrospective, quantitative study design was chosen. Data was collected from the hospital records of 250 children seen with burn injuries. Clinical data, such as the cause and severity of the burn, and socio-demographic data such as the age of the child and his or her caregivers, their socio-economic status and educational levels, were captured. Descriptive and inferential statistical analyses of the data were carried out between socio-demographic variables and the burn injuries. The Chi-squared statistical test was used to identify associations and differences between selected variables. The major causes of thermal burns were hot liquids (63.4%) and flames (36.6%). The highest prevalence of burn injuries occurred in those children in the care of illiterate caregivers ($p < 0.01$). The highest-risk environment for burn accidents was identified as the kitchen ($p < 0.05$). Most of the burns (64%) occurred in the children below the age of five years old. This finding was not statistically significant but it is of great clinical importance. Health and safety promotion programmes aimed at carers to minimize the risk of childhood disabilities due to burn injuries are recommended. Caregivers and school children have to be taught to use simple fire prevention procedures to avoid thermal burn injuries. Although the results of this study cannot be generalized, it provides a glimpse of the burn status and causes of thermal burn at BLH. However, in order to get more comprehensive information it is important to obtain information from more hospitals in the country through prospective studies.

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KEYWORDS

Burns in Children

Management of burns

Caregivers

Aetiology

Classification

Disability

Epidemiology

Ethiopia

Factors influencing burn injuries

Rehabilitation



DECLARATION

I declare that *A profile of burn injuries among children aged 0-12 years at the Black Lion Hospital Addis Ababa, Ethiopia (1996-2001)*, is my own work and that it has not been submitted before for any degree or examination in any other university, and that all the sources I have used or quoted have been indicated and acknowledged as complete references.

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SIGNED



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WITNESS

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MAY 2003

ACKNOWLEDGEMENTS

Certainly, there is nothing impossible to Almighty God. I thank him for granting me the opportunity to achieve my dream and my aspiration to further my physiotherapy knowledge, and for helping me to overcome all the challenges that confronted me. I would like to express my thanks to my supervisors, Mrs M. Marais and Mrs Jose Frantz for their advice and willingness to give me their competent guidance. Their constant support, encouragement, constructive criticism and easy accessibility inspired me to complete this work. I am most grateful to Dr Kotze and Amin Mohamed for the statistical assistance and advice. Last, but not least I would like to extend my gratitude to my friend Dr Einar Eriksen and his family for supporting my family and my entire study at this University. I thank my wife Aregash, and my daughters Deborah, Kidist and Shalom for their understanding, when I had to focus on my studies. My appreciation goes to the rest of the staff of the Physiotherapy Department at UWC for their support and encouragement. Finally my appreciation goes to the Ministry of Health in Addis Ababa, and to the Administration of Black Lion Hospital, to my research assistant Mr Fekadu and the Physiotherapy Department as well as the Ethiopian Physiotherapy Association for their valuable support for this study.

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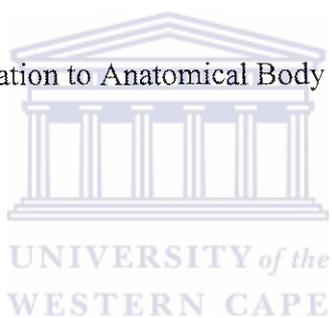
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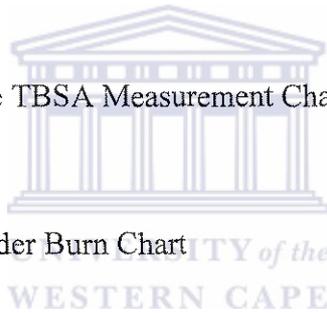
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ABBREVIATIONS

ADL	Activities of Daily Living
AIDS	Acquired Immunity Deficiency Syndrome
ATLS	Advanced Trauma Life Support
BLH	Black Lion Hospital
CSA	Central Statistic Authority
EPTA	Ethiopian Physiotherapy Association
NOP	National Office of Population Studies
TBSA	Total Body Surface Area
WHO	World Health Organization
UN	United Nations



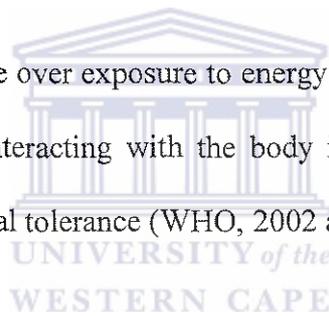
DEFINITION OF TERMS

Burns

Burn or thermal injuries occur when hot liquid (scald burns), hot solids (contact burns) or flames (flame burns) destroy some or all of the different layers of tissue, which form the human skin. Skin injuries due to ultraviolet radiation or radioactivity, electricity and chemicals, as well as respiratory damage resulting from smoke inhalation, are considered as burns (Anderson, Anderson & Glanze, 1998; WHO, 2002a).

Injury

A bodily lesion resulting from acute over exposure to energy (this can be mechanical, thermal, electrical, or chemical) interacting with the body in amounts or rates that exceed the threshold of physiological tolerance (WHO, 2002 a).



Contracture

This is a deformity resulting from inelastic skin, ligaments, capsule and muscles caused when the area of an open wound is decreased concentrically due to active biological processes that usually lead to wound closure (Achaver & Eriksson, 2000; Pugh, 2000).

Child

A “child” is defined as every human being from birth to 18 years of age. (Hodkin & Newell, 1998).

Childhood

This refers to the period of life between infancy and puberty, which ends at the 18th birthday, although this may vary in different regions and according to the policy of the country (Hodkin & Newell, 1998).

Disability

A disability is any restriction in performing an activity within the range considered normal for a human being. It may be temporary or permanent, progressive or regressive (Schuntermann, 1996; WHO, 2001a).

Disfigurement



This is the change of appearance on the skin of the face or body (Pugh, 2000).

Impairment

Impairments are problems in body function or structure as a significant deviation or loss (WHO, 2001a).

Prevalence

This term refers to the number of cases of a disease existing in a given population at a specific period of time or at a particular moment in time (Anderson et al., 1998; Pugh, 2000).

Profile

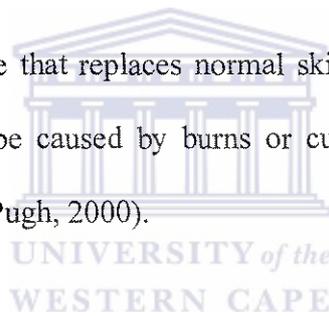
The term is used to describe the characteristics of burn injuries among children.

Rehabilitation

All measures aimed at reducing the impact of a disabling and handicapping condition, and at enabling the disabled and handicapped to attain optimal function and social integration (UN, 1990; Pugh, 2000).

Scar

A scar is an area of fibrous tissue that replaces normal skin after the destruction of some of the dermis. Scars may be caused by burns or cuts, or less commonly by disease. (Beers & Berkow, 1999; Pugh, 2000).



Caregiver

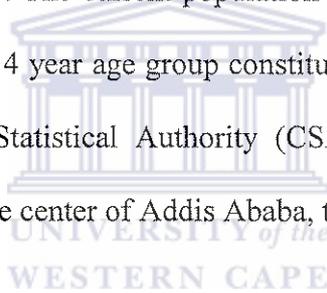
In this study a caregiver is any person living with a burn injury child responsible for both physical and financial support.

CHAPTER ONE

1.1 Introduction

In this chapter a brief profile of Ethiopia and background of the study will be discussed. It will also examine the patterns of burn injuries among children globally. The motivation for the study, its significance, aim and objectives of the study will also be highlighted. This chapter ends with a brief description of the remaining chapters in this mini-thesis.

The federal democratic republic of Ethiopia is a land locked country in Eastern Africa. The population increased from 11.7 million at the beginning of the 20th century to 60.6 million in 1999. The current population of Addis Ababa is estimated at 2.7 million, of which the 0-14 year age group constitutes 669, 813 (25%) of Addis Ababa's population (Central Statistical Authority (CSA), 1999). The Black Lion Hospital (BLH) is situated in the center of Addis Ababa, the capital city of Ethiopia.



1.2 Background to the Study

Burns remain a major health problem throughout the world and each year millions of burn injury patients require medical attention (Linares & Linares, 1990; Manson, 1992; Mahaluxmivala, Borkar, Marthur, and Fadaak, 1997). According to Museru (1999), there is an indication that burn injuries, both accidental and intentional, are on the increase in Africa. Children in the 0-4 age group are often affected by burn injuries. This could be because children are active and curious and they are unaware of the dangers of fire, stoves and boiling water (Hummel, 1982; Museru, 1999; Taylor, 2001).

The majority of deaths resulting from fire-related burn injuries occur in developing countries. According to the Murry & Lopez Report (1994), of the 50 million deaths generally occurring worldwide each year, 39 million occur in developing countries. Of these, 13 million are children, aged 0-4 years, who die from communicable diseases in developing countries. According to the World Health Organization (WHO) report (2003) fire-related burns are responsible for nearly 300,000 deaths annually. Globally, it ranks ninth among the leading causes of disability and injury in children aged 5-14 years. In Addis Ababa alone, 234 incidents of burn injuries involving children, as a result of domestic fire accidents, were reported in 1993. A personal communication with the Head of the Fire Brigade Records Department, (June 25, 2002), indicated that the total damage caused by fire to property in Addis Ababa alone was estimated at 13 million Ethiopian Birr¹.

Children with burn injuries are found in all parts of the world and at all levels of society. The epidemiology of burn injuries, the place of the accident, and the age of the victims may differ between various countries and various cultures (Hanson, 1984; Manson, 1992). A possible explanation for these variations involves several factors such as traditional beliefs and lack of parental supervision. However, the main factors that play a role in the reduction of burn injuries are measures taken by the governments of certain developed countries to improve the safety of the labourers in the factories and caregivers in the home environment.

¹ Birr= Ethiopian Currency

1US\$ =8.55 Birr

Remarkable differences in burn injury outcomes were observed between high income and low or middle-income countries (Judkins & Pike, 1998). These differences are probably related to the differences in available resources, such as trained staff in the management of burns, modern medical facilities and funds from health departments of developing countries to provide adequate burn care in cases of severe burn injuries. Lack of these resources may contribute to disability in children with burns (WHO, 2002a). However, there are no published researches accessible on mortality rates of burn victims in Ethiopia to compare with developed countries.

The United Kingdom shows a decline in mortality from burn injuries from 2000 per year to around 700 per year since 1998. Legislation and social changes account for much of this decrease in burn injuries, and can be related to the improvement of safety regulation with respect to old buildings, coal mining, fireguards, sleepwear, improved flame-proofing materials and publicity about smoke detectors (Judkins & Pike, 1998).

In comparison to infectious diseases, such as tuberculosis (TB) and leprosy, burn injuries are a relatively rare occurrence and are known to have yearly fluctuations (McLaughlin, 1995). The reasons for fluctuations in the numbers of reported burn injuries, were that burn injuries were categorised as unintentional injuries among children, and their occurrences are dependent on several factors, such as environmental, biological and social activities. Burn injuries often occur in those individuals who have underdeveloped or impaired ability to avoid danger, such as children, and alcohol and drug abusers (Edwards, 1995). Burn injuries, particularly among children and women, occur within the domestic environment.

In some parts of Ethiopia, young children are commonly affected by the absence of parents due to their migration to the city, poverty, drought, unemployment and wars. Ethiopia was at war for thirty years with Eritrea, which resulted in people being forced to leave their homes and villages. These migrations resulted in decreased parental supervision of children and the breaking up of the extended families (Desalegn, 2001).

Sustaining a burn injury impacts not only on the individual who has sustained the burn, but also on the family and the community. For effective prevention of burn injuries and management of burn injuries a holistic approach is essential (Hunt & Purdue, 2002). This would require a multi-disciplinary team to address the effects of a burn injury. The biomedical model of treatment should be replaced with holistic approaches that take into consideration the child, the family and, the environment. As physiotherapists, our approach to the management of burn injuries would thus be holistic. Thus, community development in health is located in a theoretical framework in which people and their health are seen within the context of their social interaction with their environments (Gray, 1993).

1.3 Theoretical Framework

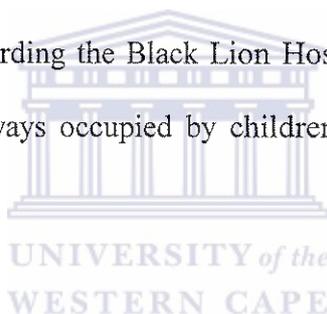
This study was conducted within the biopsychosocial model of health care, which addresses all three dimensions of health. This approach is described as the assumption that the health of individuals is influenced by their interaction with their environments, which includes biological mechanisms, psychological and social factors (WHO, 2001b). The biopsychosocial approach is the opposite of the narrow focus of the biomedical approach, which deals with the causes of diseases and its medical and therapeutic aspect (Gilbert, 2002). Therefore, the biopsychosocial approach is used to provide a coherent view of different perspectives of health from biological, individual and social perspectives.

Burn injuries can cause disfigurement and contractures that lead to disabilities, depending on the location of injuries on the body (Hummel, 1982; Derstine & Hargrove, 2001; Herndon, 2002). An understanding of the concepts of impairment, disability and function in children, due to burn injuries, is of fundamental importance for health and rehabilitation workers. According to a study carried out in Addis Ababa by the CSA (1999), the number and the degree of disabilities are increasing among young children in Addis Ababa. The survey identified a total of 5,294 children with disabilities. The role of a physiotherapist includes health promotion; rehabilitation and the prevention of disabilities resulting from unintentional injuries such as burn injuries.

Therefore the overall aim of this study is to compile a profile of children who have sustained burns injuries who were treated at the BLH from the period of 1 January 1996 to 31 December 2001.

1.4 Statement of the Problem

Although domestic accidents, such as burn injuries, contribute to morbidity and mortality in communities all over the world, there are indications that burn injuries remain a low priority compared to other health care priorities such as infectious diseases, malaria and tuberculosis (Mwaura, 1994). However, burn injuries among children are said to be a continuously increasing public health problem. Data on burn injuries from developing countries is, for the most part, unavailable (Linares & Linares, 1990). In Ethiopia, burns were first reported as a public health problem in 1973, yet to date there are no standard government policies for the prevention of burn injuries among children in the country (Desalegn, 2001). According to the Surgical Society of Ethiopia Report regarding the Black Lion Hospital about a quarter of the beds in the surgical unit is always occupied by children with burn injuries (Einar, 1999)



Therefore, the following problems have been identified. Firstly, information on the number of burn injuries among children in Ethiopia is limited; secondly, the incidence of burn injuries and the number of disabled children due to burn complications is expected to continually increase because young children are unaware of the dangers of burns.

1.5 Motivation for the Study

My interest in burn injuries among children arose from my own experiences as a physiotherapist working in more than one country (Ethiopia and Botswana) over a period of more than 7 years. Burns often result in severe deformity, disability and even long-term adverse psychological reactions in the affected children and their parents (Archibong, Antia & Udosen, 1997). As stated previously, burn injury management become lower priority because of a lack of awareness about the magnitude of burn injuries and their effect on hospital budgets. There are many factors contributing to the reduction of budgets towards health care, especially in developing countries. For instance, frequent droughts and the Acquired Immunity Deficiency Syndrome (AIDS) pandemic are the major causes for the decline of hospital and health care budgets in African countries. Ethiopia is a country where the health services, such as community based rehabilitation and physiotherapy services, were reduced due to the 30-year civil war with Eritrea.

A physiotherapist is one of the important and active members of the burn management and rehabilitation team (DigreGorio, 1984). The problem of burn injuries affects children, irrespective of gender, race, and ethnicity. Identification of the causal factors of burns injuries and the implementation of the biopsychosocial approach towards the management of burn injuries in an Ethiopian setting will facilitate comprehensive rehabilitation and generate momentum for further studies on burn related issues in the country.

1.6 Significance and Rationale of the Study

In Africa the management and preventative measures for burn injuries are not as well developed as control measures for dealing with communicable diseases (Barradas, 1995). This could be due to the lack of epidemiological studies dealing with causes of burn injuries. There is a need for comprehensive preventive and rehabilitation services in order to enhance the quality of life and service delivery for these patients and their families in their communities.

The prevention of burn injuries and their resulting complications, by the physiotherapist and paramedics will help in minimizing the level of disability and promote quality of life for children, as well as reducing the burden of hospital expenses on the family and the hospital budget. As children are more commonly affected, the information obtained from this study will assist in developing future preventative, promotive and rehabilitative programmes for children who have sustained burn injuries.

1.7 Aim of the Study

The aim of the study was to compile a profile of burn injuries and their contributing factors, among children aged 0-12 years at the BLH in Addis Ababa, Ethiopia.

1.8 Objectives of the Study

The main objective was to identify the causal agents contributing to burn injuries in children treated at the BLH between January 1996 to December 2001. The severity of

burn injuries with reference to depth, total body surface area (TBSA) and the most affected body region of children at BLH was also determined. In addition, associations between burn accidents in children and socio-demographic factors such as age, gender, living environment and the caregivers' level of education were identified.

1.9 Outline of Remainder of Thesis

Chapter 2 consists of a literature review, which will discuss the prevalence of burn injuries in developing and developed countries, the factors that influence burn injuries and the management of burns. Chapter 3 sets out the methodology, including the research setting, the research design, data collection, and data analysis. Chapter 4 presents the results of data from this study. In Chapter 5, the results will be discussed in relation to the objectives of the study. Finally, the conclusions and recommendations will be discussed in Chapter 6.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter explores some studies on burn injuries and attempted to review the prevalence and the incidence of burn injuries among the children in developed and developing countries. In addition to the prevalence of burn injuries the factors that contribute to burn injuries and the classification of burn injuries have been described. Management and impact of burn injuries were also highlighted. The chapter ends with the summary of the literature.

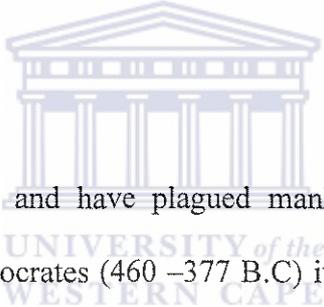
There has been wide and diverse research carried out in burn injury related topics. However, there was limited published literature within the Ethiopian context concerning burn injuries among children. This lead to the investigator's use of international literature that could be related to the Ethiopian situation, for comparative reasons. Therefore, more emphasis was placed on the literature of burn injuries in children found specifically within developing countries.

Human skin acts both as a barrier to disease and to climate change for the rest of the body (Porr & Rainville, 1999), and any breaks on or damage to the skin due to burn injuries can lead to serious health problems. The destruction of human skin can be caused by burn injuries from fire, hot liquids, hot solid material and electricity (Latarjet & France, 1995; WHO, 2002a). The amount of tissue destroyed depends on both local and systemic reactions to the heat damage. The stronger the intensity of the heat the more the destruction of the skin tissue. However, both epidermal and dermal

components of the skin vary in thickness and in composition over different parts of the body such as the palm of the hand (Fisher & Helm, 1984).

According to Tempereau, (1999) burn injuries, which have reached epidemic proportions in recent years, are considered a health care problem, which is considered to be more serious than when the polio epidemic was at its peak. It has only been in the past few years that the medical profession has begun to recognize and understand the problems associated with burns. Burns have many different meanings, and fears are attached to them. They are potentially dangerous and can quickly lead to serious injuries, loss of life and material possessions.

2.2 Culture and Burns



Burn injuries occur universally and have plagued mankind from antiquity to the present day. In the time of Hippocrates (460 –377 B.C) it was believed that diseases that were not cured by medicine were cured by iron. Those that were not cured by iron were cured by fire. Those that were not cured by fire were considered as incurable (Sowemimo, 1982). Fire is still used as a means of ritual in some societies at the present time. An example of this is among a certain religious sector in the Indian community in Malaysia where there is a practice of presenting their requests before their gods where the devotees place camphor on their palms and set it on fire at the end of the fasting period. As a result they will develop second and third degree burns on the palms (Tay & Tan, 1996). In Ethiopia, in some traditions, such as the Gedio and Oromo tribes in the southern part of the country, fire is used as the measure of manhood for the boys. The boys put a small piece of hot metal, mostly the size of a coin, on the top of the forearm, close to the wrist joint. They resist the pain until the

heat reduces after being absorbed by the body through the skin; these results in second and third degree thermal burn injuries on the forearm.

2.3 Cost of Burn Injuries

The cost of burn injuries is both visible and invisible. The visible cost of burn injuries would be the loss of body parts, such as fingers, legs and upper limbs, scarring, deformity, loss of hair, change in body pigmentation and the alterations in the skin texture and loss of sensation. The invisible cost of burn injuries are the physical and emotional pain and the associated financial burden. The physical discomfort may be itching of the wound and intolerance to ultraviolet rays. The cost of treatment for burn injuries becomes a burden for ordinary people in Ethiopia. For example, a report by McLoughlin & Mcguire, (1990) indicates that in the U.S.A, burn treatment costs the government \$3.5 billion (U.S.) per annum, whereas a report by Courtright, Haile, & Kohis, (1993), states that in Ethiopia the in-patient cost of burns treatment is estimated at approximately 25 Ethiopian Birr (US \$12.07) per day in 1993.

This cost is in contrast to the U.S.A, where the burns treatment costs \$1000 per day per patient (Warden, 1987), or to Kenya where the government spends \$5 per day per patient (Haq, 1990). It is my opinion that the reason for the differences in the cost of treatment per patient per day is due to the different standards of health care and socio-economic development between developed and developing countries. Thus, the standard of treatment is relatively higher, and therefore more expensive, in developed countries.

2.4 Age of Burn Victim

Despite the remarkable progress that has been made in medicine, serious burn injuries are still the most severe and devastating injury that can be inflicted upon an individual. Thus, burns rank among the most severe types of injuries suffered by the human body and are associated with high mortality and morbidity rates (Sowemimo, 1982). For patients between the age of 0-4 years and elderly patients, burn injuries are more life threatening than in the other age categories (Van Rijn, Bouter, & Meertens, 1989). The reason for this is that in the elderly, wounds take longer to heal due to the physiological changes associated with ageing that have taken place in the body.

In young children, the small body surface area loses a considerable amount of body fluid immediately after the burn injuries, which thus cause dehydration. According to Onuba & Udoidiok, (1987) there are numerous reports of patients with burn injuries in hospital-based settings in developing countries. However, there are minimal published population-based surveys on the prevalence of burns in developing countries (Courtright et al., 1993).

2.5 Burn Injuries Worldwide.

Burn injuries are a major health problem in many developed and developing countries (Bang & Mosbah, 1988; Mahaluxmivala et al., 1997). However, statistics suggests that the epidemic of burns all over the world is increasing (Haq, 1990). In the United States, over 2 million burn accidents are recorded on an annual basis of which 2 million (40%), involves children, (Porr & Rainville, 1999). According to Safe Kids UK, (2001) children aged 0-4 are at more than four times the risk of sustaining burn injuries than those children aged 5-14.

It is also stated that an average of 12 children, aged 14 and under, died of burn injuries each year. This indicates that there is a clear increase in the number of injuries and the number of deaths among the children in the United States each year. In the United Kingdom, a report by Safe Kids, (2001) argued that burns are the third most common type of injury sustained in the home.

A report by Rylah, (1992) shows that in the United Kingdom approximately one-third of burn unit admissions are children under the age of 15 years, and one-third of all burn deaths involve children. The report further states that babies and toddlers were affected more frequently than children over 5 years. During 1999 over 54,000 children, aged 16 and under, attended emergency departments as a result of burn injuries. Of these, 67% were children under 5 years of age.

Approximately 100,000 die and 600,000 people are burned seriously enough to require admission and treatment in India each year (Keswani, 1996). According to Davies, (1990) in a retrospective study conducted in India during 1989 and 1990, 30% of the patients with burn injuries reviewed were aged 5 years or less and 25% were aged 6-20 years. Prospective studies conducted in 32 hospitals in France by Mercier & Blond (1996), showed that of the patients admitted with burn injuries over a 12-month period, 62% were boys and the mean age was 3½ years. In another study conducted in Brazil by Rossi, Braga, Barruffini & Carvalho, (1998) from March 1996 to March 1997 among the 26 patients aged 12 years and under, it was found that 15% of the injured children were under 3 years of age and had suffered a scald burn. Boiling water was the most common agent followed by hot tea and coffee. This was particularly true of the 0-2 years age group. Flame burn accounted for 25% and the

most frequent burning agent was petrol (gasoline) however, there were no injuries from fire works.

2.6 Demography of Burn Injuries in Africa

Burns in children are increasingly recognized as an important cause of morbidity and mortality in developing countries (Chopra, Kettle, Wilkinson & Stirling, 1997). A search of the literature reveals very few publications on burns in Africa (Sowemimo, 1993). Various authors (Sowemimo, 1982 ;Iregbulem & Nnabuko, 1993) argued that Nigerian children aged 1-2 years and below the age of 15 years were mostly at risk of sustaining thermal injuries and 71% of the incidents occurred in the home. De Kock, (1978) observed from 1873 cases of burns at the Tygerberg hospital in the Western Cape, that burns were found to be predominantly associated with males, who outnumbered females in the ratio of 2:1. In South Africa, the Child Accident Prevention Center found that 3% of paediatric deaths were due to burns (Chopra et al., 1997; Godwin & Wood, 1998).

In a study conducted in Maputo, Mozambique during the years 1988-1991 (Barradas, 1995) found that children under 10 years of age were the most affected. They represented 70% of all burn injuries admitted, and of this proportion 80% of the children were less than 5 years of age. Among these two and three years olds constituted 51% which was more than half of the patients.

El-Badawy & Mabrouk, (1998) argued that of 759 burn patients reviewed in his study, 305 were children below 15 years of age. Proportionately more males than females were injured. In a retrospective study conducted by Haq, (1990) in Kenya it was

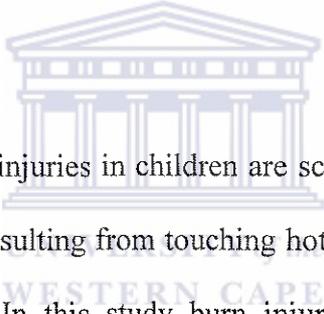
found that 73 children, 46 males and 27 females had sustained burn injuries. The youngest child was 18 months, and the mean age of the patients was 12.2 years. The male to female ratio was 1:1.2. It is believed that accidental burn injuries rank the highest of all burn injuries among the young children. A retrospective study carried out in Ethiopia (Daniel & Yoo, 1990; Courtright et al., 1993) observed that most burn injuries are related to household accidents. These contrasts in to the finding in Canada where most burns among children happened in recreational activities and due to the unsafe practice of disposing of flammable liquid (Ryan, Shankowsky & Tredget, 1992).

The potential factors for increasing the risk of burn injuries in Ethiopia were age, gender, and socioeconomic status. Naphtha lanterns, which are home made lights used at night, are a frequent cause of burns. Furthermore, poorly designed houses, as well as underlying disease conditions such as epilepsy, were considered risks. Similar studies conducted in Ethiopia by Wolde, (1973) and in India by Keswani, (1978) suggested that most of the cases, particularly those with open fire-burn, came from a low-income group, suggesting a causal relationship between burn and socio-economic status. In the rural parts of the Ethiopia there are usually no separate rooms for the kitchen, and cooking is carried out in the living quarters with no place for small children to play. Thus unattended children were susceptible to sustaining burn injuries.

2.7 Classifications of Burns.

The definition and the classification of burn injuries vary according to different authors and schools of thought. According to Latha & Babu, (2000) burn injuries may be classified etiologically as thermal, electrical or chemical in origin. Chemical and electrical burns accounted for about 5% and the fourth category radiation and sunburn are extremely rare burn injuries (Pruitt, Goodwin & Mason, 2002). In this study burns will be classified according to the etiology of burn, the measurement of body surface area, and the depth of the burn.

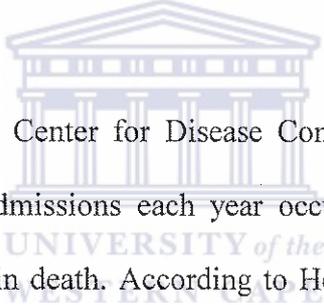
2.7.1 Causes of Burns



The common etiologies of burn injuries in children are scalds, caused by hot liquids; flame burns and contact burns resulting from touching hot objects (Forjuoh, Guyer & Smith, 1995; Herndon, 2002). In this study burn injuries caused by hot liquids, flame/fire, stoves and charcoal are grouped under thermal burn injuries. The most frequent type of thermal burn injuries among young children are scalds and flame burns. However, there has been an increase in the incidences of sunburn, because of the growing popularity of sun bathing in the western world. Severe sunburn, which is often only first and second-degree burn, is comparable to a superficial burn injury (Van Rijn et al., 1989). Flash burns or infrared radiation burn are rarely discussed in the literature, probably because of their low incidence. Flash burns occur during explosions of natural gas, propane, gasoline, and other flammable liquids, which cause intense heat for a very brief time. Clothing is a protective mechanism in most

cases unless it ignites. Flash burn are dermal in depth, being superficial or deep in proportion to the amount and kind of fuel that explodes (Hunt & Purdue, 2002).

A burn caused by electrical shock results from touching live electrical wire. The electrical current usually enters the body through the upper limbs and exits through the feet. This is because human beings use their hands for daily activities and the chances of the hands and fingers coming into contact with a live electric wire are higher than for the other parts of the body. Furthermore, young children are prone to electrical accidents at home because they are not aware of the dangers of the electricity. Due to their inquisitive nature they tend to pull on leads and put their fingers in plug socket outlets.



According to a report from the Center for Disease Control and Prevention in the U.S.A., about 52,000 trauma admissions each year occur as a result of electrical injuries, and nearly 1000 result in death. According to Herndon, (2002) one third of electrical injuries occur in the home. Chemical burns are also encountered in young children, such as toddlers who drink or spill household chemicals. The heat and corrosive nature of the chemical reaction causes the initial tissue damage (Hummel, 1982; Derstine & Hargrove, 2001). According to Herndon, (2002) in 1988 in the United States there were 236,200 patients with chemical injuries of all types treated in emergency rooms. Of those, 6,500 or 5% were children younger than 5 years with chemical burns.

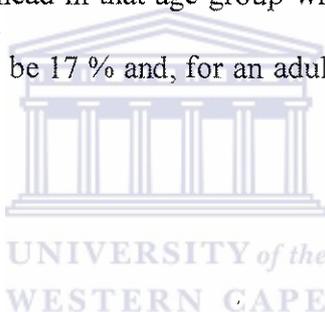
2.7.2 Estimation of the Total Body Surface Area (TBSA) of Burn Injuries

The precise assessment of the total body surface area (TBSA) of the burn injury is fundamental for the appropriate replenishment of the fluid balance. However, there is still a great controversy on the standard methods of surface area measurements and measurements of depth of the burn injuries. Although there is a controversy about the standard of internationally accepted methods, there are several methods that may be used to measure the size of burn area in the body. In the United Kingdom, the whole hand represents 1% of the TBSA of body. In the United States of America the Advanced Trauma Life Support (ATLS) use the palm area alone as equated to 1% of TBSA (Berry, Evison & Roberts, 2001).



In Ethiopia, the standard method used to measure at the BLH was the “rule of nine” for an adult. The more widely used methods of assessing the extent of burn injuries in adult patients is measured by means of the rule of nine. This method of measurement is a simple and rapid but relatively inaccurate method of determining the size of burn injuries (Appendix E). In this method of measurement, the body is represented by nines, or multiples of nines, and the perineum makes up the final 1 %. For instance the entire head and neck covers 9 % of the total body surface area (TBSA), the posterior surface of the trunk covers 18% and the posterior surface of each leg is equal to 9 % each of the (TBSA) in adults.

However, the above methods of measurements for burn size are not suitable for children below 15 years of age, because of the different relative proportions of the head, trunk and extremities to those of fully-grown individuals (Salisbury, Newman & Dingeldein, 1983; Van Rijn et al., 1989; Rylah, 1992; Herndon, 2002). A more suitable and accurate assessment of the area involved in the burn injury in the adult and child can therefore be obtained by employing the Lund-Browder Chart of burned body surface assessment. (see Appendix F). The Lund-Browder chart basically gives an estimation for each age group, depending on the part of the body affected. For example, if the head of a child below one year of age has suffered burn injuries, the total surface area for the child's head in that age group will be 19%, whereas for the age group between 1-4 years will be 17 % and, for an adult, will be 7% of total body surface area.

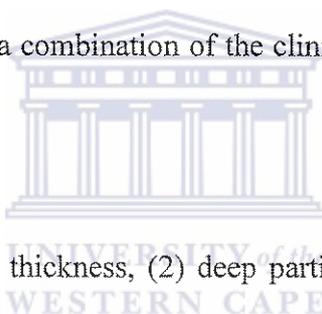


2.7.3 Depth of Burn Injury

The measurement of burn depth is not an exact science but there is some agreement about the criteria used for the clinical assessment of burn depth. However, the complexity of the dynamic changes that occur to the cellular and parenchymal elements of the skin after burning, has led to the failure to produce an agreed technique for the histological measurement of burn depth. Determination of burn depth is further complicated by the dynamic changes in depth that were observed during the acute post-burn period (Watts, Tyler, Perry, Roberts & McGrouther, 2001). In the early nineteenth century, Dupuytren reviewed the care of 50 burn patients, treated with occlusive dressings, and developed a classification of burn depth that is still used today (Herndon, 2002). The diagnosis of the depth of burn is difficult

(Leveridge, 1991). For the diagnosis of burn depth, the surgeon depends on a combination of (1) the nature and circumstances of the burn, and, (2) the appearance and texture of the skin. He or she makes use of the pinprick test by pricking the skin to determine the level of sensation.

Various techniques such as biopsy, vital dyes, infrared pictures and ultrasounds have been used for determining the depth of burns. These are all techniques used in research for estimating burn depth. The depth of burns can be classified according to the degree of burns. Clinically, burn depth measurement is important as it determines the appropriate treatment (Spurr & Shakespeare, 1990). The currently accepted categories of cutaneous burn injuries, found in many surgical texts, describe three levels of burn injuries based on a combination of the clinical estimation of depth and outcome of the wound.



These are (1) superficial partial thickness, (2) deep partial thickness (deep dermal), and (3) full thickness burn (Panke & McLeod, 1985; Watts et al., 2001). A superficial burn affects the epidermis, and is a minor injury that leaves the underlying tissue red and painful. This corresponds to the first-degree burn. Deep partial thickness burns (second degree burn) destroy the epidermis and dermal layer but it leaves sweat glands and hair follicles intact. Moist and blistered, these burns are not sensitive to pinprick, but perception of deep pressure is still intact (Derstine & Hargrove, 2001; Herndon, 2002).

Full-thickness burns (third degree burn) occur when the entire skin layers are destroyed. As a result of nerve ending destruction, the victims experience little or no pain. Deep injuries that involve muscle and bone destruction are sometimes referred

to as fourth-degree burns. Electrical injuries often result in fourth-degree injuries (Derstine & Hargrove, 2001). In children, at the surface of the burn injuries, a superficial or deep layer of the skin is actually destroyed by the heat. The deeper layer of the skin and the subcutaneous tissue are severely affected by the heat, because the resistance to heat of the epidermal layer in children is less than that of the adult skin (Muir, Barclay & Settle, 1987).

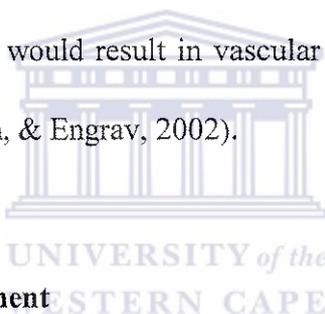
2.8 Pathophysiology of Burn

The body's initial response to burn injury is capillary vasoconstriction and, soon thereafter, vasodilatation occurs. Capillary walls become permeable and plasma leaks into the injured site (Derstine & Hargrove, 2001). Under normal physiological conditions the pressure in the arterioles, capillaries and venules causes a filtration of fluid into the interstitial spaces of all tissues. An immediate and rapid increase in the water content because of burned tissue is seen in the first hour after the burn injuries (Herndon, 2002).

Rylah, (1992) argues that both local and systemic alterations to physiology occur after a thermal injury. Major burns cause numerous pathophysiological changes in the body, and affect the function of almost every organ in the body. The most immediately life-threatening response to burn injury is the syndrome of burn shock (Fisher & Helm, 1984; Derstine & Hargrove, 2001). Thus the greater the injury, the more severe are the functional alterations in the body system, such as regulation of body temperature and blood pressure. Hypovolaemic shock would soon occur if the intervascular volume were not filled with a proper amount of intravenous fluid, such as Ringer's Lactate and a 0.9% solution of sodium chloride (normal saline) (Rylah,

1992). When the fluid is lost into subcutaneous tissue it causes oedematous swelling, which will prevent the flow of circulating blood.

In electrical burn injuries, the effects on the tissue vary from minimal skin wounds to tissue vaporization. Electrical damage to a large artery represents a grave prognostic sign for limb survival. When the integrity of the cell membrane is lost, the impedance to the electrical current is decreased markedly, leading to a simultaneous increase of the area exposed to current flow. The traditional pathophysiological understanding of electric injury was based on the assumption that the passage of electrical current produces heat and triggers tissue damage. As osseous tissue shows the highest electrical resistance, it will generate the most heat. It was also found that lesions produced by the electric current would result in vascular occlusions and progressive tissue necrosis (Heimbach, Mann, & Engrav, 2002).



2.9 Burn injury and Treatment

In the sixth century BC, the Chinese used tinctures and extracts from tealeaves to treat burns. Nearly 200 years later, Hippocrates, the father of medicine, described the use of rendered pig fat and resin for burn injuries that were impregnated in bulky dressings (Boswick, 1987; Derstine & Hargrove, 2001; Herndon, 2002). Through time, every conceivable substance has been used as treatment of the burn wound itself, in the form of sprays, ointments and solutions on dressings or powders.

It is interesting to note that one of the major changes in the use of a particular therapy involves a change in the concentration or strength of the material. For instance, at one

time 10% of silver nitrate was a commonly used agent as a treatment for burn injuries; however, today it is known to cause the death of cell tissue (Jacoby, 1972). A burn is not just a superficial and localized injury affecting only the skin; it may affect the entire system of the body. The treatment of burns, whether serious or mild, has always constituted a problem. Burn injuries require specialist treatment by a team of medical and nursing personnel possessing specialized skills and knowledge.

Most major advances in burn care occurred within the last five decades, beginning from between 1942 and 1952 (Herndon, 2002). Recently, burn survival care for children has improved to such a degree that more than 95% of burn injury cases have a 50% recovery rate. The management of a burn wound is interrelated with other patient care protocols. Close collaboration by all members of the multi-disciplinary burn care team, such as physiotherapists, occupational therapists, dietitians, nurses, clinical psychologists and chest therapists, is essential (Salisbury et al., 1983; Fisher & Helm, 1984; DigreGorio, 1984; Duncan & Driscoll, 1991; Rylah, 1992; Derstine & Hargrove, 2001). Current burn care involves the use of a tropical antibacterial agent, skin substitution, early excision of necrotic tissue and grafting. A skin graft is a portion of skin, composed of dermis and epidermis, which is removed from one anatomical site and placed onto a wound elsewhere on the body (Thomas, 1990). These treatments allow the wound to heal, or close early, as in the case of deep partial and full thickness injuries. These procedures have greatly decreased the mortality and morbidity rates of patients who have sustained burn injuries (Patterson, Everett, Bombardier, Questad, Lee & Marvin, 1993). Burn injuries to the face, neck, hands and perineum are relatively serious because skin shrinkage often occurs during the healing process. This may lead to contracture of the skin and disfigurement.

Myofibroblasts, which are bundles of contractile elements, cause contracture in the affected joint and the surrounding soft tissue (Kozerefski, 1984; Martyn, 1990).

The goal of the physiotherapist in the management of burn injuries is twofold. Firstly, the physiotherapist is to assist the patient in regaining his or her pre-burn range of motion, and integration into the family and community. The rehabilitation phase begins when the burn wound is decreased to less than 20% of the total body surface area, and it continues until the patient reaches his or her maximum level of physical and emotional independence (Salisbury et al., 1983; Serghiou, Evans, Ott, Calhoun, Morgan & Hannon, 2002). The physiotherapist's role during the rehabilitation phase is to work with the patient to plan and implement a treatment programme, which will assist the child to regain muscle strength, range of motion, and function.

The success of the patient's rehabilitation does not only depend on the correct programme planning and the diligence of the physiotherapist during and after hospitalization, but also on the patients themselves. In the case of children, the family's willingness and determination also play a crucial role in treatment programmes in the hospital and at home. Therefore, the more the therapist can motivate a child to strive for functional independence, the more successful the rehabilitation will be (Feller & Grabb, 1979; Salisbury et al., 1983; Fisher & Helm, 1984; Derstine & Hargrove, 2001; Herndon, 2002).

An aggressive programme for preventing joint and skin contractures is continued from the beginning of admission into the rehabilitative stage. However, complete prevention is at times impossible, although minimizing contractures and deformity is an essential part of the treatment. The major methods that are employed by the

therapist (physiotherapist /occupational therapist) to achieve these goals are the activities of daily living (ADL) such as feeding, brushing teeth and washing his or her body or clothes. Activities of daily living (ADL), regular exercise and splinting are important for maintaining a range of motion. The patient can either do the activity and exercise programme alone, or with the aid of the therapist or a family member who has been instructed by the physiotherapist. Passive movements and stretching is often needed to maintain and increase the range of motion whereby the joint is taken to the maximum available range, then gently stretched and held for one to two minutes (Martyn, 1990). Therapeutic play activities form an important part of the child's treatment.

Following grafting over joint surfaces, exercise is discontinued for approximately five days to facilitate grafting success. As healing progresses, gentle, active motion is encouraged and the employment of an actively-assisted range of motion is utilised to decrease skin contractures (Feller & Grabb, 1979; Rylah, 1992; Derstine & Hargrove, 2001). Prolonged bed-rest should be avoided to prevent contractures of the joints and soft tissue. Exercise can be used to improve the blood circulation and to prevent muscular atrophy. This is a particular area where a physiotherapist will be directly involved with burn management. As physiotherapists, our approach to the management of burn injuries would be holistic. The bio-psychosocial approach, which includes the families and the environments, will be essential to achieve the maximum outcome of the treatment.

Nutritionists or dietitians monitor daily caloric intake and weight maintenance, and recommend dietary intervention to provide optimal nutritional support to combat the hyper-metabolic response to burn injuries. Caloric intake, as well as intake of

appropriate vitamins, minerals and trace elements, must be managed to promote wound healing and facilitate recovery (Derstine & Hargrove, 2001; Herndon, 2002). Anaesthesiologists, who are experts in the altered physiological parameters of the burned patient, are critical for the survival of the patient.

Anaesthesiologists play a significant role in facilitating comfort and healing for burned patients. Inhalation injury and prolonged bed-rest lead to fluid shifts, and the threat of pneumonia associated with burn injury. These patients require respiratory therapy usually performed by physiotherapists. All patients admitted with burns should be given daily chest physiotherapy as even those with no apparent respiratory injuries or underlying chest condition can develop chest symptoms due to chest wall burns, aggravated by bed-rest (Leveridge, 1991). Burn injuries that occupy less than 15 % of the surface area of the body, (10 % in children), can usually be treated with oral fluids. Accurate total body surface area (TBSA) estimation is mandatory. Two vitally important factors for the treatment of hypovolaemic shock due to burn injuries are sodium and water. If one of these is not given; the child is likely to die (Herndon, 2002).

The most frequently used formulae for fluid replacement are those of Evans and Parkland. The Evans formula is calculated as follows: if the child's burned surface area (BSA) is greater than 50 % of the total body surface area (TBSA), he or she will be given the following fluid replacement in the first 24 hours: 50 % of Ringer lactate calculated as 1 ml/ kg/ % BSA, 50 % of plasma at 1 ml /kg/ % BSA, and 5 % Dextrose at 200 ml /m² body surface. In the Parkland formula, for the first 24 hours the recommended fluid replacement for children is 5000 ml/m² BSA + 2000 ml /m²

BSA. Small children are more sensitive than adults to insufficient or excessive fluid loading (Salisbury et al., 1983; Rylah, 1992; Warden, 2002).

Skin care is an important, but often neglected, issue in burn management. Newly healed burn skin is fragile, itchy, dry and susceptible to sunburn. Without proper skin care burned children may suffer from sleep and mood disturbances, depression and poor compliance to the rehabilitation process (Ho, Chan, Ying, Cheng & Wong, 2001). Burn injuries carry a high mortality rate with delayed healing and high complication rates such as scar and contractures among survivors.

2.10. Factors Affecting the Prevalence of Burn Injuries

There are various factors that affect the prevalence of burn injuries in developed and developing countries. In the African context, burn injuries to children are related to factors such as gender, poverty, poor living conditions, lack of education, especially of the mothers, physical disability, seasonal climate variation, storage of inflammable substances in the home, medical conditions such as leprosy and epilepsy, war and a lack of awareness of the basic social services and of health and education measures. Wars and other forms of violence result in destruction, poverty, a high proportion of over-burdened and impoverished families (WHO, 1995; Forjuoh, 1996).

In the developed countries some of the above-mentioned situations are not common. For example in Denmark almost all cases of children sustaining electrical shock burns involved the electrical cords of vacuum cleaners. Young children can play and bite the cord, sustaining electrical shocks in the mouth (McLoughlin, 1995). In contrast to the aforementioned example, stressful circumstances within the family of the child and

the associated reduced child-care increase the risk of burn injuries for young children (Werneck & Reichenheim, 1997). Children with psychological problems are at greater risk of burn injuries.

Kaprio, (1978), Hummel, (1982), Ye, (1998) and Herndon, (2002) pointed out that burn injuries often occurred more frequently where there are housing problems, such as poorly constructed housing conditions with poor lighting, where there is a high alcohol consumption and where a large proportion of the population are smokers. Persons with epilepsy and leprosy are also more liable to sustain burn injuries than others.

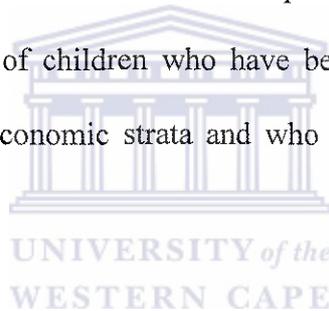
2.10.1 Socio-Economic Status and Burn Injuries

Poverty affects individuals and families in every part of the world. Although most of the poorest people live in developing countries, poverty and disability are closely linked in all societies. Poverty is more than just a lack of income; it is also a lack of influence, power, information and control over basic life decisions (World Bank, 2000; Frank, Mekonen, & Paolo, 2001). Children with burns were found to live more frequently in single parent families than the general population (Libber & Stayton, 1984; Herndon, 2002). The mean values of total socio-economic status indicated that low socio-economic status and cultural factors have direct influences on the burn injuries in children.

Improvement of the socio-economic and cultural status of people might lower the incidence of burn injuries among children. Educational programmes aimed at identifying and preventing the causes of burn injuries are essential, in order to

increase the parents' awareness of burn risks, and especially for those living in informal settlements and congested areas (Keswani, 1996). In this study the socio-economic status was defined by the monthly income of parents, the educational level, and the number of rooms of their homes.

The effect of low income on fire-and burn-related deaths is also related to residence in old buildings, crowded living conditions and the absence of smoke detectors. A study conducted in Egypt by El-Badawy & Mabrouk, (1998) revealed that there is a positive relationship between the incidence of childhood burn injuries and families of low socio-economic status. In India, Gupta, Gupta & Goil, (1992) reviewed a retrospective study that recorded 127 paediatric burns in children up to 14 years of age, and found that a high incidence of cases of children who have been burned occurred among those living in the low socio-economic strata and who had medium to large sized families.



Cronin, Butler, McHugh, & Edwards, (1996) found that 77% of the children involved in burn injuries were from a low-income families. Onuba & Udoidiok, (1987) and Haq, (1990) identified the rapid urban migration with the development of slums, where poor families abound in shanty huts, and which are built with highly combustible materials and are fire hazards. These ideas are further supported by Safe Kids, (2001) which argues that there is a clear relationship between a poor housing environment and the incidence of childhood injuries. Millar, (2001) pointed out that in extreme weather conditions, where there is no electricity, fires or the use of paraffin stoves in a confined space often results in devastating consequences for children. There is limited space for children to move around in a small house, and they mostly

sit around open fires to warm themselves. However, this does not happen during warm weather.

2.10.2 Burns and Associated Medical Conditions

There are some medical conditions that contribute to the incidence of burn injuries among children. Epilepsy and leprosy are among the medical conditions, which lead to the high rate of injury, often with resulting death or physical disability.

2.10.2.1 Epilepsy

Epilepsy is a neurological disorder that affects people in every country through out the world. It characterised by a tendency to recurrent seizures and it defined by two or more unprovoked seizures (WHO, 2001c). Epilepsy is one of the common chronic neurological disorders of childhood with a prevalence of about 5 per 1000 (Beckung, 2000). Patients suffering from seizure disorders are at risk of injuries due to their seizure activity. A retrospective study carried out in the USA by Sobocinski, Rabbitts, Bessey & Yurt, (2001) found that patients with poorly controlled seizure disorders are at a greater risk of burn injuries.

According to Gerrits, (2001) many children who have such seizures experience life-threatening risks, such as when a child has a fit while sitting close to the open fire. Epilepsy has many implications, not merely medical but also social and economic. The socio-economic aspect of epilepsy can become further complicated if a patient suffers burns on the face, head or trunk during an attack (Bhatnagar, Srivastava &

Gupta, 1976). If the victim is a girl, for example, she may be unable to marry in the future because of her disfigured face.

2.10.2.2 Leprosy

Leprosy is a chronic disease caused by a bacillus, *mycobacterium leprae*.

Mycobacterium leprae multiplies very slowly and the incubation period of the disease is about five years. It is transmitted via droplets, from the nose and mouth, during close and frequent contacts with untreated, infected persons (WHO, 2001d).

According to Noordeen, (1995) leprosy is still a serious problem in about 80 countries in Asia, Africa, and Latin America. Of all the communicable diseases, leprosy is most important for its potential to cause permanent and progressive physical disability. A person with leprosy will not be able to feel any hot or cold temperature and may thus easily suffer a burn injury without noticing it. Therefore, the disease may result in more visible impairments and disabilities such as the loss of body parts, especially fingers and toes because they are always exposed to sharp or hot objects in their activities of daily living. According to the CSA (1999), the total number of leprosy patients in Addis Ababa city in 1995 was about 2,673; among this number 56 were children between 0-14 years old.

2.10.3 The Association of Burn Injuries with Child Development

Children have an instinctive desire to explore their surrounding environment and to play with new, exciting games. Through playing, they acquire skills for survival and develop inter-personal relationships. Children grow and learn new skills rapidly and

particularly during their early years. As they explore their world they face new hazards and take new risks, such as fire burn (Ying & Ho, 2001; Herndon, 2002). Most burn injuries among children result from the complex interaction of intrinsic and extrinsic factors. These factors are the maturity of the central nervous system and physical development of the body, although burn injuries do also happen accidentally.

The ability of a child to maintain a stable, upright position and to walk involves the use of a number of the body's systems in a co-ordinated and integrated way. This development is crucial to the child's ability to escape from the danger of burn and smoke inhalation injuries, which are often caused by domestic fire. Children with developmental impairments may be more prone to these burn injuries. Ying & Ho, (2001) pointed out that playing with dangerous objects, such as fire, might cause burn injuries to children with serious physical and psychological consequences.

Children have no real understanding of the situation they place themselves in (Herndon, 2002). Studies by (Forjuoh et al., 1995) indicate that burn injuries in young children are closely associated with meal preparation in the kitchen. This is probably because young children tend to be around their mothers in the kitchen and they are in need of attention. In contrast, in India, burn injuries are associated with Diwali, the festival of lights, among the young children (Keswani, 1986). Hence, educating children as early as possible about the dangers of fire and heat, and providing safe environments for children, are imperative. This is the responsibility of parents; carers, the community and health care providers in order to minimize the incidence of burn injuries among children.

2.10.4 Educational level of Parents and Burn Injuries

Numerous studies have shown that childhood burn injuries and mortality are associated with the educational level of their parents. A study carried out in Zimbabwe shows that childhood mortality is strongly associated with the level of education of the mother. The rate of infant mortality during early childhood is six times higher for children whose mothers have no formal education than for children whose mothers have a secondary education. Research shows that the father's level of education is similarly related to childhood injuries and mortality (Gray, 1993).

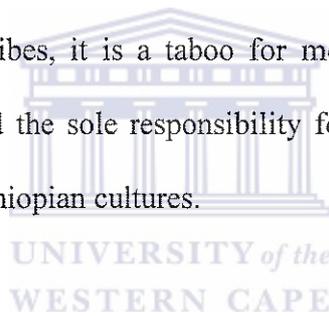
In the U.S.A., young men with less education and lower incomes tended to be burned more often than others in the general population (Patterson et al., 1993). A retrospective study carried out in Egypt by El-Badawy & Mabrouk, (1998) revealed that 206 (68%) of burned children had an illiterate mother, while 99 patients (30 %) had a literate mother. This indicates that more children who are involved in burn injuries may come from illiterate mothers. Another study carried out in Brazil by Werneck & Reichenheim, (1997) showed that the low educational level of the mother was one of the potential risk factors that were believed to be associated with the occurrence of burn injuries in childhood.

2.10.5 Association of Gender and Burn Injuries

Studies on burn injuries, which involved large samples of children between the age of 0 and 14, show that the incidence of burn injury is more frequent in males than females. Keswani, (1986) highlighted this view in India, where this predominance

was more marked in the age group 0-5. Similar studies in Nigeria, by Iregbulem & Nnabuko (1993), and in Kenya by Haq (1990), and in Egypt by El-Badawy & Mabrouk (1998), indicated that males are more frequently involved in burns injuries. This is supported by studies conducted by other authors namely Van Rijn et al., (1989), Rossi et al., (1998) and Libber & Stayton, (1984).

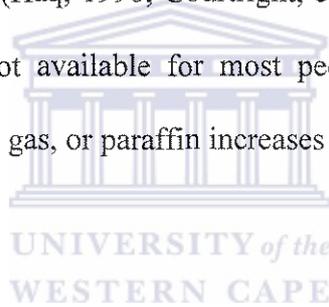
These differences are postulated in terms of acquired or encouraged' masculine or feminine 'role behavior' (Van Rijn et al., 1989). By contrast, in a country with a high prevalence rate of epilepsy, such as Liberia, Ethiopia (Gerrits, 2001) the higher percent of burn injuries was among females. This is accounted for by the fact that they do all the cooking in those countries. For instance in rural parts of Ethiopia, in some traditions such as the Gdeio tribes, it is a taboo for men to enter the kitchen for cooking purposes. Women hold the sole responsibility for all types of cooking and taking care for a sick child in Ethiopian cultures.



2.10.6 Storage of Flammable Liquids.

Ignorance about the storage of flammable liquids in the living room or bedrooms could also lead to serious burn injury and death. In some rural areas of Ethiopia people do not understand the danger of petrol, so they keep cans of highly inflammable liquid in their bedrooms or in living rooms. Naked lights or lighted cigarettes often ignite them, causing major fires with disastrous human tragedy.

This can happen when the children are left unattended at home and when they have access to reach those highly inflammable substances at home and play with them. These views were supported by (Haq, 1990; Courtright, et al., 1993). Since imported gas and electric cookers are not available for most people in Africa, the danger associated with kerosene, butane gas, or paraffin increases the risk of fire burn injuries among young children.



2.10.7 Seasonal Variation and Burn Injuries

There is a positive relationship between a seasonal variation in climate, and the incidence of burn injuries in children. These views are supported by studies conducted by Gupta et al., (1992), who discovered the frequent occurrence of children's burns in the winter months between December and March in India. Boiling water, heated for baths, and fires that had been lit for warmth, caused these.

This view was further supported by studies conducted by other authors namely, Iregbulem & Nnabuko, (1993); Barradas, (1995) and El Badawy & Mabrouk, (1998) who indicate that there were higher incidences of burn injuries in the winter and a

lower incidence in the summer seasons. A study carried out by (Ryan et al., 1992) in Canada indicates that there was a marked seasonal variation in recreational burns, compared to all other burns, with the peak incidence occurring in the summer months. Unfortunately literature based on seasonal variation of burn injuries was not available from Ethiopia.

2.11 The Impact of Burns.

A burn injury is a life-interrupting event and it occurs, like all accidents, when a person least expects it (Mannon, 1985). It is an event fraught with considerable physical pain, physiological trauma and psychological anxiety. It is one of the most severe forms of trauma to the body and it can be a life threatening injury in severe cases (Pedretti, 1985). Majority of the patients who attended a burn unit will suffer temporary or permanent disability from the burn related injuries.

Burns also cause scarring and deformity, loss of hair and body pigment, alteration of the skin texture and destruction of the sense receptors in the skin. Associated injuries might be loss of vision, neurovascular damage, smoke inhalation, fractures, itching of the wound, and intolerance to the heat of ultraviolet rays (Pedretti, 1985; Keswani, 1996). Post-traumatic response to burn injuries leads to significant and prolonged skeletal muscle loss and weakness, which persists despite the standard rehabilitative programme of physiotherapy and occupational therapy (Krupa, 2001). Thus burns are one of the most common injuries that lead to temporary or permanent disability among children, especially young ones.

Extensive burn injuries may contribute to complications such as severe infections and the formation of hypertrophic scars (Onuba & Udoidiok, 1987). Factors contributing to the formation of hypertrophic scars may include wound infection, genetics, immunologic factors, repeated harvesting of donor sites, age, chronic inflammatory processes and the location of the injuries. To date hypertrophic scars remain very problematic and difficult to manage although pressure therapy reduces the development of these scars. From the perspective of physiotherapy, knowledge of the predisposing factors for scar formation is essential for the rehabilitation worker (Serghiou et al., 2002).

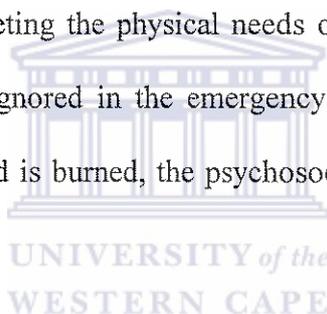
According to available literature, the burn scar has a close relationship with the formation of carcinomas or malignant transformation of the skin on the burn site (Can, Yilmaz , Riza , Apaydin & Kuzu,1998). According to Millar, (2001) when a child gets burnt, the person who attends to the child at home during the accident is also often exposed to the dangerous chemical toxins emitted by burning materials. With a little care and safer methods of handling fire, the majority of these accidents would never occur (Shroff, 1997). Research on children's burns highlights the fact that facial burns are traumatic, resulting in serious social handicaps (Markus, Sandra, Muli & Martin, 2000).

According to Bryant, (1996) the psychosocial adjustment of the child with severe burns should be considered a long-term goal. A patient with a burn is required to deal with the challenges of pain, disfigurement, and functional limitations that may impact on the adjustment process. Millar, (2001) argued that the pain a child has to deal with for weeks after the accident was not only physical. Furthermore, Millar pointed out that another harsh reality is the anxiety or anticipation that the child feels when, for

example, dressings are about to be changed or skin grafts carried out. Burned children frequently have psychological handicaps (Libber & Stayton, 1984).

2.12 Psychological Impact of Burn Injuries

Since antiquity, burn injuries have been a major source of human trauma. Burn care through the centuries has ranged from primitive herbal medications to sophisticated modern-day medical and surgical treatment. The psychological impact of this type of injury, however, has received attention in the literature only in the last few decades (Patterson et al., 1993). Moreover, the psychological and spiritual care and support of the burn patient are as important as wound care or therapeutic exercise. Because greater attention is given to meeting the physical needs of an acute burn injury, the psychological needs are often ignored in the emergency care settings. (Derstine & Hargrove, 2001). When the child is burned, the psychosocial problems often involve the family more than the child.



This is not to say that the child has no difficulties but the family may have intense problems due to the circumstances surrounding the burn injuries. Dealing with the family in such a situation becomes very difficult because the family member may feel guilt about the accident. This guilt can be incapacitating, inducing illness in some family members, and especially if the patient dies (Fisher & Helm, 1984; Rylah, 1992). Young children probably have fewer psychological problems in hospital, and after hospital, because they do not fully comprehend this fate (Cresci, 1982). Very young children may develop severe withdrawal, as a result of their separation from home and family during hospital admissions. The child who is burned is sometimes tense and displays sleeping problems (Fisher & Helm, 1984).

A severely burned child needs to be observed constantly for changes in mental status as well as physical status. The burn accident itself is very upsetting and the patient may experience nightmares, because of unfamiliar people and surroundings, and painful treatments. Therefore it is important to involve the child during treatment, such as the removal of dressing from the wound, bathing or the application of moisturizers on the healed area. Recreational and occupational therapist can be most helpful in distracting the child's attention from the discomfort (Jacoby, 1972; Fisher & Helm, 1984; Rylah, 1992; Herndon, 2002).

Parents and other family members can provide the necessary support, comfort and guidance for their children during the recovery and rehabilitation periods. Health care providers can promote more family involvement in patient care, by encouraging a parent to sleep in the room with the frightened child. The psychological needs are often ignored in the developing burn care settings and emergency care settings. Greater attention is usually given to meeting the physical needs of a child with acute burn injuries. (Derstine & Hargrove, 2001).

2.13 Summary of the Chapter

In spite of the significant improvement that has been made in the medical field, a serious burn injury is still the most severe and devastating injury. Therefore, a burn injury is a personal and societal burden. Burn injuries in children are increasingly recognised as an important cause of morbidity and mortality in developing countries. According to the available literature on children's burns, burn injuries occurred mostly to children below 5 years of age.

The most common environment for accidents was the home, and particularly the kitchen. It is important to know the nature of the causal agent in order to manage burn injuries among children, because this could guide the clinician to determine the depth of the burn. Most epidemiological studies of burns have been hospital- based and excluded the many burn cases that never reach hospital. Therefore the true epidemiology of burn injuries has not been completely presented in any studies to date, particularly in developing countries such as Ethiopia. The literature reviewed on burn injuries mainly presented retrospective and prospective studies in children with burn injuries. Chemical and electrical burns are more complex in nature and often show little similarity to other types of burn injury. Thermal burns were the main cause of burn injuries among children.

The children of illiterate parents are more prone to burn injuries. Psychological and spiritual care are as important as medical care in the management of burn injuries, and these must be included from the acute stage of burn injury management. In addition skin care both to donor site and the grafted part should be considered in the rehabilitation programme.

As a member of the health team involved with victims of burn injuries, it is important for physiotherapists to understand the biopsychosocial approach to the management of burn injuries. This knowledge is essential for a better management and rehabilitation following burn injuries. Prevention is also a significant approach. As Shroff (1997) indicates, it is cheaper to prevent burns than to treat them. The next chapter will discuss the methodological aspect of this study and the methods employed for data analysis, as well as the ethical considerations applied.



CHAPTER THREE

METHODOLOGY

3.1 Introduction

In this chapter I will explain the methods used in the study. It describes the research setting, the study design, the study sample, and the procedures used in data collection, data capturing and data analysis. Finally, ethical considerations are explained.

3.2 Research Setting

The study was conducted at the Black Lion Hospital (BLH) in Ethiopia. This 559 bed tertiary hospital, which is managed by the University of Addis Ababa, was established in 1962. The paediatric department at the BLH admits children up to the age of 12 years. The BLH has several departments such as orthopaedics, surgery, physiotherapy, gynaecology and medicine. It is used to train nurses and doctors, and it serves an estimated population of 1.5 million people. Both in-patients and out-patients are seen at this hospital, presenting with medical, orthopaedic, gynaecological, paediatric and surgical conditions, which included burn injuries. Patients with burn injuries are admitted to the hospital if they meet one or more of the following criteria: (i) acute burns involving between 5-10% body surface area (ii) burns involving areas of functional importance such as the face, hands or the perineum, irrespective of the severity of the burn (iii) burns resulting from electrical shock and chemical agents such as acids and alkalis, irrespective of the size of the burn, and (iv), complications associated with burns such as contractures and keloids.

The BLH is the only referral hospital for serious surgical and medical conditions in Ethiopia. However, self-referred patients with burn injuries are admitted into the hospital without a formal referral from any health post or health station. There are only two qualified physiotherapists who are assisted by rehabilitation assistants in the hospital. The qualified physiotherapists attend to ward patients twice a week, and out-patients daily. The services rendered by the physiotherapy department at the BLH are exercise therapy, and infrared radiation, which is the only electrotherapy modality available. Children with burn injuries receive limited physiotherapy treatments in the ward, and they don't come to the physiotherapy out-patient department. This is because the physiotherapy department does not have sufficient equipment such as pulleys for therapeutic exercises.



3.3 Study Design

A retrospective survey was chosen for the study. In this non-experimental design, the researcher had no control over the subjects and the research setting. The purpose of the retrospective survey was to describe and interpret the factors related to burn injuries sustained by children of the ages 0-12, between 1996 and 2001. Retrospective surveys are used when the answer for the research question is sought from the past. Data from past occurrences was systematically gathered, and critically evaluated in order to provide a better understanding of what happened in the past. This offers insight into present happenings (Kovacs, 1987). Therefore, this retrospective study was based on the hospital records of children with burn injuries, who were treated at the Black Lion Hospital between January 1996 and December 2001. The advantage of the retrospective method is that it allows investigators to explore simultaneously the

possible multiple factors associated with a disease or injuries. For example, many variables that are possibly associated with burn injuries such as age; gender and socio-economic factors might be investigated in the same study (Riegelman, 1981).

3.4 Instrument

Since the study design was a retrospective quantitative survey, its effectiveness depended on the quality and relevance of variables included in the data capture sheet. To achieve this, a data capture sheet was designed and developed in a way that enabled the researcher to gather relevant information from the hospital records of the children. The data capture sheet, based on examples found in the literature reviewed, was modified to meet the objectives of the study (Daniel & Yoo, 1990; Daisy, Mostaque, Bari, Khan, Karim & Quamruzzaman, 2001). The data capture sheet shown in Appendix A was divided into two sections. The first section dealt with information on the personal characteristics of the subjects, which included socio-demographic variables such as age, sex, the income of the family, the size of home, the educational status of the parents and the size of the family. The second sections dealt with information on the type of burn injuries, the cause of burn injuries, the depth of the burn, the total body surface area affected by the burn and the place of the accident.

3.5 Study Population

The study population comprised of children aged 0-12 years treated for burns at the BLH in-patient and out-patient Paediatric Department between 1996 and 2001.

According to the records from the hospital's statistic department, during this period

1225 children were treated as in-patients and out-patients. This number included children with a variety of surgical and orthopaedic problems.

3.6 Study Sample

For the purpose of this study, the medical records of children with burn injuries were used. Only 265 (that is, 21.6%) children out of the total of 1225 children were treated at the hospital for burn injuries between 1996 and 2001. Only two hundred and fifty folders were considered in the study sample. Fifteen folders could not be used because of the missing information, illegible handwriting and incorrect folder numbers.

3.7 Pilot Study

A pilot study was carried out on the folders of children with burn injuries between 1993 to 1995. Five folders from each year, giving a total of fifteen folders, were used. This period (1993-1995) is equivalent to the period of September 1984 to November 1987 in the Ethiopian calendar. The selection of the folders was systematic, and involved choosing every fifth folder from the years 1993, 1994 and 1995 respectively. The main purpose of performing the pilot study was to pre-test the use of the data-capturing sheet for possible changes before it was used in the main study. Amendments were made to the data capture sheet.



3.8 Procedure

The Ministry of Health and the head of the Black Lion Hospital paediatric ward granted permission to carry out the study (Appendix B). Data collection was done from June 18th 2002 to July 18th 2002. Medical records for the period January 1996 to December 2001 were reviewed. The folder numbers for patients, who were 0-12 years old and sustained had burn injuries, were identified from registers in the paediatric outpatient department at Black Lion Hospital. Once the folder numbers were identified, the names and diagnoses of the children were followed up with the admission ward and the records department where the folders of all discharged patients were kept. The main purpose for the follow-up was to make sure that the folders had the exact identification number and the name of the child in order to ascertain that the date of admission and diagnosis were correct. After compiling the list of folder numbers, they were taken to the records department where a request form for each folder was completed and handed in to the clerk. Most of the folders that were requested were made available for the researcher. Five folders from the year 1999 were missing from the record office. Another ten had incorrect information and illegible handwriting. The list of names and folder numbers were cross-checked three times with the head nurse in the paediatric ward, until the exact total number of eligible files were ascertained.

A rehabilitation assistant and a student nurse were trained by the researcher to capture the information from the folders onto the data capture sheet because they were familiar with the medical terminology and the hospital environment. Each patient's folder was allocated a research identification number to ensure confidentiality.

3.9 Inclusion Criteria

The hospital records of all children 0-12 years with burn related injuries that were seen as out-patients or in-patients at the BLH between January 1996 and December 2001 were included in the study sample. All folders with insufficient information for the study were excluded.

3.10 Data Capturing and Analysis

All information from the hospital folders was captured on the data capture sheet (see Appendix, A). This information was later transformed into a numerical format for entering on the Microsoft Excel spreadsheet on the computer. This was done by assigning numerical codes to the information recorded from the folder on the data capture sheet. All information regarding socio-economic status and socio-demographic information was grouped into nominal and interval data (see Appendix A).

Descriptive statistical analysis was done using the Statistical Package for Social Science (SPSS) version 11.0 and Microsoft Excel. This was used to ascertain the frequencies for the different variables in the study sample. This information was presented using frequency tables and graphs. Non-parametric methods, such as contingency tables and the chi-square (χ^2) test statistic were used to identify associations between variables. This test demonstrates differences between and within two or more groups based on frequencies (Kovacs, 1987; Bland, 1987). It compares frequencies observed from a set of data with those that would be expected to occur in

the population if there were no significant relationships between the two variables being studied.

3.11 Ethical Considerations

The proposed study was presented to the Higher Degrees Committee of the University of the Western Cape for approval. Permission was also obtained from the Ministry of Health in Addis Ababa and from the University of Addis Ababa, Faculty of Medicine (see Appendix B and C). All information gathered for this study was handled confidentially and no patients' names were revealed on the data capture sheet and during the processing of the data.



3.12 Summary

Chapter 3 described the methodology used in this study. It explained the rationale of the research settings, the pilot study and the whole procedure of how the data was collected. Data analysis was described. Finally the chapter explained how ethical considerations were applied in this study. The next chapter will discuss the results of this study.

CHAPTER FOUR

RESULTS

4.1 Introduction

In this chapter the results of the study will be described. Descriptive statistical analysis was used to report on the profile of burn injuries seen among the children aged 0-12 years at the Black Lion Hospital (BLH) from the period January 1996 to December 2001. Characteristics of the sample with reference to the numbers of burn injuries, demographic profile, clinical data and educational and socio-economic level of caregivers will be described with the aid of graphs and tables. Inferential statistical analyses were carried out, using the chi-squared statistical test for exploring associations.

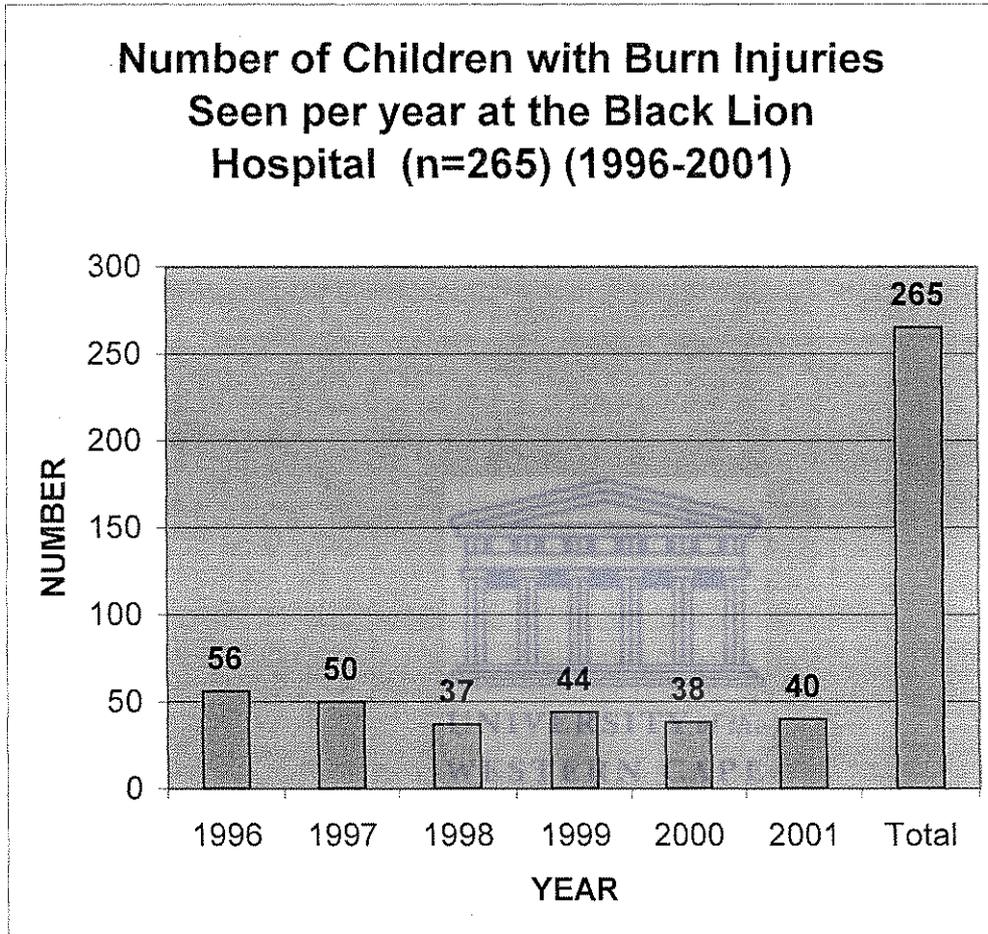


4.2 Numbers of Children with Burn Injuries at the Black Lion Hospital (BLH)

Figure 1 (p.51) shows a total number of 265 children who were treated at the BLH between January 1996 and December 2001. The proportion of burn injuries at BHL accounted for 21.6% of the total number of children admitted. Fluctuations in the number of burn injuries reported at the BLH, with the highest number recorded in 1996, namely 56 (22.4 %) of children, were observed. The general trend showed a decline in the numbers from 1996 to 2001; with the greatest decline of 13 burn cases between 1997 and 1998. Possible reasons for the fluctuation in numbers cannot be given.

Figure 1 Number of Children with Burn Injuries seen per year at BLH (n=265)
(1996-2001)

Figure 1



Source: BLH Statistics Department (2002)

4.3 Sample Size of the Children

A manual search of the records dating from January 1996 to December 2001 revealed that 265 children between 0-12 years were treated for burn injuries at this hospital. By applying the inclusion and exclusion criteria stated in Chapter 3 (p.48) only 250 records of the children were used for the study. Fifteen medical records could not be used due to illegible handwriting, incorrect folder numbers and missing records.

4.3.1. Gender distribution of the Children at BLH

Table 1 (p.53) shows the gender distribution of the sample (n=250), which comprised of 149 male children and 101 female children. More male children (59.6%) than female children (40.4 %) sustained burn injuries.

4.3.2 Age distribution of the Children at BLH

The age of the children used in this study ranged from 5 months to 12 years. Table 1 (p.53) shows the age statistics, by comparing the mean age (60.6 months) to the median ages (48 months). Further observation of the data showed a skewing towards the younger age group. This means that burn accidents decrease as the age increases.

Table 1 Demographic Characteristics of the Sample (1996-2001)

Variable	Characteristic	Number	Percentage
Gender	Male	149	59.6
	Female	101	40.4
Age in (months)	Mean age	60.6	
	Median	48	
	Mode	24	
	Standard deviation	43.57	
	Minimum	05	
	Maximum	144	
Location	Urban	115	46.0
	Rural	126	50.4
	Unknown	9	3.6
Type of burn	Thermal	246	98.4
	Electrical	3	1.2
	Chemical	1	0.4

n = 250

4.3.3. Age Group of the Children

The age group intervals in this study were chosen to correspond with pre-school, foundation year and primary school ages in the Ethiopian context. Thus the ages were grouped as follows: (i) 0 - 5 years old were are infants, toddlers and pre-schoolers who were either cared for at home, kindergarten or pre-schools; (ii) 6 – 10 years old were foundation year learners, namely from grades 1 to 4; and (iii) 11– 12 years old

were usually primary school learners in grades 5 to 6. The decline in the number of burn injuries from the younger to the older age group is evident.

This finding is confirmed in Table 2 below which shows that most of the children's burns (64%) were seen in the 0 – 5-year age at the BLH. The 6-10 year age group constituted 23.6% of the total number of burns cases and the lowest number (12%) was seen in the 11-12 year old age group. Although, the general trend shows a decline in burn injuries as the age increases, the 12 year olds showed an increase in burn incidents (8.8%). This was discovered when the raw data were analysed using cumulative frequencies for each age in the study.

Table 2 Burns in Different Age Groups (1996-2001)

Age group (yrs)	Number	Percentage
0 – 5	160	64
6 – 10	59	23.6
11 - 12	31	12.4
Total	250	100

4.3.4 Type of Burn Injuries and Gender

The types of burn injuries were classified into three main categories based on etiology, namely thermal, electrical, and chemical burn injuries. In this study, hot liquid, flame, stove, and charcoal burns were included under “thermal burns”. Table 3 (p.55) shows the percentage of each category of burns at the BLH in relation to gender. The gender distributions showed that 145 male children (58% of the sample) and 101 female children (40.4%) sustained thermal burns. Four of the 250 children (1.6%) sustained electrical and chemical burns. The incidence of thermal burns was

higher among the male children than the female children. In this study, electrical and chemical burns were not discussed because of their relatively low frequency.

Table 3. Type of Burn Injuries and Gender (1996-2001)

Table 3: Type of Burn Injuries and Gender			
	Male	Female	Total
Thermal *	145 (58.%)	101 (40.4%)	246
Electrical **	3 (1.2%)	0	3
Chemical ***	1 (.4%)	0	1
Total	149	101	250

(n=250)

* Moist or dry heat injuries e.g. hot liquid or flame

** When the human body is exposed to electrical current of 20-40 milli-amps (MA) or 45 volts

*** Any skin damage due to acid or alkali e.g. sulphuric acid, sodium hydroxide.

4.3.5 Thermal Burn Injuries and Gender

A thermal burn injury refers to burn injuries caused by dry or moist heat. For example, moist heat could be any hot liquid, which results in a scald of varying degrees. Similarly, dry heat, such as flames and non-luminous heat emitted from electrical appliances, hot coals or wood ash, result in skin and tissue damage. Figures 2 and 3 show that 145 male children (58.9%), and 101 female children (41.1%), sustained thermal burn injuries. Equal proportions of male and female children sustained scald burns (63.4%) flame burns (36.6%) in both genders respectively.

Figure 2 Male Children with Thermal Burn at the BLH (1996-2001)

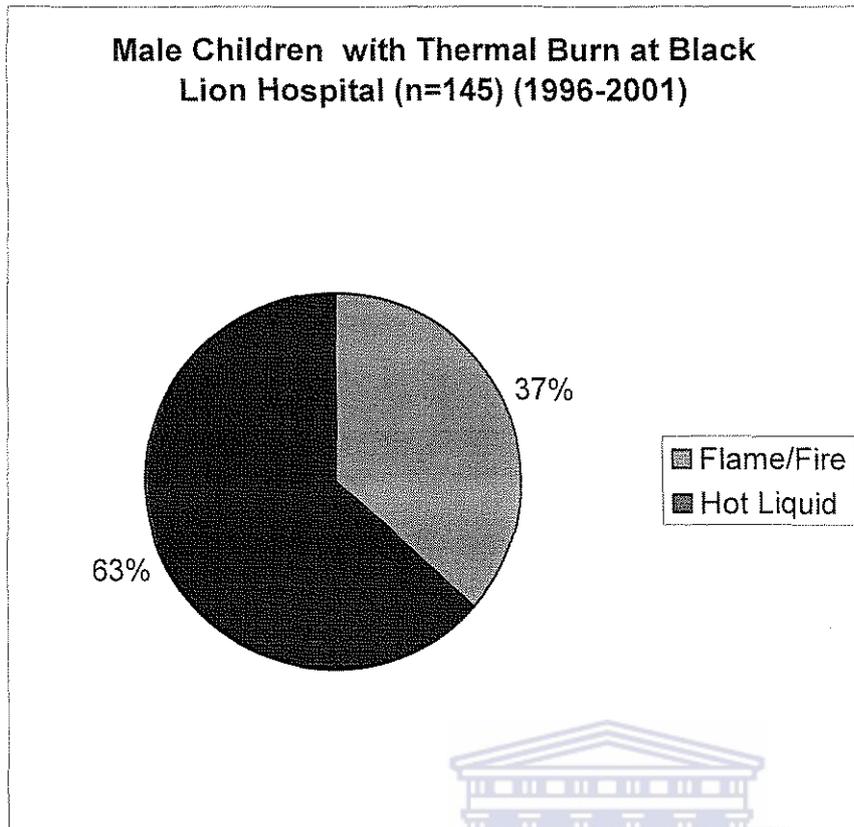
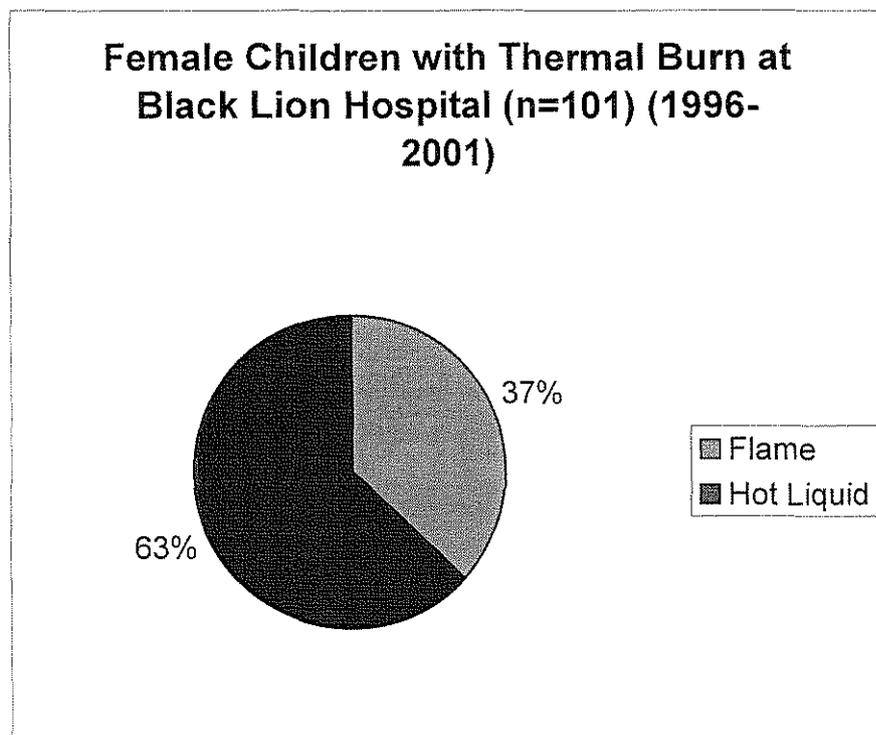


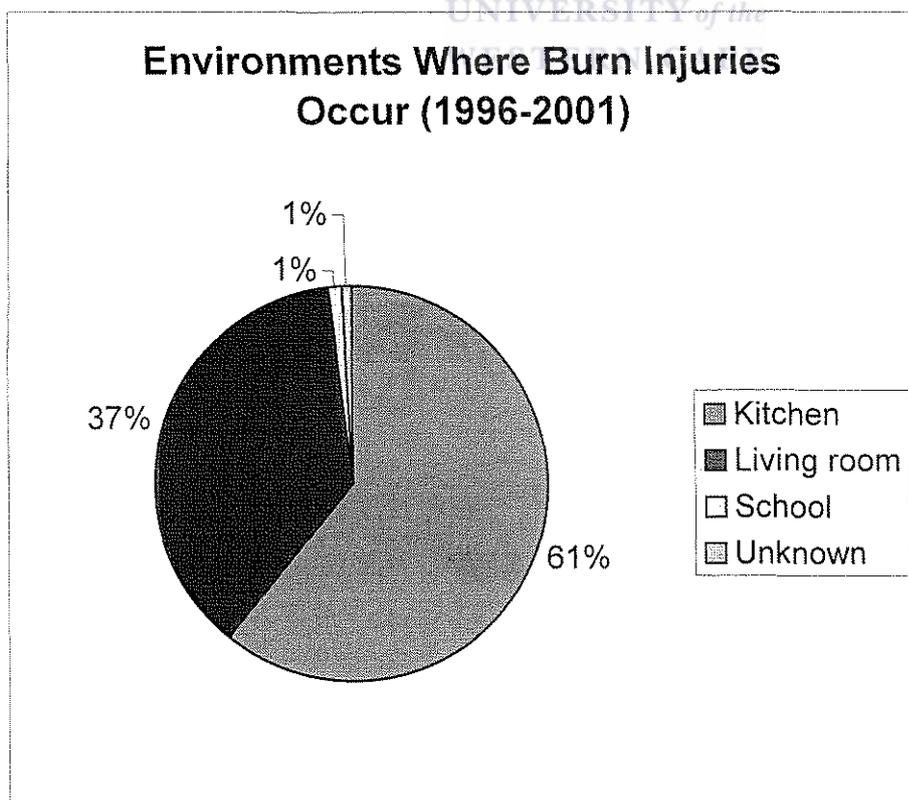
Figure 3 Female Children with Thermal Burn at the BLH (1996-2001)



4.3.6 Environments where the Burn Injuries occur

Burn injuries can happen anywhere and at any time. However, domestic burn injuries mostly happen indoors. The reason for this could be that at home people are forced to use fire for domestic purposes. Figure 4 (p.57) shows the environments where the burn injuries were most commonly sustained. Sixty one percent (61%) of burn injuries occurred in the kitchen while 37% occurred in the living room, and 1% in the school. In this study the definition of a “living room” refers to those in the rural and urban settings of the low and middle classes in Ethiopia. A living room is usually a space that serves as a kitchen, bedroom, and sitting room, where children may play during meal preparation. For the remaining 1% of burn injuries, the places of accident were not specified in the records.

Figure 4 Environments where Burn Injuries occurred (n=250)



4.3.7 Residential Areas

Virtually no differences were found in the numbers of burn injuries between urban and rural children. A small number (4%) of the children whose addresses were unknown could not be classified as either urban or rural. (Table 1 p.53)

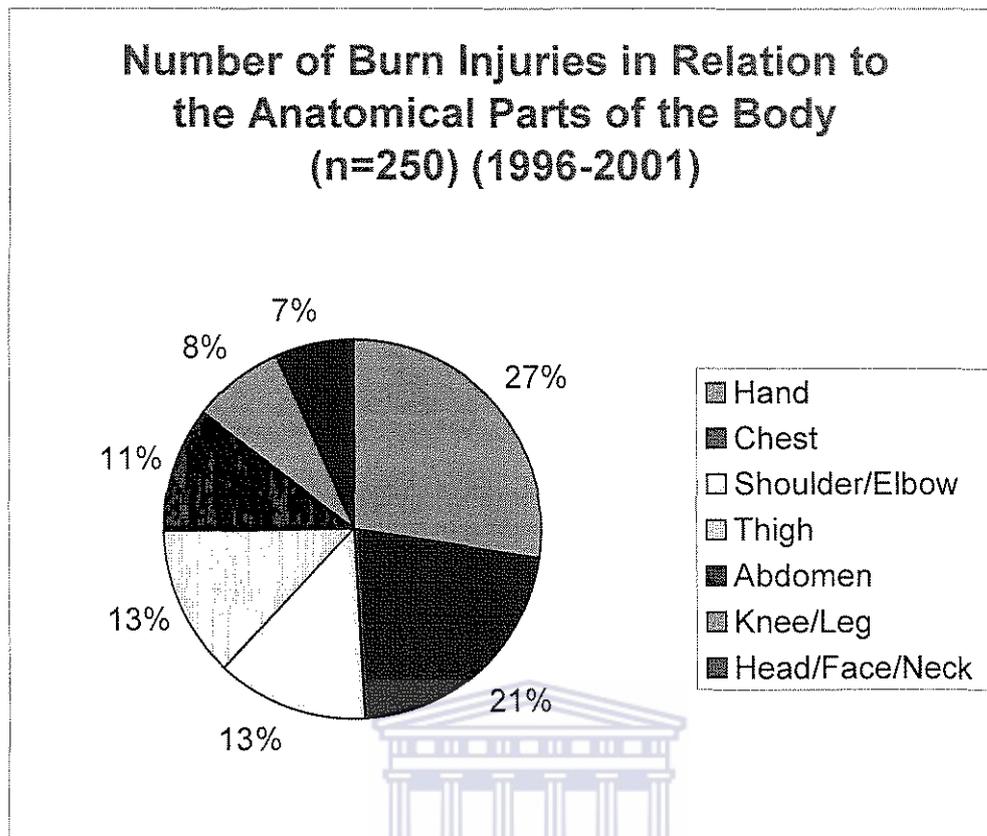
4.3.8. Thermal Burn and Anatomical parts of the Body

Figure 5 (p.59) shows the body region most affected by burn was that of the upper limbs, such as the hands; 69 children (26%), suffered burns in this area, followed by 54 children (22%) who sustained burn injuries to the chest area. The anatomical parts of the body mostly injured for the rest of the children were as follows: thigh (13%), shoulders and elbows (13%); abdomen (11%), knees and legs (7.7%) and head, face and neck burn (7%) of children. The pattern of the thermal burn injuries in relation to the anatomical part of the body is not clear.

Figure 5 Burn Injuries in Relation to Anatomical parts of the Body at the BLH

(1996-

2001)



4.3.9 Severity of Burn Injuries based on Total Body Surface Area (TBSA) and Depth of Burn

The severities of the burn injuries were also assessed (Table 4, p.60).It was observed that 176 children (70.4%) sustained burns of 0-10% of the TBSA, followed by 63 children (25.2%) who sustained burns to 11-25 % of the TBSA. The remaining 11 children (4.4%) sustained injury more extensively, ranging between 26-55% of TBSA. The average TBSA for all the children treated for burns at BLH was 15%. The minimum TBSA was between 0-10 % and the maximum TBSA of 36-55% was observed. The depth of burn was, in most cases, second-degree (75.6%), followed by

first-degree burn (14.8%). Third-degree burns accounted for 9.6% of all burns (Table 5).

Table 4. Percentage of Total Body Surface Area Affected (TBSA)(1996-2001)

Table 4: Percentage of Total Body Surface Area (TBSA) Affected

TBSA%	Frequency	Percent
0-10%	176	70.4
11-25%	63	25.2
26-35%	9	3.6
36-55%	2	.8
Total	250	100%

(n=250)

Table 5. Depth of Burn (1996-2001)

Depth of burn	Frequency	Percent
First-degree	37	14.8
Second-degree	189	75.6
Third-degree	24	9.6
Total	250	100

(n=250)

Inferential Statistical Analysis

Inferential statistical analyses were carried out in order to explore whether associations existed between the variables, namely the demographic data and the prevalence of burn accidents in the children used in the study. Contingency tables and the Chi-square statistical analysis were used. This test is appropriate for problems where the variables are categorical data given in the form of frequencies or counts, and not numerical scores. The purpose of this test is to calculate how much the observed frequencies differed from the expected frequencies.

4.4.1 Age Group of Children and Socio-economic Level of Parents

Table 6 (p.62) shows the column percentages and observed frequencies of the 250 children in the study. The differences in the distributions were not statistically significant ($p > 0.05$). However, it was found that children in the older age group from social level 3, were involved in more burn injuries. This finding was surprising for the high-income group, because the literature indicates that burn injuries are more prevalent among the lower socio-economic groups of children. However, statistically no relationship was found between burn injuries and the age groups of children from parents of socio-economic level 1 and 2 ($p > 0.05$).

Table 6. Age Groups of the Children and Social Level of the Parents in Relation to the Burn Injuries (1996-2001)

Age group In Years	Social level	Social level	Social level	Total
	1 Number & % of children	2 Number & % of children	3 Number & % of children	
0-5	84 (65.1%)	39 (65.0%)	37 (60.7%)	160 (64.0%)
6-10	31 (24.0%)	14 (23.3%)	14 (23.3%)	59 (23.6%)
11-12	14 (10.9%)	7 (11.7%)	10 (16.4%)	31 (12.4%)
Total	129 (100%)	60 (100%)	61(100%)	250 (100%)

Chi-squared = 1.2236, p = 0.8742

Social level based on income:

1 = Low income

2 = Middle income

3 = High income



4.4.2 Age Group and Causes of Thermal Burn

Tables 7.1 and 7.2 (p. 63) show the most frequent causes of burn injuries for thermal burns, with hot liquid being the highest cause of burns (156 out of 250) and flame burns the second highest (90 out of 250). This information was further stratified according to the gender of the different age groups. Finally 3X2 and 2X2 contingency tables were constructed for the different causes of thermal burn injuries in relation to gender (see Table 7.3 and 7.4, (p. 65).

Table 7.1. Causes of Burn in Relation to Age Group (1996-2001)

Age group	Hot liquid	Flame/ fire	Stove	Charcoal	Chemical	Electrical	Total
0-5	101	43	8	3	1	2	158
%	(40.4%)	(17.2%)	(3%)	(1.2%)	(0.4%)	(0.8%)	(63.2%)
6-10	35	17	4	3			59
%	(14%)	(6.8%)	(2%)	(1.2%)			(24%)
11-12	20	9	2	1		1	33
%	(8.%)	(3.6%)	(1%)	(0.4%)		(0.8%)	(13%)
Total	156	69	14	7	1	3	250
%	(62.4%)	(27.6%)	(6%)	(3%)	(0.4%)	(1.2%)	(100%)

(n=250)

Table 7.2 Causes of Thermal Burn in Relation to Gender (1996-2001)

Table 7:2 Causes of Thermal Burn Injuries in Relation to Gender

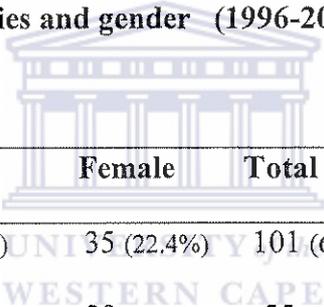
	Gender		Total
	Male	Female	
Hot liquids	92 (37.8%)	64 (26%)	156 (63.4%)
Flame/fire	53 (21.5%)	37 (15.4%)	90 (36.6%)
Total	145 (59.3%)	101 (41.4%)	246 (100%)

(n=246)

4.4.3 Hot Liquid Burn and Gender of the Child

It was found that the older females in the 11 to 12 year age groups were more likely than males to sustain hot liquid burns ($X^2 = 5.0815$, $p = 0.0788$). This result is significant at the 10% level but not at the 5% level ($p > 0.05$). The 2X2 table of the same information (Table 7.3) yielded a more significant difference between male and female. This was done by combining the age groups, 6-12 years, giving a larger sample size for this group. A more significant association between the two variables was found ($X^2 = 5.2678$, $p = 0.0217$; $p < 0.05$, but $p > 0.01$).

Table 7.3. Hot liquid burn injuries and gender (1996-2001)



Age group	Male	Female	Total
0-5	66 (42.3%)	35 (22.4%)	101 (64.7)
6-12	26 (16.7%)	29 (18.6%)	55 (35.3)
Total	92	64	156 (100)

(n=156)

Chi squared = 5.2678, $p = 0.0217$

4.4.4 Flame Burns and Gender

The Chi-squared statistic, according to Table 7.4 (p.65) showed no difference between the age distribution of the two genders with respect to those who had flame burns ($X^2 = 0.4201$, $p = 0.8105$) with $p > 0.05$.

Table 7.4: Flame Burns and Gender at BLH (1996-2001)

Age group	Male	Female	Total
0-5	29 (58.0%)	26 (65 %)	55 (61%)
6-10	15 (30 %)	9 (22.5%)	24 (27%)
11-12	6 (12 %)	5 (12.5%)	11 (12.2%)
Total (%)	50 (100%)	40 (100%)	90 (100%)

(n=90)

Chi-squared = 0.4201; p = 0.8105

4.4.5 Gender, Age Group and Socio-economic Status

Tables 8.1 and 8.2 show the frequencies for the children's age groups and socio-economics levels, stratified according to gender. The Chi-squared statistic test for males ($X^2 = 3.1151$, $p = 0.5388$) and for females ($X^2 = 3.8224$, $p = 0.4306$) showed there was no relationship between age and socio-economic status within the males and females ($p > 0.05$).

Table 8.1: Caregivers' Social Level and Age of Male Children (1996-2001)

Age group	Low income	Middle income	High income	Total
0-5	51 (69.9%)	26 (74.3%)	21 (56.8%)	98 (67.6%)
6-10	16 (21.9%)	7 (20.0%)	11 (29.7%)	34 (23.4%)
11-12	6 (8.2%)	2 (5.7%)	5 (13.5%)	13 (9.0%)
Total	73 (100%)	35 (100%)	37 (100%)	145 (100%)

(n=145)

Chi -square = 3.1151, p = 0.5388

Table 8.2. Caregivers' Social level and Age of Female Children (1996-2001)

Age group	Low income	Middle income	High income	Total
0-5	33 (61.1%)	12 (50.0)	15 (65.2%)	60 (59.4%)
6-10	15 (27.8%)	7 (29.2%)	3 (13.0%)	25 (24.8%)
11-12	6 (11.1%)	5 (20.8%)	5 (21.7%)	16 (15.8%)
Total	54 (100%)	24 (100%)	23 (100%)	101 (100%)

(n=101)

Chi-squared = 3.8224, p = 0.4306

4.4.6 Educational level of Care givers/Parents

Table 9.1(p.67) shows the educational level of the caregivers or parents of the burn victims. In Ethiopian culture caring for the sick or their children was traditionally the responsibility of women. In this study women were found to be the majority of caregivers (73.6%) for children with burn injuries at BLH. Table 9.2 (p.67) indicates that more than half (55.7%) of the thermal burns occurred in the children of illiterate caregivers. The percentage of children with burns declines in children of caregivers who have some level of education. Illiterate parents were usually those associated with low socio-economic status, no proper schooling and poor home environments. The illiteracy rate was compared with the information from the National Office for Population (NOP) (2001). According to their information, the illiteracy rate was 30.5% among women in Ethiopia.

Table 9.1 Composition of Thermal Burn Victims according to the Educational Level of Parents /Carers (1996-2001)

Educational level	Number	Percentage
Illiterate	137	55.7%
Primary	52	21.1%
Secondary	37	15.0%
Tertiary	20	8.1%
Total	246	99.9%

(n=246)

Table 9.2 shows the expected illiteracy versus literacy number based on the national population percent (30.50%). It shows an expected illiteracy of 75 versus 171 for literacy. However, it is clear that the observed illiteracy rate is well above the expected illiteracy rate. $X^2 = 9.351E-18$; P-value is significant at <0.01% level.

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Table 9.2 Observed and Expected Literacy Rate based on National Literacy Rate of Ethiopia (1996-2001)

Caregivers	Thermal burn victims		National literacy percentage	Expected number of children with burns
Illiterate	137	55.7%	30.50%	75
Literate	109	44.3%	69.50%	171
Total (%)	246	100%	100%	246

(n=246)

(Chi-squared = 9.351 E-18) (p< 0.01)

4.4.7 The Relationship Between Gender and the Place of Accident

The column percentages below show the observed frequencies of the places where burn injuries occur in relation to gender. The result indicates that more burn injuries take place in the kitchen than in the living room. Statistically, the differences are significant at a level of 5%. Clinically this finding is important to target the kitchen area as the primary place for the prevention strategies.

Table 10.1 Place of Burn Accidents and Gender (1996-2001)

Gender	Kitchen	Living room	School	Unknown	Total
Male	81(54%)	63(69.3%)	1*	4*	144
Female	69(46%)	28(30.7%)			97
Total	150 (100%)	91 (100%)			241

(n=241)

Chi-square =5.4634, p=0.0194; p<0.05.

* These numbers were excluded from the calculation because of small numbers

4.5 Summary of the chapter

The incidence of burn injuries accounted for 21.6% of the total number of children treated at the BLH during the study period. It was observed that there were fluctuations in the number of burn injuries from 1996-1998. The majority of burn victims were children <5 years, and a predominance of male children was observed. It was evident from the result that the higher the age of the children, the fewer the accidents occurring. Thermal burn injuries, sustained through hot liquids, were the main cause of burn injuries in children in comparison to electrical and chemical burns.

Most burn injuries were found in children in the care of illiterate caregivers. Kitchens were identified as a main place of accidents. The next chapter will discuss the findings that arose from this study.



CHAPTER FIVE

DISCUSSION

5.1 Introduction

In this chapter, the outcome of the study will be discussed in the relation to the aims and objectives of the study. The objectives of the study were: (1) to identify the contributing factors to burn injuries in children, treated at the Black Lion Hospital; (2) to determine the severity of burn injuries, (3) to identify the association between the number of burn accidents and socio-demographic factors such as age, gender, living environments and levels of education. The chapter will end with a summary of the main discussion on the findings.

5.2 CONTRIBUTING FACTORS OF BURN INJURIES

5.2.1 Causes of Burn Injuries of Children at the Black Lion Hospital in Relation to Age group and Gender

One of the objectives of the study was to identify the causal agents of burn injuries among the children aged 0-12 years old at BLH. Of the 250 medical records scrutinised, the two main agents of burns were flame and hot liquids (Table 7.2, p. 63). Hot liquids, followed by flames caused most thermal burns. Similar findings were reported in studies carried out in Nigeria (Onuba & Udoidiok, 1987), in Kuwait (Bang & Mosbah, 1988), in Ethiopia (Daniel & Yoo, 1990) and in Ghana (Forjuoh, 1996). The Nigerian study also found hot liquids to be the most frequent causes of burns (61.1%) in children of less than 5 years of age. This compares well with the current

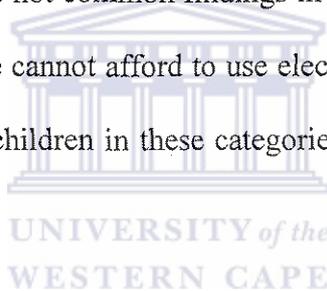
study, where 63.4% of hot liquid burns (or scalds) were seen in this age group at the BLH. In contrast, Haq (1990) reported flame burns (22.%) to be the commonest cause of burn injuries, over and above scalds, in the Kenya Provincial Hospital.

However scald burn was clinically more important among the male children, in comparison to girls in the 0 to 5 age group at the BLH. The majority of burn accidents were thermal burn injuries at the BLH. The possible reason for this could be the lack of awareness of the parents towards the risks of burns (Keswani, 1986; Courtright et al, 1993). None of the children sustained hot liquid burns in the bath. This is in contrast to the findings in Japan by Fukunish , Takahashi , Kitagishi , Matsushima , Kanai & Ohsawa, (2000) in which bath burns accounted for 47.9% of all burns recorded in children. Mercier & Blond, (1996) highlighted that 13.58% of bath burns were reported among young children in France. In Ethiopia hot bath burn injuries among children are not common. This may be due to the fact that children from low socio-economic status may not have access to hot water baths, or they may not report these burns to the hospital.

Young children were most likely to be victims of hot liquid burns, whereas older children were more likely to be burned by flame (Keswani, 1986; Rossignol, Locke & Burke, 1990; Ye, 1998). The possible reasons for this could be that the older children attempt to experiment with lighters, matches or fireworks while they are playing and, as a result, they sustain flame burns. However, this was not found in the current study which was similar to findings in the Ireland whereby no fire work was reported in the Irish Paediatric burn unit on children of 0-14 years of age (Cronin et al., 1996). This is in contrast to the findings in India and Hong Kong where firework and wax- related burns during the mid-autumn festivals, are the commonest thermal burn accidents

among children (Keswani, 1986; Davies, 1990; Ying & Ho, 2001). There was no difference in the proportion of male and female children who sustained flame and hot liquid burns (figures 2 & 3, p.56). In contrast to this finding, Courtright et al., (1993), identified that females were more frequently involved in flame burn injuries in Ethiopia. More female than male children between 6 and 12 years sustained hot liquid burn injuries. This was probably because female children were more associated with working in the kitchen where they assist their mothers with meal preparation. In the Ethiopian culture, girls and women are expected to perform kitchen duties. They usually wear loose fitting clothes made up of nylon polyesters materials, which are easily ignited during fire accidents in the kitchen.

Electrical and chemical burns were not common findings in the study. One reason for this is that in Ethiopia most people cannot afford to use electricity because of its high costs. In addition the numbers of children in these categories were too small to be of statistical value.

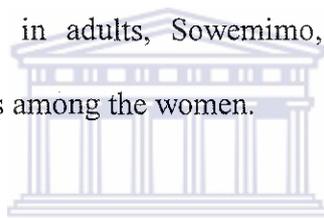


5.2.2 Age and Gender of Burn Injuries Children at the BLH

The majority of burn accidents (64%) occurred in the 0 to 5 year age group, although only 2% of accidents affected children below the age of 1 year. This is in contrast to Libber & Stayton, (1984), who described the most frequently burned children as being infants and toddlers (6-18 months). However, in this study the age range was similar to previous studies by Daniel & Yoo, (1990), Iregbulem & Nnabuko, (1993), and Haq, (1990), with most cases of the burn injuries occurring within the 12 to 60 month age group.

Children in this age group are usually at home with their mothers in the environment where cooking is done indoors, and where they are at risk of burn accidents. In addition, the children's motor and cognitive skills are not yet matured. They may not be aware of dangers and therefore they do not fear touching hot objects. Ignorance of the parents about the child's cognitive and motor development is also a predisposing factor (Keswani, 1986; Archibong et al., 1997).

Boys were predominantly affected in these studies. This was also observed by Fisher & Helm, (1984); Haq, (1990) and Barradas, (1995) who indicated that thermal burn injuries were more common in male than female children. According to Van Rijn et al., (1989) masculine behaviour played a role in burn accidents in male children. When comparing burn accidents in adults, Sowemimo, (1993) found a higher incidence of domestic related burns among the women.



5.2.3 Burn Injuries and the Educational level of the Parents

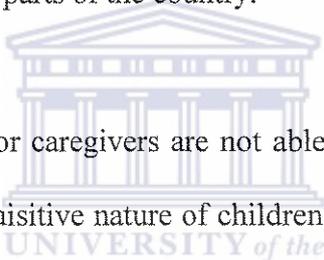
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Illiteracy among the caregivers of children seen with burns at BLH was higher than the national illiteracy rate of 30.50% (National Office of Population, 2001). The survey demonstrated a statistically significant relationship between the prevalence of burn injuries, and level of education of the caregivers. This finding was supported by studies in Egypt (El-badawy & Mabrouk, 1998) in Kenya (Haq, 1990) and in Ethiopia (Courtright et al., 1993), which found that more children with burn injuries were observed in families run by non-educated caregivers. Illiterate caregivers may have difficulties in reading instructions or warning labels about dangerous flammable substances. The previously mentioned authors such as Herndon, (2002) indicated that

primary health care and education focusing on prevention would play a significant role in reducing unintentional injuries such as burns.

5.2.4 Environments where Burn Injuries occur

Most burn injuries occurred in the kitchen, followed by the living room. This finding concurs with studies done in Denmark (Lindblad & Terkelsen, 1990) in India (Davies, 1990) and in Greece (Petridou, Trichopoulos, Mera, Papadatos, Papazoglou, Marantos and Skondras, 1998) where most domestic burns occurred indoors. Some households in Ethiopia, the kitchen and the living rooms are not separated. For instance, people who live in huts that are made of grass and wood use the living rooms as both kitchen and bedroom, especially in the rural parts of the country.



During meal preparations mothers or caregivers are not able to pay enough attention to the children. In addition, the inquisitive nature of children who want to know what is being cooked may be increased by hunger in male children (Rossignol et al., 1990; Nzarubara, 1999). As a result of the above factors the risk of burn injuries was increased. This evidence demonstrates the considerable need to educate the housewife, and her children about basic fire safety. Ground level cooking, where the children were not shielded from the fire, was the causes of many burn injuries. Therefore, it is suggested that children should never be left alone in the kitchen, particularly if there is fire around. Cooking places should be elevated or a barrier should be erected around the fireplace.

5.2.5 Burn Injuries in Relation to Residential Location

No significant differences in the number of rural and urban burn injuries were found among children. This was in contrast to the finding in Bangladesh by Daisy et al., (2001), which highlighted that children from urban areas are more prone to burn injuries than those from rural areas.

5.2.6 Socio-Economic Status and Burn Injuries

The majority of parents in this study fell within the low socio-economic level. The true socio-economic status was difficult to determine. Some people may not have declared their income in order to escape payment of hospital fees. As this study was retrospective, and based on hospital records only, the association of burn injuries and the socio-economic status of the families or caregivers should be interpreted with caution. The analysis did not reveal the association of burn injuries with a particular gender, age group or socio-economic status of the caregivers. A surprising finding was that older children from the higher-income levels of society were victims of hot liquid burn injuries.

This is contrary to the literature, which demonstrated a more constant relationship between burn injuries and low-income socio-economic status. Studies in Ethiopia (Frank et al., 2001), in Bangladesh (Daisy et al., 2001) and in Mozambique (Barradas, 1995) indicate that children from poor families, aged between 0 and 5 years, are a vulnerable group for burn injuries. However, this is not always true; for example

Forjuoh, (1996) found that none of demographic and socio-environmental variables examined were significant among the Ghanaian children with burn injuries.

5.3 Severity of Burn: Depth and Total Body Surface Area (TBSA)

The total body surface areas of the injuries were, in general, not large when compared with other studies. This may be because clothes covered the children's bodies during the hot liquid accidents (Table 4, p. 60). The majority of children (75.6%) sustained second-degree burns, followed by first-degree burns (14.8%). This result corresponds closely to the studies conducted in Denmark (Lindblad & Terkelsen, 1990) and in Greece (Petridou, 1998). These results are clinically important and suggest early interventions by physiotherapists and the rehabilitation team to minimize the level of complications of burns, such as contracture. Patient with second-degree burn mostly develop scar in the later stage and it will cause a lot of psychological and social stress to the patient or child. Thus, it is imperative for physiotherapist to intervene immediately after resuscitation of patient medically. The depth or degree of burn injury and the TBSA can determine the expected outcome of the burn injuries.

The anatomical areas affected such as hands, elbows, shoulders and facial burns may have serious implications for the child. Head and neck burns represent significant risk factors for poor psychological adjustment. Circumferential neck burn can compress the underlying trachea causing upper airway obstruction (DigreGorio, 1984). A child who is badly disfigured may lack self-confidence in his or her daily activities Keswani, (1978). For example, if the child sustained the burn to the face or the chest, it may cause the child to isolate him or herself from social gatherings or sport such as swimming. In other studies the psychological impacts of burn were found to be more

severe among the female than the male children (Patterson et al., 1993; Ye, 1998). In the Ethiopian context, female children may not be able to marry as a result of prejudice when they develop a disfigurement or handicap. According to some beliefs in Ethiopia, this is considered to be a sign of bad luck. Similar stigmas exist in some Indian cultures (Keswani, 1996).

5.4 Summary of the Chapter

In this chapter, the findings of the study were discussed in relation to previous studies on burn injuries in children. Similarities with other studies were found with regard to the effect of age, place of accident and the cause of burns. No significant associations between the percentage /proportion of burn injuries and the socio-economic status of the caregivers, or the residential location of the children were found. However, a significant association was found between the burned children and illiterate mother. The major causal agent was hot liquid and flame. The hands and the chest were most severely affected by burns. This is clinically important to physiotherapists because burn injuries are predisposing factors for impairment, handicap and disability in the children. Hand and chest are the vital part for activities of daily livings (ADL). The summary of the study, conclusion and recommendations based on the findings will be explained in the next chapter.

CHAPTER SIX

SUMMARY, CONCLUSION AND RECOMMENDATIONS

6.1 Introduction

The purpose of the study was to compile a profile of burn injuries among children aged 0-12 years, treated at the Black Lion Hospital (BLH) from 1996 to 2001. This chapter will summarise the study and make recommendations based on the results. The limitations of the study will be discussed

6.2 Conclusion of the Study

The objectives of the study were to identify the main causes of thermal burns and factors contributing to burn injuries among children, aged 0-12, at the BLH. It identified thermal burns by hot liquids and flames as major causal agents of burns in the children in the study. No burns were sustained in hot baths. This was contrary to the finding of studies conducted in Japan, France and Denmark. Although many of the associations between the variables were not statistically significant, the findings could still be considered as clinically significant. For instance, the greatest prevalence of burn injuries was found in the 0-5 year age group. This is of great concern, and suggests the need for good supervision and for an awareness of safety measures amongst caregivers for this age group. Also of clinical significance is the fact that the majority of burns were to the hands, followed by the chest the thighs, the shoulders and the elbows. Burns to these areas usually require the skilful intervention by physiotherapists or rehabilitation workers to minimize the level of disability and handicap. The upper limb is essential for activities daily living (ADL) such as eating, drinking and personal care such as bathing and toileting.

A statistically significant difference was found between literate and illiterate mothers or caregivers of children with burn injuries. Most burns occurred in the kitchen. It was surprising to find that more male than female children, sustained burn injuries in the kitchen (Table 10.1 p.68). It is assumed that if no comprehensive prevention and rehabilitation programmes for burn injuries are put in place, morbidity and mortality rates will increase. Thus, health care budgets will be affected and the workload on health professionals, particularly those involved in rehabilitation, will be increased.

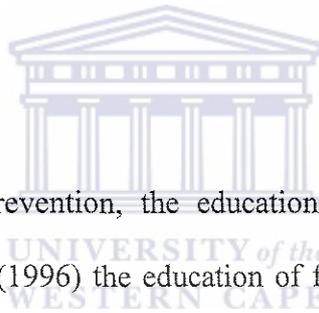
6.3 Limitations and Weaknesses of the Study

It is important to emphasize the limited scope of the study in relation to the observed outcome. As the study was carried out retrospectively, there were some errors in documenting the burn injury cases at the records office of the BLH. This resulted in excluding some files from the sample. The time frame for data collection was not enough. The sample size could have been larger if more hospitals were used. This would be useful in order to infer conclusions and make relevant comparisons. The data was collected from past records retrospectively. If the study were conducted prospectively, it would provide more recent information on the pattern and incidence of burn injuries at BLH. A comparison group of children with burn injuries with in the same age group should also be made from other hospital in Addis Ababa. The number and the pattern of burn injuries could then be compared with finding from BLH. As the data collected retrospectively and as child brought by different family members to the hospital identification of biological parents/ caregiver was not possible. Reliability of this study is also affected by the retrospective design.

The strengths of this study might be that it could initiate the development of future prevention strategies for burn injuries within the bio-psychosocial context of health care. Such an approach should be integrated into the existing health care structures.

6.4 Recommendations

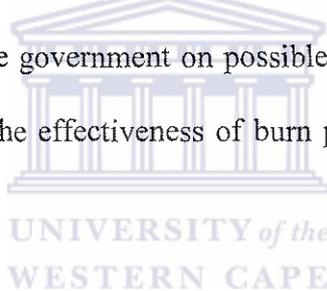
The decline in death from smallpox was the consequence of campaigns led by the World Health Organization (WHO), which succeeded in eradicating this disease globally. Similarly the prevention of burn injuries, with associated morbidity, disability and mortality should be focused on globally. Burn injuries are global problems and concern both developed and developing countries (Lari, Mohammad, Ali-raza and Mackkay, 2002).



From the perspective of burn prevention, the education of women or carers is important. According to Furjuoh, (1996) the education of female caregivers in basic prevention methods and in first aid for burns was found to minimize burn-related impairments, disability and handicap. Protection of fire places, heating devices and hot objects, hiding matches and flammable liquids from children, turning down water heaters to lower temperatures, and being alert to potential accidents to small children are fundamental to the prevention of burn injuries (Shroff, 1997; Taylor, 2002). In addition, national commitment and community involvement are important in burn prevention.

In conclusion, the author wishes to recommend the following based on the findings of the study: Prevention strategies, as explained above, should target both rural and urban settings. Education about burn prevention could be promoted through literature and posters that can be disseminated through partnerships with fire departments, so as to increase awareness of burn prevention. It is recommended that burn injury preventions should be incorporated into rehabilitation programs for children, because the rehabilitation workers, and particularly physiotherapists and occupational therapists have the opportunity to provide basic education on burn prevention to the parents.

Further studies should be conducted involving all health institutions in Ethiopia in order to determine the magnitude of the problem more accurately. The outcome of such studies could then inform the government on possible burn prevention policies. Such studies could also monitor the effectiveness of burn prevention strategies once they have been implemented.



There is a critical need to promote and develop physiotherapy services in Ethiopia, since there is very limited physiotherapy staff at the BLH. More physiotherapists and occupational therapists are needed to cope with the specific attention that children with burn injuries require.

The physiotherapy curriculum should emphasize health promotion and disability prevention as a module for undergraduate students when dealing with the management of burns in the classroom and clinical practice. The recording and filing of patient records at the Black Lion Hospital needs some attention.

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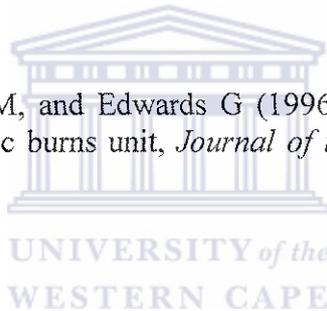
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APPENDIX A

DATA CAPTURE SHEET

PART ONE: SOCIO DEMOGRAPHIC DATA

IDENTIFICATION NUMBER

1 GENDER

1	Male	
2	Female	

2 AGE

3 AGE GROUP

	0-5	
2	6-10	
3	11-12	

4 RESIDENTIAL AREA

1	Urban	
2	Rural	
3	Unknown	



5 CARE GIVERS

1	Father	
2	Mother	
3	Aunt	
4	Siblings	
5	Grandparents	
6	Others	

6 AGE OF CAREGIVER

7 OCCUPATIONS OF CAREGIVER

1	Farmer	
2	Merchant	
3	Unemployed	
4	Civil servant	
5	Student	

8 MARITAL STATUS OF CAREGIVER

1	Single	
2	Divorced	
3	Married	
4	Widowed	

9 EDUCATIONAL LEVELS OF CARE GIVERS

1	Primary	
2	Secondary	
3	Tertiary	
4	Illiterate	



10 NUMBERS OF CHILDREN IN THE HOME

11. INCOME PER MONTH (1 \$=8.55 ETHIOPIAN CURRENCY (BIRR))

1	50-100	
2	101-200	
3	201-300	
4	301-400	
5	401-500	
6	>501	

12. NUMBER OF ROOMS IN THE HOUSE

PART TWO: FACTORS RELATING TO THE BURN INJURY

1 TYPE OF BURN

1	Thermal	
2	Electrical	
3	Chemical	
4	Other	

2.CAUSE OF BURN

1	Flame	
2	Hotliquid	
3	Charcoal	
4	Stove	
5	Electric/Chemical	

3.DEPTH OF BURN

1	First degree	
2	Second Degree	
3	Third degree	



4.PERCENTAGE OF TBSA

1	0-10%	
2	11-30%	
3	31-50%	
4	>50%	

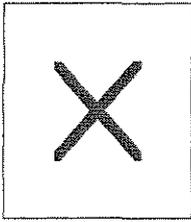
5.MAIN AREA OF BURN

1	Face	
2	Chest	
3	Hand/Elbow	
4	Feet	
5	Thigh/Leg	
6	Shoulder	

6. PLACE OF THE ACCIDENT

1	Kitchen	
2	Living room	
3	School	
4	Unknown	

APPENDEX B



Private Bag X17 Bellville 7535 South Africa
Telephone: (021) 959 2542 Fax: (021) 959 1217

DEPARTMENT OF PHYSIOTHERAPY

March 19 2002

The Director of Black Lion Hospital
Addis Ababa Ethiopia

Dear Sir,

Re: Request for permission

I am a postgraduate student in the department of physiotherapy at University of Western Cape. I am expected to conduct a research study as part of the requirements for Master of Science (Msc) Degree in physiotherapy. The title of my research study will be " The profile of burn injuries among the children aged 0-12 years at the Black Lion Hospital Addis Ababa Ethiopia.

I hereby request your permission to have access to hospital records of the patients, who had burns from Jan 1996 to December 2001. The information gathered will be treated with respect and confidentiality. The study will be helpful in planning and developing burn prevention strategy programs, aimed at minimizing the number of disabled children due to burn injuries. This will also provide information, for more rigorous investigation to be carried out on burn related injuries .The result of this study will be provided to the Black Lion Hospital.

Thank you for your positive response.

Worku Woldegiogis

Supervisor

MRS M MARAIS -----

APPENDIX C



የኢትዮጵያ ዲሞክራሲያዊ ጊኖራሪያዊ ሪፐብሊክ
የኢትዮጵያ ፌዴራላዊ ዲሞክራሲያዊ ጊኖራሪያዊ ሪፐብሊክ
Federal Democratic Republic of Ethiopia
Ministry of Health
አድራሻ: አዲስ አበባ P.O. Box 1234
Tel: አዲስ አበባ P.O. Box 1234

WOD 813/26/19
11-10-94

የአዲስ አበባ ዩኒቨርሲቲ
ሶፍትዌር አንባቢ ሆስፒታል
አዲስ አበባ

ጉዳይ :- የድህረ ምረቃ ትምህርትን ተከታትሎ ለመጨረስ
የሚዘጋጅ የመመሪያ ስህ-ፍን /Thesis/ ይመለከታል።

በደቡብ አፍሪካ አገር ኬፕታውን ከተማ በሚገኘው የዌስተርን ኬፕ ዩኒቨርሲቲ
/University of Western Cape/ በማስተርስ ዲግሪ ደረጃ በሬዚድ-ቴራሮ
ትምህርታቸውን በመከታተል ላይ የሚገኙት አቶ ወርቁ ወ/ጊዮርጊስ የመመሪያ
ዕውቀታቸውን የአገጣጠም ምርመራ ስህ-ፍን /The Profile of Burn Injuries
Among Children/ በሚል ርዕስ ለማዘጋጀት እና ሶፍትዌር አንባቢ ሆ/ል ውስጥ
ህክምናቸውን በሚከታተሉት ህፃናት ላይ ለመመራት መፈለጋቸውን በመጥቀስ ለዚህ
ለሚያደርጉት የምርምር ሥራ ድጋፍ እንዲደረግላቸው በፃፉት ማመልከቻ ጠይቀዋል።

ለልሆነም ሰልጣኝ የትምህርት ገዢያቸውን ካጠናቀቁ በኋላ ወደ ሀገራቸው በመመልስ
በመ-ያቸው የሚሰጡትን አስተዋፅኦ ከወዲህ ከግምት ውስጥ በማስገባት በእናንተ ጠኩል
አስፈላጊውን ትብብር እንድትደርጉላቸው እናሳስባለን።

ጋልባጭ፣
ለጤና ባለሙያዎች ትምህርት/ዘ/ድን
ጤና ጠበቃ

ከሰልጣኝ ጋር
የአዲስ አበባ ዩኒቨርሲቲ
የጤና አገልግሎት ልማት መምሪያ
ድ/ሪ

APPENDIX C

ኃይሉ ኢየሱስ ሞያ የትርጉም ሥራ
HAILE YESUS WANNA TRANSLATION OFFICE

Tel. 15 81 30 Fax 505140 P. O. Box 21277 አዲስ አበባ - Addis Ababa, Ethiopia

June 17th, 2002

Emblem
Federal Democratic Republic of Ethiopia
Ministry of Health

To Addis Ababa University
Black Lion Hospital
Addis Ababa

Subject: This refers to of a thesis writing, which is a requirement for the completion of graduate studies

Ato Worku Woldegiorgis who is currently pursuing his studies for his Masters Degree in Physiotherapy in South Africa, Cape town city at Western cape University and he is writing his thesis on " The Profile of Burn Injuries Among Children" has requested us in writing to be allowed to conduct the research work in Black lion hospital on children who are under treatment in the hospital.

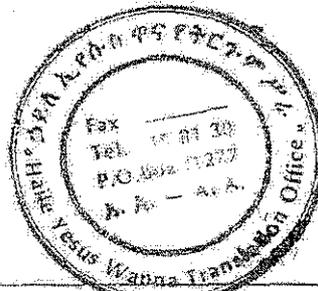
Therefore in view of this and taking into considerations the contributions that the individual would make development of health Service in the country after completing his studies we request you to make all the necessary cooperation and assistance in his endeavor.

With regards
Signed

Yohannes Tadesse.

Health Service and Training Department Head

Copy
To Health Professionals
Ed./T./Team
Public Health

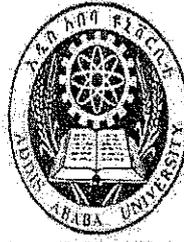


Handwritten signature and stamp: Haile Yesus Wanna Translation Office, General Manager

አድራሻ: በታዲያ ስፔስ ላለበት ምክንያት ለጊት ለጊት ቁጥር 402
Address: Around Stadium Infront of Lalibela Restaurant No. 402

APPENDIX D

የአዲስ አበባ ዩኒቨርሲቲ
አዲስ አበባ ፣ ኢትዮጵያ



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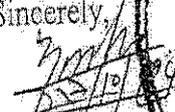
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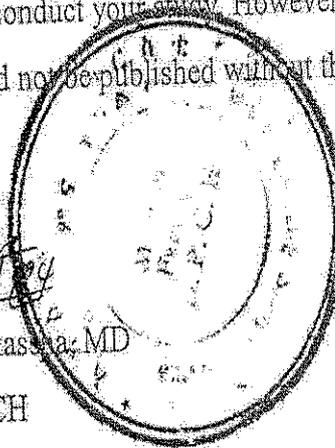
This is to inform you that we have examined your research proposal. Hence, you are allowed to conduct your study. However, as per our conversation the outcome of the study should not be published without the consent of the department.

Sincerely,


Amha Mekassa MD

Head, DPCH

A.A.U- MF



APPENDIX E

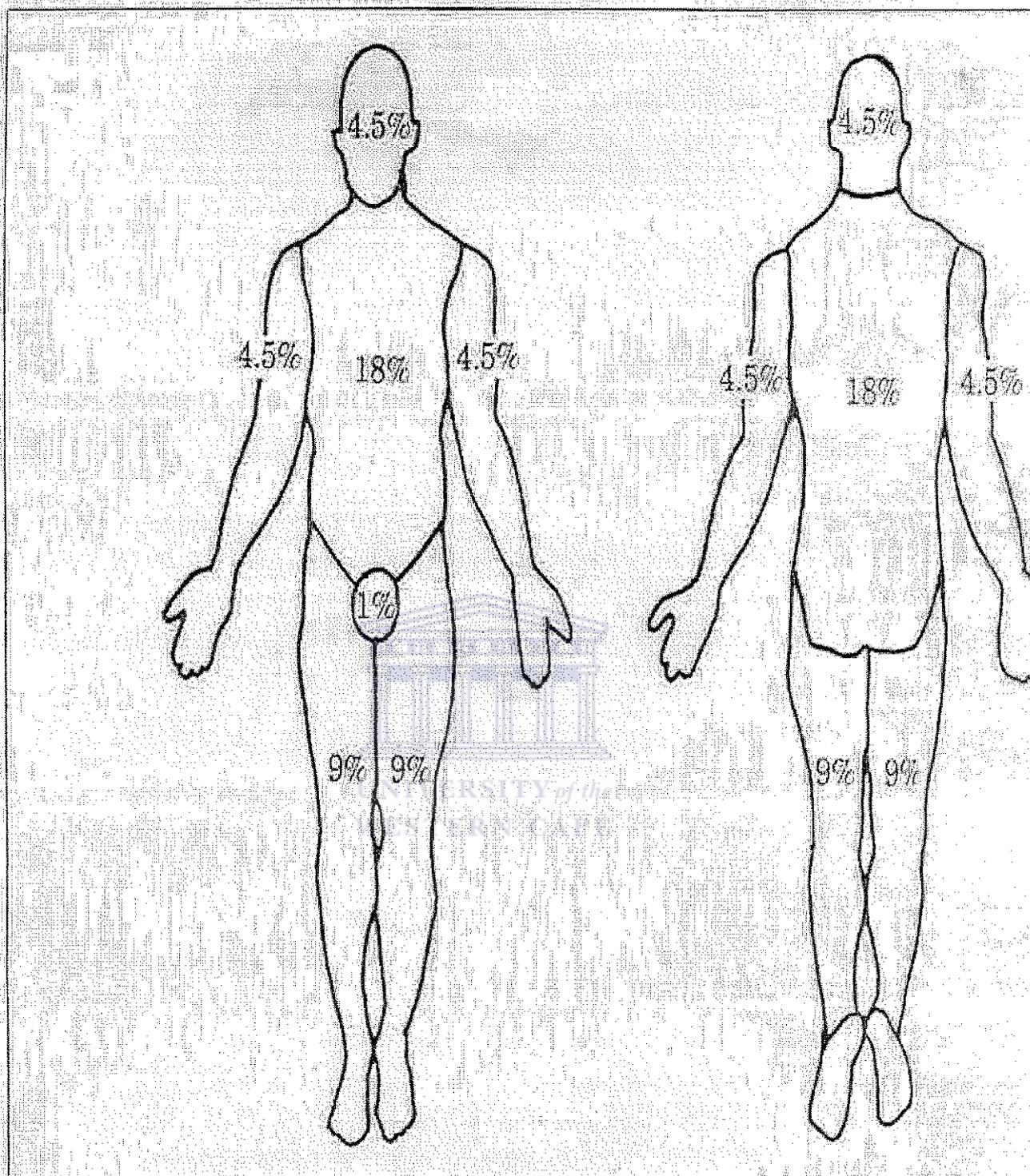


Fig. 1-1. Rule of nines.

Rylah (1992) Rule of Nine Body Chart

Appendix F

Lund-Browder Chart

Percent Area / %	Age groups					
	Birth- 1yr	1-4yr	5-9yr	10-14yr	15yr	Adult
Head	19	17	13	11	9	7
Neck	2	2	2	2	2	2
Anterior trunk	13	13	13	13	13	13
Posterior trunk	13	13	13	13	13	13
Right buttock	2½	2½	2½	2½	2½	2½
Left buttock	2½	2½	2½	2½	2½	2½
Genitalia	1	1	1	1	1	1
Right upper arm	4	4	4	4	4	4
Left upper arm	4	4	4	4	4	4
Right lower arm	3	3	3	3	3	3
Left lower arm	3	3	3	3	3	3
Right hand	2½	2½	2½	2½	2½	2½
Left hand	2½	2½	2½	2½	2½	2½
Right thigh	5½	6½	8	8½	9	9½
Left thigh	5½	6½	8	8½	9	9½
Right leg	5	5	5½	6	6½	7
Left leg	5	5	5½	6	6½	7
Right foot	3½	3½	3½	3½	3½	3½
Left foot	3½	3½	3½	3½	3½	3½

Lund-Browder Chart (Rylah, 1992)



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