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ESTIMATING THE TREND AND MECHANISM OF BURNS PATIENTS BROUGHT TO KATH FOR THE PAST FIVE YEARS

BY

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DECLARATION

I hereby do declare that except for references to other people's work which have been duly acknowledged, this piece of work is my own composition and neither in whole nor in part has this work been presented for the award of a degree in this university or elsewhere.

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ABSTRACT

Introduction: Burn is traumatic, devastating and its economic and social implications leave much to be desired, coupled with its significant cause of fatality, morbidity and disability. Very little is known about burn injuries at KATH in Ghana and thus epidemiological study and management of burns at KATH is imperative, hence the choice for this study to assess the trend and mechanism of burns at Komfo Anokye Teaching Hospital –KATH, Ghana for the 5-year period from May 2009 to April 2014. This study specifically has the object of determining the trend of burns, estimating the prevalence rate of burns and measuring the degree and total body surface area (TBSA) of burn victims at KATH. Further, study sought to estimate the survival rate and the main causes of burns presented at the burns unit at KATH.

Methods: The study adopted a retrospective approach to collect data from the clinical records of a sample of 300 in-patients folders for the past five years. Data collected was sieved for completeness, coded and input on a software STATA version 12.0 to generate information for analysis. With the help of statistical tables, mainly in frequencies and percentages, and chart produced by the software, data was analyzed quantitatively.

Results: Among the main findings from the analysis of data, it was found that 51.3% of the burns victims were males whilst 48.7% were females. Again, children under 5 years sustained the highest burn injuries (41.6%) followed by the ages between 15-44 years representing 35.3% of burn victims. It was again established from the study that most burn incidents occurred between the hours of 2pm-7pm of which most were unintentional or accidental. The prevalent rate of burns among the common

trauma cases at KATH stands at 4.2% of which nearly 81% of the injury are 2nd degree burns and about 56% also showed a total body surface area (TBSA) >20%.

The study further found a general survival rate of 86% over the 5-year period under review implying a 14% mortality rate. Hot liquids steam and gas were the major cause of burns represented by 53.75% of the burn cases reported followed by a 35% caused by flames (fire).

Conclusion: In conclusion, most burns reported at KATH are related to domestic use of thermal materials such as gas, kerosene stoves, coal pots which easily catch flames with little negligence and disregard of fire precautionary measures. The study revealed that domestic related burns mostly occur during the working hours of the day between 2pm and 7pm. Incidentally, this is the period when meals are prepared in many homes rendering women and children more vulnerable to burns. The aged people above 65 years rarely suffer burn injuries but few who encounter burns experience the 2nd degree type and have major burn, perhaps due to the weak nature of their body cells. This may adversely enhance their mortality.Serious and regular public sensitization campaigns on burns and enhanced strategies to build up strong management personnel at the hospital are necessary to help reduce the burn menaceand the resultant high mortality, morbidity and disability from burns.

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CHAPTER ONE

1.0 INTRODUCTION

This chapter introduces the entire study giving the general background of the study, the statement of the problem, the purpose and the objectives of the study. Again, it outlines the research questions which guide the achievement of the research objectives, justification, limitations, the scope of the study and the organization of the study.

1.1 Background of the Study

Burn injury is often a devastating event globally, with long-term physical and psychosocial effects. Burn scars after deep dermal injury are cosmetically disfiguring and force the scarred person to deal with an alteration in body appearance (Peck, 2011). In addition, the traumatic nature of the burn accident and the painful treatment may induce along with it significant burdens on available resources (Brunicardi & Charles, 2010).

A burn according to Peck (2011) is a type of injury to flesh or skin caused by heat, electricity, chemicals, friction, or radiation. Peck further explains the various degrees of burn to include first degree, second degree, third degree and forth degree burns. Peck (2011) explains burns that affect only the superficial skin as superficial or first-degree burns. When damage penetrates into some of the underlying layers of the skin, it is a partial-thickness or second-degree burn. In a full-thickness or third-degree burn, the injury extends to all layers of the skin. A fourth-degree burn additionally involves injury to deeper tissues, such as muscle or bone. Peck further explains that the treatment required for burns depends on the severity of the burn.

Although large burns can be fatal, modern treatments developed since 1960 have significantly improved the outcomes, especially in children and young adults (Peck, 2011).

Globally, about 11 million people seek medical treatment, and 300,000 die from burns each year. As of 2004, 11 million burns required medical care worldwide and resulted in 300,000 deaths. This makes it the 4th leading cause of injuries after motor vehicle collisions, falls and violence. About 90% of burns occur in the developing world. This has been attributed partly to overcrowding and an unsafe cooking situation. Overall, nearly 60% of fatal burns occur in Southeast Asia with a rate of 11.6 per 100,000. The number of fatal burns has increased from 280,000 in 1990 to 338,000 in 2010.In the United States, approximately 4% of those admitted to a burn centre die from their injuries (American Burn Association, 2012).

In Ghana, there are approximately 1500 severe burns cases reported annually and majority of these are caused by large scale disasters caused by petrol and LPG explosions (Agbenorku, 2010). In the developed world, adult males have twice the mortality as females from burns. This is probably due to their higher risk occupations and greater risk-taking activities. In many countries in the developing world, however, females have twice the risk of males. This is often related to accidents in the kitchen or domestic violence. In children, deaths from burns occur at more than ten times the rate in the developing than the developed world. Overall, in children it is one of the top fifteen leading causes of death. From the 1980s to 2004, many countries have seen both a decrease in the rates of fatal burns and in burns generally.

The above stated epidemiological data tells it all about the devastating effect of burns injury. Quality of life initially seems to be lower in burn patients compared with the general population. Mediating variables such as low social support, emotion and avoidant coping styles, and personality traits such as neuroticism and low extraversion, negatively affect adjustment after burn injury.

Burns are caused by a variety of external sources classified as thermal (heat-related), chemical, electrical, and radiation. In the United States, the most common causes of burns are: fire or flame (44%), scalds (33%), hot objects (9%), electricity (4%), and chemicals (3%). Most (69%) burn injuries occur at home or at work (9%),and most are accidental, with 2% due to assault by another, and 1-2% resulting from a suicide attempt.These sources can cause inhalation injury to the airway and/or lungs, occurring in about 6%.

Resuscitation begins with the assessment and stabilization of the person's airway, breathing and circulation. If inhalation injury is suspected, early intubation may be required.This is followed by care of the burn wound itself. People with extensive burns may be wrapped in clean sheets until they arrive at a hospital. As burn wounds are prone to infection, a tetanus booster shot should be given if an individual has not been immunized within the last five years. In the United States, 95% of burns that is present to the emergency department are treated and discharged and 5% require hospital admission. With major burns, early feeding is important.Hyperbaric oxygenation may be useful in addition to traditional treatments.

In children, with more than 10-20% Total Body Surface area (TBSA) burns and adults with more than 15% TBSA burns, formal fluid resuscitation

andmonitoring should follow.While inadequate fluid resuscitation may cause problems, over-resuscitation can also be detrimental. Wounds requiring surgical closure with skin grafts or flaps (typically anything more than a small full thickness burn) should be dealt with as early as possible. In low income countries, burns are treated up to one-third of the time with traditional medicine, which may include applications of eggs, mud, leaves or cow dung. Surgical management is limited in some cases due to insufficient financial resources and availability. The management of burns injury is critical in reducing mortality and limiting disability. The setting, Komfo Anokye Teaching Hospital, has an ultra-modern emergency centre running. The facility has burns intensive care unit (BICU) in place. The emergency unit has been admitting burns cases ranging from single home accidents to mass explosions as they occur. This study seeks to estimate the trend and mechanism of burns injury at the KATH.

1.2 Problem Statement

The Burns Intensive Care Unit (BICU) receives almost all burns cases from the northern belt of Ghana, and at times some from the southern part and its neighboring countries. It has been observed that burns injury and its sequellae has not only increased the mortality in Ghana but also rendered many victims disable, increasing the economic burden on the government of Ghana.

Ignorance and poor fire safety standards have caused an increase in the number of burns injury. Evidence have also shown that the extent of damage, the degree of burns, cause of injury and the area involved as well as co-morbidity are factors that influence mortality. Again, the quality and timely management of burns injury also promotes or delays recovery. Studies (Agbenorku et al , 2010)have

indicated that most burn injuries are preventable but due to ignorance, illiteracy and poverty, people easily get burns which leave psychosocial and physical trauma with severe complications on victims.

Sadly, critical research studies on burns situations in Ghana has not been enough especially at KATH to help with the management systems. Furthermore, only 12% of nurses at the BICU have undergone training in burns trauma management. It is against this background that this study is carried out to establish the trend and mechanism of burns at KATH for the past five (5) years so as to institute preventive measures and develop some strategies to reduce burns injury and possible resultant mortality rate typically in Ghana. The study would again help to identify risk factors, create awareness and develop community support systems, advocacy, lobbying and multispectral collaboration.

1.3 Research Questions

The following research questions would guide the study to achieve the research objectives:

1. What is the trend of burns in the past 5 years at KATH?
2. What is the prevalence of severe burns at KATH?
3. What are the main causes of burns presented at KATH from May, 2009 – April, 2014?
4. What is the degree of burns and Total Body Surface Area (TBSA) of burn victims reported at KATH?
5. What is the survival rate of burns patients at KATH?

1.4 Study Objective

1.4.1 General Objectives

The main purpose of the study is to estimate the trend and mechanism of burns at Komfo Anokye Teaching Hospital (KATH) for a 5-year period.

1.4.2 Specific Objectives

To help achieve the general purpose, the study seeks to achieve the following specific objectives:

1. Determine the trend of burns injury brought to KATH in the past 5 years?
2. Estimate the prevalence of burns at KATH?
3. Estimate the main causes of burns presented at KATH from January to April 2014?
4. Measure the degree of burns and TBSA victims that reported at KATH?
5. Estimate the survival rate of burns patients at KATH?

1.5 Significance of the Study

The research hopes to establish the trend and mechanism of burns injury with its consequences on clients at KATH. This would provide a fair knowledge on areas to be tackled and the appropriate advice that can underpin the public to reduce or curb the situation.It is assumed that with stringent legislation and vibrant advocacy measures, the incidence of burns injury would reduce.

It is observed that majority of severe burns injury are found in the low and middle income countries with high mortality rates of which Ghana is not an exception. However, most of these burns injury are preventable.

The study would therefore be a source of reference for other researchers in a similar field of study, and thus add to the store of literature. The findings and recommendations outlined at the end of the study would also inform and guide policy makers and the management of KATH on burns treatment and handling and in fact the general hospital practices.

1.6 Limitations of the Study

Undoubtedly, an academic study of this nature would not go without certain limiting factors. The study was conducted at a single hospital - KATH and thus the study findings are not generalizable to burns cases in the entire country but only KATH. Again for want of time and other resources, the study could have been extended to cover more than the 5-year period the researcher opted for to allow for a more in-depth examination and analysis.As data in a retrospective study setting are not originally produced for investigational purposes, the data sheets are not always uniform, nor are the data reported in a consistent manner and might therefore lead to missing values.

1.7 Scope of the Study

The study concentrated on only KATH in Kumasi – Ghana and again ignored the cases of out-patients. No human respondent was involved but the researcher sourced data from the clinical records of admitted cases from patients' folders available. Overcoming the possible limitations of the retrospective nature of the data, the researcher took the pain and with the help of research assistants recorded all the necessary data from the medical records of patients to ensure confidentiality and credible data.

1.7 Organization of the Study

The study has been organized under six chapters. The first chapter introduces the entire study. Chapter two deals with the review of relevant literature detailing types and causes of burn injury, classification of burns, the pathology of burns and risk factors and management of burns. Further, burns complications and preventive measures were also covered.

The third chapter explained the methodological approach for the study outlining the research design, the study population, sample size, sampling techniques, data collection tools used and the data analysis procedure. The chapter also presents the validity and reliability of the study data as well as the ethical issues observed. Chapter four was devoted to results of the study, with Chapter five for discussion of data whilst the last Chapter six summarizes the research findings, states conclusion and outlines recommendations for stakeholders' consumption.

CHAPTER TWO

2.0 LITERATURE REVIEW

This second chapter of the study reviews some empirical studies of other authors which are deemed relevant to the current topic of study. The review covers the concept and definition of burns, causes, classification and pathophysiology of burns. Other areas also include management of burns, burn complications and prevention.

2.1 Definition and Concept of Burns

A burn is a type of injury to the skin (and deeper structures) caused by heat, electricity, chemicals, or radiation (sunburn) (Herndon, 2012). Burns are highly variable in terms of the tissue affected, severity, and resultant complications with subsequent pain due to profound injury to nerves. Structures such as muscle, bone, blood vessels, dermal and epidermal tissue can also be damaged. Depending on the degree and/orthe location of the body affected, `a burn victim may experience a wide number of potentially fatal complications including shock, infection, electrolyte imbalance, and respiratory distress (Agbenorku et al , 2010).

Rong and Karger (2004) reiterate that the socio-economic implications of burns cannot be overemphasized as burn represents an extremely stressful experience for both the burn victims as well as their families. Patients who suffer from extensive burn injuries frequently die, while others suffer from long hospitalization, multiple surgeries, and prolonged rehabilitations. Prevalence of burn in Ghana needs a track to see its reflections in studies from different parts of the country. Burden of this phenomenon causes severe pressures on financial and manpower resources (Batra, 2003; Subrahmanyam, 1996). Therefore, Epidemiological studies have an important role in recognition of risk factors and high-risk groups.

Burns are serious but preventable accidents (Cronin, Butler, and Edwards, 1996) and without recognition of affecting factors we cannot plan any preventive program. Cronin, Butler, and Edwards(1996) posit that high incidence among young adults may be explained by the fact that they are generally active and exposed to hazardous situations both at home and at work. However, low percentage of old people in the present study might be explained by the social structure in our setup as older members usually live within the family, thus decreasing their exposure to hazardous situations.

The high incidence of flame burn is explained by use of oil for lamps in villages, candle for lighting, substandard kerosene and gas stoves, use of open coal and wood fires and use of pressure stoves for cooking in urban areas. Open coal or wood fires were the most common source and were responsible for 33.19% total burn cases in India (Cronin, Butler, and Edwards, 1996) . This is consistent with the findings of study in developing countries. On the other hand, the picture reported from industrialized countries differs, where flammable liquids and gas stoves were the most common source of flame burns.

Burns and scalds constitute 5–12% of all traumas and a common problem presented to the health professionals working in hospitals. WHO (2006) reports that in United States 5,500 deaths were caused by burn in 1991. India shows that 700,000 patients per year are admitted due to burn but few of them receive attention in specialized burn unit. According toBatra (2003), approximately 90% cases of burn occur in developing world out of which 70% involve children.

Person with the burn injuries greater than 40% TBSA seldom survive in developing world. The study further reports that most incidence of burn takes place most

commonly at home because of cooking, availability of inflammable materials, life style and social factors.

Scalds among the children are frequent occurrence at home (WHO, 2006). This pattern suggests certain life style, behaviour of individual and age group predisposition to burn. Searching, suspicious nature and lack of knowledge of danger, play some role in burn injury of children while the young adults are burnt because they are in the active part of life to tackle all situations both at home as well as work. Elderly persons are at non active part of life, therefore not much exposed to the hazardous situations. Female preponderance in the age group 5-14 and later part of life coincides well with the other studies done in developing countries. Few victims are seen above the age of 56 years, while the largest populations of the burn victim are in the age group 16-25years, a finding similar to the study done in India and Jordan (Maghsoudi, 2005).

2.2 Types or Causes of Burn Injury

Depending on the causative agent burns are classified as follows:

a. Physical, Thermal burns (dry heat - flame burns and wet heat - Scalds), Electrical burns, (high voltage and low voltage), Radiation burns (Lasers, sun burn).
b. Chemical (acid burns, alkali burns) (Tiwari, 2012).

2.2.1 Thermal Burns

Thermal burns are caused by fire, steam, hot objects, or hot liquids. Scald burns from hot liquids are the most common burns to children and older adults. Of house fires that result in death, smoking causes 25% and heating devices cause 22%.

Almost half of injuries are due to efforts to fight a fire (Herndon, 2012).Various causes of scalding as observed by Herndon (2012) include hot liquids or gases and most commonly occurs from exposure to hot drinks and high temperature. Equally,tap water in baths or showers, hot cooking oil, or steam also contribute to scalding.Contact with hot objects is the cause of about 20-30% of burns in children (Herndon, 2012).Generally, scalds are first- or second-degree burns, but third-degree burns may also result, especially with prolonged contact.

2.2.2 Electrical Burns

Electrical burns or injuries are classified as high voltage (greater than or equal to 1000 volts), low voltage (less than 1000 volts), or as flash burns secondary to an electric arc (Tintinalliand Judith, 2010). Herndon (2012) observes that the most common causes of electrical burns in children are electrical cords (60%) followed by electrical outlets (14%). He further noted listening as also a cause of electrical burns. Risk factors for being struck include involvement in outdoor activities such as mountain climbing, golf and field sports, and working outside. Mortality from a lightning strike is about 10% (Marx, 2010).

Burns injuries caused by electrical may also cause fractures or dislocationsecondary to blunt force trauma or muscles. Marx (2010) adds that in high voltage injuries, most damage may occur internally and thus the extent of the injury cannot be judged by examination of the skin alone. According to Marx cardiac arrhythmias or cardiac arrest may be caused by contact with either low voltage or high voltage.

2.2.3 Radiation Burns

Radiation burns may result from protracted exposure to ultraviolet light from the sun, tanning booths or arc welding. Equally as ionizing radiation from such sources as radiation therapy, X-rays or radioactive falloutcan cause radiation burns(Prahlow, 2010). Sun exposure is the most common cause of radiation burns and the most common cause of superficial burns overall. There is significant variation in how easily people sunburn based on their skin type. As Prahlow (2010) explains, skin effects from ionizing radiation depend on the amount of exposure to the area. Redness, if it occurs, may not appear until sometime after exposure. Radiation burns are treated the same as other burns (Marx, 2010).Microwave burns occur via thermal heating caused by the microwaves.While exposures as short as two seconds may cause injury, however, this is an uncommon occurrence (Krieger, 2001).

2.2.4 Chemical (acid burns, alkali burns)

Chemicals cause from 2 to 11% of all burns and contribute to as many as 30% of burn-related deaths. Chemical burns can be caused by over 25,000 substances (Tinitalli, 2010), most of which are either a strong base (55%) or a strong acid (26%). Most chemical burn deaths are secondary to injection. Marx (2010) identifies some common agents including sulphuric acid as found in toilet cleaners, sodium hypochlorite as found in bleach, and halogenated hydrocarbons as found in paint removers, among others Studies (Makarovsky, 2008; Brunicardi, 2010) also prove that Hydrofluoric acid can cause particularly deep burns which may not become symptomatic until sometime after exposure, equally as Formic acid which may cause the breakdown of significant numbers of red blood cells.

2.2.5 Accidental and Non-accidental

Among patients hospitalized from scalds or fire burns, 3–10% are from assault for whichreasons include spousal abuse, child abuse, personal disputes, elder abuse, and business disputes. An immersion injury or immersion scald may also indicate child abuse (Peck, 2012). It is created when an extremity or the lower body (buttock or perineum) is held under the surface of hot water. It typically produces a sharp upper body border and is often symmetrical. Other high-risk signs of potential abuse include: circumferential burns, the absence of splash marks, a burn of uniform depth, and association with other signs of neglect or abuse.Some non-accidental burns in the view of Herndon (2012) include bride burning.

A form of domestic violence occurs,in some cultures such as India where a woman is burned due to what the husband or his family considered to be inadequate dowry. In Pakistan, acid burns represent 13% of intentional burns, and are frequently related to domestic violence (Herndon, 2012). Self-immolation (setting oneself on fire as a form of protest) is also relatively common among Indian women (Peck, 2011). Apart from the obvious fact that skin damage is present in all these burns, local and systemic management are not the same for each of the above burns.

2.3 Signs and Symptoms

Superficial burns cause pain lasting two or three days, followed by peeling of the skin over the next few days. Individuals suffering from more severe burns may indicate discomfort or complain of feeling pressure rather than pain (Granger, 2009). Full-thickness burns may be entirely insensitive to light touch or puncture.While superficial burns are typically red in color, severe burns may be pink, white or black

(Herndon, 2012).Burns around the mouth or singed hair inside the nose may indicate that burns to the airways have occurred, but these findings are not definitive (Brunicardi, 2010). More worrisome signs include shortness of breath, hoarseness and stridor or wheezing(Brunicardi, 2010).

During the healing process, itchiness is common occurring in up to 90% of adults and nearly all children. Numbness or tingling may persist for a prolonged period of time after an electrical injury (Goutos et al, 2009). Burns may also produce emotional and psychological distress.

2.4 Classification of Burn Injuries

Burns can be classified by depth, mechanism of injury, extent, and associated injuries. The most commonly used classification is based on the depth of injury. The depth of a burn is usually determined via examination, although a biopsy may also be used. Tiwari (2012) posits that it may be difficult to accurately determine the depth of a burn on a single examination and repeated examinations over a few days may be necessary. Based on the depth of injury, burns can be classified as First-degree burn or epithelial burns, Second-degree burns (Second-degree superficial and second-degree deep) and Third-degree burn (full thickness burns).

2.4.1 Superficial (First Degree) Burns

This type of burns which affect only the superficial layer of the skin (Epidermis) is described as superficial burn. It appears red without blisters and dry pain. It takes 5–10 days to heal and it heals well. Repeated sunburns increase the risk of skin cancer later in life.

2.4.2 Superficial Partial-Thickness (Second Degree) Burns

Second-degree burns are typically caused by hot water and are always accompanied by blister formation. Second-degree burns are erythromatous, sore, and moist. They are also called dermal partial thickness burns (Hettiaratchy and Papini 2004).It extends from the epidermis into superficial (papillary) dermis. There is redness with clear blister which blanches with pressure. It is moist and very painful similar to first degree burns. The pain is soothed by cooling. There are minimal or no edema, tingling and hyperesthesia since the nerve endings are present. Healing takes place less than 2–3 weeks with local infection/cellulites but no scarring typically.

2.4.3 Deep Partial-Thickness (Second Degree) Burns

It involves the epidermis, upper dermis, and extends into deep (reticular) dermis. It is similar to third degree burns and appears yellow or white, less blanching. It may be blistering with mottled red base, broken epidermis, weeping surface and edema but in some instances fairly dry. Deep dermal burns have immediate blistering, the skin peels off, and the exposed reticular dermis has no capillary refill, the circulation is sluggish and pain sensation is decreased.

Dermal vascular plexus is extensively destroyed. Healing time is over 21 days and hypertrophic scarring is likely. Deep second-degree burns are considered deep burns and require excision and skin grafting. A large, deep second-degree burn requires excision and skin grafting. (Jackson 1953, Hettiaratchy and Papini 2004, Evers et al. 2010).There is pressure and discomfort, sensitive to cold air. Recovery is in 3 to 8 weeks, with some scarring and depigmentation, contractures which may require excision. Infection may convert it to full thickness which may prolong hospitalization.

2.4.4 Full Thickness (Third Degree) Burns

This type of burns involves the epidermis, entire dermis and sometimes subcutaneous tissues. They are stiff, pale white or brown with no blanching, very dry, leathery or charred. Sometimes with broken skin with fat exposed and oedema. It is Painless; there may be shock, haematuria (blood in the urine) and possibly haemolysis (blood cell destruction). Flame usually causes a third-degree burn. As described by Hettiaratchy and Papini (2004) the burn is deep, impacting all layers of skin and at worst also subcutaneous tissue and muscles. The injured area is dry, leathery, and without sensation as the sensory nerves is destroyed. There is no blister formation and no capillary refill. A third-degree burn does not heal spontaneously but always requires surgery. Scarring is inevitable.

Hyper metabolism develops as a consequence of large burns. Energy expenditure, oxygen consumption and carbon dioxide production increase. This leads to increased ventilatory demand and minute ventilation increases. Hemodynamic is typically hyper dynamic; heart rate and cardiac output increase although occasionally myocardial depression may occur. As a sign of systemic inflammatory response hyperthermia may develop. Thermal injury also causes per oxidation of hepatocytes, tubular dysfunction in the kidneys and decreased blood flow to the bowel, pulmonary hypertension and oedema. Catabolic reactions in fat and muscle tissue can be seen (Latenser 2009).Healing is prolonged (months) and incomplete Scarring, contractures, and amputation may result. Early excision is recommended.

2.4.5 Deep Full-Thickness (Fourth Degree) Burns

Deep Full Thickness extends through entire skin and into underlying fat muscle and bone. It appears black or charred witheschar, sloughs may be present.

It is dryand painless and has possible entrance and exit wounds in electrical burn.Scarring require excision and skin grafting may be necessary. Contractures and loss of digits or extremity requires amputation, significant functional impairment and, in some cases, death may result.

Hyper metabolism develops as a consequence of large burns. Energy expenditure, oxygen consumption and carbon dioxide production increase. This leads to increased ventilatory demand and minute ventilation increases. Hemodynamics is typically hyper dynamic; heart rate and cardiac output increase although occasionally myocardial depression may occur. As a sign of systemic inflammatory response hyperthermia may develop. Thermal injury also causes per oxidation of hepatocytes, tubular dysfunction in the kidneys, and decreased blood flow to the bowel, pulmonary hypertension and oedema. Catabolic reactions in fat and muscle tissue can be seen (Latenser, 2009).

Burns can also be classified according to the extent of injury. Based on this, the total body surface area of injury (TBSA) can be estimated in percentage terms. In this case burns are classified by the American Burns Association as minor, moderate and major. The estimate to determine the type of class is dependent on individual's age and the classification according to Garmel(2012) is presented on Table 2.1.

Table 2.1 American Association of Burns TBSA Classification

Minor	Moderate	Major
Adult <10% TBSA	Adult 10-20% TBSA	Adult>20% TBSAYoung or old
< 5% TBSA Young or old	5-10% TBSA Young or old	>10% TBSA
<2% full thickness burn	2-5% full thickness burn	>5% full thickness burn
High voltage injury	High voltage burn	
Possible inhalation injury	Known inhalation injury	
Circumferential burnsignificant burn to face, joints, hands or feet		

Source: Garmel (2012)

Burn severity is determined through among other things the size of the skin affected. The size of a burn is measured as a percentage the total body surface area (TBSA) affected by partial thickness or full thickness burns. First-degree burns that are only red in color and are not blistering are not included in this estimation.Most 1st degree burns (70%) involve less than 10% of the TBSA (Tintinalli, 2010).

There are a number of methods to determine the TBSA, including the ‘‘rule of nines’’, Lund and Browder charts, and estimations based on a person’s palm size. The rule of nines is easy to remember but only accurate in people over 16 years of age.More accurate estimates can be made using Lund and Browder charts, which take into account the different proportions of body parts in adults and children. The size of a person's handprint (including the palm and fingers) is approximately 1% of their TBSA (Herndon, 2012).

2.5 Pathophysiology

At temperatures greater than 44 °C (111 °F), proteins begin losing their three-dimensional shape and start breaking down (Marx, 2010).This results in cell and tissue damage. Many of the direct health effects of a burn are secondary to disruption in the normal functioning of the skin. They include disruption of the skin's sensation, ability to prevent water loss through evaporation, and ability to control body temperature. Disruption of cell membranes causes cells to lose potassium to the spaces outside the cell and to take up water and sodium (Tintinalli, 2010).

In large burns (over 30% of the total body surface area), there is a significant inflammatory response, this results in increased leakage of fluid from the capillaries and subsequent tissue oedema, (Brunicardi, 2010). This causes overall blood volume

loss, with the remaining blood suffering significant loss of plasma, making the blood more concentrated.Renal failure and stomach ulcers may result from poor blood flow to organs such as the kidney and the gastrointestinal tract (Hannon, 2010).

Increased levels of catecholamine and cortisol may result in a hyper metabolic state which can last for years. This is associated with increased cardiac output metabolism, a fast heart rate, and poor immune function (Rojas et al, 2012). The presence of a smoke inhalation injury, other significant injuries such as long bone fractures and serious co-morbidities (e.g. heart disease, diabetes, psychiatric illness, and suicidal intent) also influence prognosis (Tintinalli, 2010).

The prognosis is worse in those with larger burns, those who are older, and those who are females (Lloyd et al, 2012). In those who have head ache or are dizzy and have a fire-related burn, carbon monoxide poisoning should be considered. Cyanide poisoning should also be considered (Garmel, 2012).

2.6 Vulnerable Group

In the developed world, adult males have twice the incidence as females from burns. This is probably due to their higher risk occupations and greater risk-taking activities. In many countries in the developing world, however, females have twice the risk of males. This is often related to accidents in the kitchen or domestic violence (Peck, 2011).Children under the age of five, adolescent males and adults over 65 are mostly vulnerable.

2.7 Risk Factors

Herndon(2012) sees the presence of a pre-existing impairment, history of a sibling burn, and maternal illiteracy or low education cited as significant risk factors

for burns especially in childhood burns. Burn injuries occur more commonly in the poor. Smoking has also been noted as a risk factor, although alcohol use is not. Fire-related burns are generally more common in colder climates. Specific risk factors in the developing world include cooking with open fires or on the floor as well as developmental disabilities in children and chronic diseases in adults (Peck, 2011).

2.8 Management of Burns Injury

Management of burn injuries begins right from the very time the burn occurs where pre-hospital care is necessary before admission at the hospital. Subsequently, in-patient provision, application of intravenous fluid, wound care, medication, surgery and other alternative medicines would be taken in the burn management practices.

2.8.1 Pre-hospital Care

The availability, accessibility, affordability, and awareness of pre-hospital and emergency care after burns are crucial determinants between life and death after burn injuries. First-aid respondents, strengthening ambulance services, decreasing the interval between injury and hospital contact, promoting referral system based on triage, availability of facilities in hospitals, and expanding communication networks are key strategies to improve pre-hospital care.

Unfortunately, the absence in most Lower Middle Income Countries (LMICs) of efficient first aid networks, an inefficient culture-specific ambulance service, and improper referrals not based on proper triage result, delays in presentation and hospitalization strongly impact morbidity and morbidity secondary to major burn injuries.Burn care in low- and middle-income countries (LMICs) is very dependent on the availability of financial resources, equipment, and expertise.

An additional important problem is that burn care in most developing countries is usually delayed. In rural areas, access to burn care facilities and thus proper treatment are compromised by factors such as long distances to travel, inaccessible roads, and unavailable transportation means. Burn survivors in Ghana for example seek medical help at the local hospitals only when their burns become infected, often waiting as long as 60 days.

Only 48% of all childhood burns in Ghana are treated at a modern health care facility, of which 68% are treated within 24h post-burn. Lack of knowledge regarding the seriousness of the illness and financial constraints are some of the reasons Forjuoh et al, (1995) cited for the delay in treatment.

To provide optimal burn care to a large population with limited resources, it is imperative to strengthen the existing infrastructure. A few regional burn centers should be developed to provide tertiary management and training to burn care staff. General surgeons working in district hospitals should form the nucleus of the burn care service and decide on referral procedures.

2.8.2 In-patient Provision for Burn Injuries

Burn service stratification is necessary to optimize access to the appropriate level of expertise and minimize unnecessary travelling by patient and family. Basic burn care provision should be undertaken at district and base hospitals led by general surgeons with burns training. Fluid resuscitation, conservative wound management, blood transfusion, treatment of septicemia and simple skin grafting can beundertaken locally, whereas complex and extensive burns should be treated at regional burn centers which can offer as much as possible high-quality rehabilitation, reconstructive surgery, and other therapies.

Referral guidelines should be drawn up to aid the identification of factors that can make a burn injury complex and suggest the need for early referral to the regional burns center. If it is not possible to keep referred patients at burn centers for six to eight weeks of treatment, they can be discharged after two or three weeks of stabilization. Such patients can then be treated at district hospitals or at home with the help of primary health centers. Thus, primary health centers can act as liaison between burn patients and district hospitals. The incidence of burn wound septicemia with domiciliary treatment is remarkably low. These patients can be readmitted as necessary for blood transfusions, treating septicemia, and skin grafting.

The need to target health needs appropriately based on priorities defined locally is increasingly recognized as being of crucial importance. Difficulties faced by practitioners in the developing nations arise primarily from inability to provide the same level of infrastructure, technical support, and resources as in developed countries. Local practitioners should be innovative in adapting available resources and facilities to the needs of their patients while maintaining minimally acceptable standards

Operating theatres in developing countries often do not adhere to standards for physical parameters. However, optimizing usage of existing facilities should be encouraged, such as placing two operating tables in one theatre for simultaneous surgical operations. This has proved to be safe in various settings and highly cost effective. Reuse and recycling of donated and purchased items can allow health care facilities in developing countries to remain financially viable. Hospital based management involves resuscitation which begins with the assessment and stabilization of the person's airway, breathing and circulation. If inhalation injury is suspected, early intubation may be required (Granger, 2009).

This is followed by care of the burn wound itself. People with extensive burns may be wrapped in clean sheets until they arrive at a hospital.As burn wounds are prone to infection, a tetanus booster shot should be given if an individual has not been immunized within the last five years (Brunicardi, 2010). With major burns, early feeding is important. Hyperbaric oxygenation may be useful in addition to traditional treatments.

In children with more than 10-20% TBSA (total body surface area) burns, and adults with more than 15% TBSA burns, formal fluid resuscitation and monitoring should follow.While inadequate fluid resuscitation may cause problems, over-resuscitation can also be detrimental. Wounds requiring surgical closure with skin grafts or flaps (typically anything more than a small full thickness burn) should be dealt with as early as possible. In low income countries, burns are treated up to one-third of the time with traditional medicine, which may include applications of eggs, mud, leaves or cow dung. Surgical management is limited in some cases due to insufficient financial resources and availability.

2.8.3 Intravenous Fluids

Research (Granger, 2009) has recommended boluses of isotonic crystalloid solution for victims with poor tissue perfusion.In children with more than 10-20% TBSA burns, and adults with more than 15% TBSA burns, formal fluid resuscitation and monitoring should follow (Granger, 2009).This should begin pre-hospital if possible in those with burns greater than 25% TBSA. The Parkland formula can help determine the volume of intravenous fluids required over the first 24 hours. The formula is based on the affected individual's TBSA and weight. Half of the fluid is to be administered over the first 8 hours, and the remainder given over

the following 16 hours. The time frame is calculated from the time at which the burn occurred, and not from the time at which fluid resuscitation was begun (Enoch et al, 2009). Children require additional maintenance fluid that includes glucose. Additionally, those with inhalation injuries require more fluid. While inadequate fluid resuscitation may cause problems, over-resuscitation can also be detrimental.The formulas are only a guide, with infusions ideally tailored to a urinary output of>30 ml/h in adults or >1ml/kg in children and mean arterial pressure greater than 60 mmHg ((Enoch et al, 2009).

While lactated Ringer's solution is often used, there is no evidence that it is superior to normal saline. Crystalloid fluids appear just as good as colloid fluids, and as colloids are more expensive they are not recommended (Granger, 2009). Blood transfusions are rarely required. They are typically only recommended when the haemoglobin level falls below 60-80 g/L (6-8 g/dL) due to the associated risk of complications (Wasiak, 2013). Intravenous catheters may be placed through burned skin if needed or intraosseous infusions may be used (Brunicardi, 2010).

The goal of fluid management in major burn injuries is to maintain the tissue perfusion in the early phase of burn shock, in which hypovolemia finally occurs due to steady fluid extravasation from the intravascular compartment (Haberal, Sakallioglu, Abali&Karakayli, 2010).

2.8.4 Wound Care

Early cooling (within 30 minutes of the burn) reduces burn depth and pain, but care must be taken as over-cooling can result in hypothermia. It should be performed with cool water 10–25 °C (50.0–77.0 °F) and not ice water as the latter

can cause further injury. Chemical burns may require extensive irrigation (Granger, 2009). Cleaning with soap and water, scraping of slough, necrotic tissue and or removal of eschar, and application of dressings are important aspects of wound care. If intact blisters are present, it is not clear what should be done with them. Some tentative evidence supports leaving them intact. Second degree burns should be re-evaluated after two days (Tintinalli, 2010).

In the management of first and second degree burns, little quality evidence exists to determine which type of dressing should be used. It is reasonable to manage first degree burns without dressings (Wasiak, 2013).While topical antibiotics are often recommended, there is little evidence to support their use (Marx, 2010).The use of Silver sulfadiazine or negative-pressure as a wound therapy has little evidence in wound dressing (Dumville& Munson, 2012).

2.8.5 Medications

Burns can be very painful and a number of different options may be used for managing pain. These include administration of analgesics such as ibuprofen and acetaminophen and opioids such as morphine. Anxiolytics such as Benzodiazepine may also be used as an adjunct to reduce anxiety. To reduce itching in the healing process antihistamines, gentle wound massage, or transcutaneous nerve stimulation may be used (Marx, 2010).Antihistamines, however, are only effective for this purpose in 20% of people (Zachariah, 2010).

Intravenous antibiotics are recommended before surgery for those with extensive burns (>60% TBSA).As of 2008, guidelines do not recommend their general use due to concerns regarding antibiotic resistance and high risk of fungal

infections (Herndon, 2012).Tentative evidence, however, shows that they may improve survival rates in those with large and severe burns. To prevent or treat anaemia in people with burns Erythropoietin has not been found to be effective (Anvi et al, 2010).Calcium gluconate is a specific antidote which may be used intravenously and /or topically in burns caused by hydrofluoric acid (Brunicardi, 2010).

2.8.6 Surgery

Jeschke (2012) advises that wounds requiring surgical closure with skin grafts or flaps (typically anything more than a small full thickness burn) should be dealt with as early as possible.Circumferential burns of the limbs or chest may need urgent surgical release of the skin, known as an escharotomy.This is done to treat or prevent problems with distal circulation, or ventilation. It is uncertain if it is useful for neck or digit burns. Fasciotomiesmay be required for electrical burns (Orgill& Piccolo, 2009).

2.8.7 Alternative Medicine

Honey has been used since ancient times to aid wound healing and may be beneficial in first and second degree burns.The use of aloe vera has been criticized for its poor quality (Jull et al, 2008). While it might be beneficial in reducing pain and a review from 2007 found tentative evidence of improved healing times a subsequent review from 2012 did not find improved healing over silver sulfadiazine (Dat et al, 2012).

In the treatment of keloids or scarring there is little evidence in support of the use of vitamin E.

Traditional medicine is commonly used in the treatment of burns in about one-third of the time in low income countries, which may include applications of eggs, mud, leaves or cow dung (Cox et al, 2007).Surgical management is limited in some cases due to insufficient financial resources and availability. There are a number of other methods that may be used in addition to medications to reduce procedural pain and anxiety including: virtual reality therapy, hypnosis and behavioral approaches such as distraction techniques (Herndon, 2012).

2.9Causes of Death of Burn Patients

The most common cause of death in patients with burns in developed countries is multiple organ failure (Brusselaers et al. 2010, Krishnan et al. 2012). The American Burn Association's registry of the causes of burn mortalities indicates that almost 50% of non-survivors died of organ failure (Miller et al. 2006). Organ dysfunctions are mainly noted in the pulmonary, cardiovascular, renal, hepatic, hematologic, and central nervous systems (Ferreira and Sakr, 2011). Later Lefering et al. in 2002, noted the gastrointestinal tract as one of the multiple organ failure (MOF) organs and found that gastrointestinal failure did not have impact on mortality and CNS damage was impossible to assess in most cases due to need for sedation for mechanical ventilation.

Due to these findings, Lefering et al. (2002) suggested that GI and CNS failure should not be considered in MOF score assessments.

By definition, multiple organ failure (MOF) and systemic inflammatory response syndrome (SIRS) both affect at least three organs. This makes pinpointing the clinical diagnosis of death especially challenging. Severe MOF and severe sepsis are both related to burn size, age, and male sex.

Both are related to the length of stay in intensive care and duration of mechanical ventilation (Cumming et al. 2001). Sepsis is a clinical syndrome that complicates severe infection and is characterized by systemic inflammation and widespread tissue injury. MOF is a continuum, with increased physiological derangements in individual organs; it is a process rather than an event (American College of Chest Physicians, 1992). Sepsis is a serious and common consequence of burn trauma although the number of patients dying of septicemia has declined (Bloemsma et al. 2008).

Burns shock and inhalation injury are the main causes of early death (< 48h post-burn) together with adult respiratory distress syndrome (ARDS), pneumonia, liver failure, ischemic bowel, and toxic megacolon, cardiac arrest, and myocardial infarction (Krishnan et al. 2012).

2.10BurnMortality

The outcome of burn patients has improved over the past decades (Åkerlund et al. 2007, Krishnan et al. 2012) with currently the overall mortality from burn injuries varying between 1.4% and 18% (Brusselaers et al. 2010). Brusselaers et al. (2010) further declare the factors predicting increased mortality to include contact burns, inhalation injury, age, burn size, and female gender. Mortality is highest during the first week post-trauma.

Previously up to 75% of all burn deaths have occurred with one week of the trauma (Coca et al. 2007). Individual organ failures such as the kidney affect the patient prognosis and raise the mortality to over 60% (Mosier et al. 2010).

However, careful fluid resuscitation and nutritional support, burn wound care and infection control, and pulmonary care are all attributable to better prognosis of the burn patient (Åkerlund et al 2007).

Mortality due to burn injuries is higher in developing countries as compared to developed countries because of lack of awareness among people and lack of availability of health care services. The developing countries also differ from developed countries with respect to sex of people affected, place of injury etc. Females are more affected in developing countries than developed countries and domestic burns are more in developing countries while non-domestic burns are more in developed country. Several studies on epidemiology of burns are done in different countries and in India.

Most of the studies have included different epidemiological factors such as age, sex, occupation, place of burns, cause of burns etc. in their study.Although flame, scald, chemical , electricity seem to be the direct causes of burns, underlying social factors like interpersonal relationship in the family , mental stress and negligence equally contribute.

2.11Complications

Throughout most of history, serious burns occupying a large percentage of body surface area were an almost certain death sentence because of subsequent infection. A number of factors such as disruption of the skin barrier, ready availability of bacterial nutrients in the burn milieu, destruction of the vascular supply to the burned skin, and systemic disturbances lead to immunosuppression combined together to make burns particularly susceptible to infection.

In his study, Taylor (2003) established that burn injuries lead to multiple short and long term costs to families, communities, and the nation.

The obvious consequences of burns are well known and include pain, infections, scarring wound contractures, amputations, and death, as well as psychological trauma. Hypertrophic scarring for example occurs in almost half of severe burn cases (Spurr, 1990). Keloid formation is relatively more common among people of African descent. Burn injuries are a major cause of prolonged hospital stays, disfigurement, disability, and death in Africa Region (Hyder et al, 2004). Non-visible sequelae also can be long lasting.

Main contributors to adverse outcome in severely burned patients are complex fluid and metabolic changes which occur in response to the initial injury. Research (Hyder et al., 2014) found that hyper metabolic and inflammatory alterations can be in a hyper inflammatory state three years post-burn. Pediatric patients in the United States (n=977) with burns over 30% of their total body surface were followed for up to three years and compared to a cohort of non-injured children.

The resting energy expenditure, body composition, metabolic markers, cardiac and organ function clearly demonstrated that burns caused profound alterations even several years post-burn- demonstrating marked and prolonged hyper metabolism.Increasedhyper metabolism, elevated cortisol, catecholamine, cytokines, and acute phase proteins indicate that burned patients are in a hyper inflammatory state up to three years after the burn injury was sustained. Even though the metabolic alterations after severe burn injury are similar to any major trauma, they are characterized by responses more extreme and sustained (Jeschke et al, 2011).

Burn injuries often lead to long hospital stays In a retrospective analysis of case notes of 149 children with burns who were presented to Hlabisa Hospital in

KwaZulu Natal, South Africa, 59% (88) were admitted (Chopra et al, 1997), of them 22% (19) developed wound infections, 6% (5) developed contractures and 23% (20) required a total of 32 surgical procedures, and one died. Burns were responsible for more pediatric patient days spent in hospital than any other condition except malnutrition.

In Ghana, short term complications as identified by Forjuoh (1995) include infection and septicemia. Eighteen percent of childhood burns led to long-term physical impairment or disability. They include, hypertrophic scarring and Keloid, contractures, amputations, and other disfigurement (Forjuoh et al, 1995).

At Bugando Hospital in Mwanza Tanzania for example, from 1995-1997 while burns were only 2.6% of the injuries that were reported, the case fatality rate which averaged 2.2% for all injury, was 13% for burns (even higher than traumatic amputation at 8.7%), (Rutta, 2001). LMIC hospital care is often plagued by chronic shortage of resources and health care professionals (Lau, 2006). As in many other LMICs, in Ghana, facilities to provide continuing care, functional and psychological rehabilitation, do not exist.

The victim and their families are left to their own devices to come to terms with sometimes, devastating injuries. Due to genetic factors, accessibility and affordability of hospital treatment, reliance on traditional medicine and high burns infection rates, many of these burns result in keloid scarring or contracture formation, in turn leading to significant physical impairment.

Again, a number of complications may occur, with infections being the first enemy for the burnt patient.In order of frequency, potential complications may include respiratory failure, urinary tract infections, pneumonia andcellulitis.Risk

factors for infection include: burns of more than 30% TBSA, full-thickness burns, extremes of age (young or old), or burns involving the legs or perineum (Herndon, 2012). Pneumonia occurs particularly commonly in those with inhalation injuries (Brunicardi, 2010).

Anaemia secondary to full thickness burns of greater than 10% TBSA is common (Granger, 2009). Compartment syndrome or rhadromyolisis seen in electrical burns is as result of muscle breakdown. Deep vein thrombosis is estimated to occur in 6 to 25% of people ((Brunicardi, 2010).The hyper metabolic state that may persist for years after a major burn can result in a decrease in bone density and a loss of muscle mass.Rojas et al, (2012) observed that hypertropical scars and Keloids could form in later days in a burnt patient, particularly in young and dark skinned people.

Children may experience psychological trauma withpost-traumatic stress disorder following burn injury (Juckett& Hartman-Adams, 2009). Scarring may also result in a disturbance in body image.Social isolation, extreme poverty and child abandonment are common in the developing world as a result of burns (Peck, 2011).

2.12 Prevention of Burns

Historically, about half of all burns were deemed to be preventable (Herndon, 2012). Many health, agencies, corporations, authorities, and even medical personnel in LMICs consider injury prevention to have a much lower priority than disease prevention. Injury prevention policies and programmes are conspicuously absent and ongoing efforts are crisis-oriented, adhoc, and unscientific in nature. It costs

approximately US$ 1000 per patient per day to provide satisfactory care in the Western world. This is clearly not possible in many developing countries.

Herndon (2012) suggests that prevention of burn injuries, based on the epidemiology of burn in developing countries, remains a major way of reducing the current spate of morbidity and mortality and is the only logical solution. This is not easy and is time-consuming. But easy or not, there are no options; burns must be prevented. Focusing on burn prevention in LMICs rather than on treatment cannot be overemphasized, owing to a shortage of secondary and tertiary management in these settings.

Adequate preventive measures towards high-risk population groups (under 3 years) and a specialized unit for adapted management should be instituted. Prevention programmes should be directed at behavioral and environmental changes which can be easily adopted into lifestyle.Burn prevention programs have significantly decreased rates of serious burns. Preventive measures include: limiting hot water temperatures, smoke alarms, sprinkler systems, proper construction of buildings, and fire-resistant clothing (Marx, 2010).

Experts recommend setting water heaters below 48.8 °C (119.8 °F). Other measures to prevent scalds include using a thermometer to measure bath water temperatures, and splash guards on stoves (Marx, 2010). While the effect of the regulation of fireworks is unclear, there is tentative evidence of benefit with recommendations including the limitation of the sale of fireworks to children (Herndon, 2012).

2.13Controversies in Burn Patient Care

2.13.1 On-scene Care

Studies (Allison, 2002) have proved that some on-scene actions help reduce the mortality of the burn patients. These actions include supplying oxygen, starting an intravenous line for analgesia and fluid resuscitation as well as avoiding hypothermia (Singer et al. 2010). Muehlberger et al. (2010) added that obtaining a victim's medical history and detailed information about the burn injury and assessing possible concomitant injuries affect the prognosis and care given to burn victims.

Some other on-scene action including the necessity and indication of intubation on site or during transportation, the amount and quality of fluid resuscitation a pre-hospital estimate of burn size and degree (Mackie et al. 2009), burn wound coverage, and the speed of transport to the trauma center with or without a pre-hospital physician (Eastman et al. 2010; Endorf and Gamelli 2007) have been found useful but still remain subjects of debate.

2.13.2 Intubation

Inhalation injury is diagnosed in 13% of flame injury patients (American Burn Association 2013). Inhalation injury causes airway swelling and obstruction. It is vital that patients with inhalation injuries are recognized and intubated at the site of the injury (Mackie et al. 2009,) In order to correct hypotension caused by sedation during intubation, fluid resuscitation must be augmented (Cancio et al. 2004, Steinval et al. 2008). Patients receiving excessive volumes of fluids are at increased risk of sepsis, adult respiratory distress syndrome (ARDS), pneumonia, multiple organ dysfunction syndrome, and death (Klein et al. 2007).

Intubation also increases the risk of pneumonia in burn patients (Mosier and Pham 2009). Intubating all burn patients is not recommended because of risks related to

intubation (Mackie et al. 2011), however, not intubating a patient with inhalation injury may lead to airway obstruction (Eastman et al. 2010,). Therefore the subject of intubation on site is complex and hotly debated. Mackie et al. (2009) suggest that improving the diagnosis of inhalation injury would benefit the burn patients as unnecessary intubation could be avoided.

2.13.3 Fluid Resuscitation

An effective fluid resuscitation regimen has been one major aspect of modern burn care because it has strongly improved patients survival (Åkerlund et al. 2007). The Parkland formula is one widely accepted and well-studied protocol for carrying out fluid resuscitation (Bak et al. 2009). However, there seems to be a trend towards providing increasing amounts of fluids, in excess of the Parkland recommendations, to avoid acute kidney injury during acute burn resuscitation in severely injured burn patients A number of studies have confirmed that exceeding the Parkland formula may have harmful effects and lead to increased mortality (Klein et al. 2007). Over-resuscitation according to Vaara et al. (2012) increases the risk of infectious complications, ARDS, abdominal compartment syndrome, and death.

The controversy between the uses of colloids versus crystalloids for fluid resuscitation in burn patients still persists. Fluid resuscitation with crystalloids frequently leads to hypoalbuminemia and it is debated whether this should be corrected by albumin supplementation (Atiyeh et al. 2012). Some studies conclude that patients resuscitated with colloids required less fluid than patients resuscitated with crystalloids (Atiyeh et al. 2012), but others (Perel and Roberts 2012) have debunked this belief. Colloids can almost completely prevent edema in unburned tissues. The outcome benefit of colloid use is still under discussion, however. Some

studies deny that any outcome benefit has been proven so far whilst others advocate the use of albumin as it is not harmful and argue that it provides a mortality benefit (Endorf and Dries 2011).

Albumin use is also associated with a reduced need for vasopressors and a shorter duration of mechanical ventilation in burn patients with burns to 20% or more of their total body surface area (Park et al. 2012). Although biological colloids such as albumin or fresh frozen plasma carry a risk of biological disease transmission, they are a better choice than synthetic colloids if colloids must be used (Atiyeh et al. 2012). They claim fresh frozen plasma to be the best colloid solution available for burn patients as it diminishes the coagulopathy risk.

Other studies have found the use of colloids harmful (James 2012). Colloid use may increase bleeding and mortality and increase in lung edema. Hydroxyethylstarch (HES) has proven to be an especially harmful colloid for critically ill patients. Large studies have proven HES to increase the risk of AKI, renal replacement therapy, acute liver injury, and death compared to crystalloids (Nisula et al., 2013).

In 2008, the American Burn Association recommended that crystalloid-based resuscitation be used during the first 24 hours (Endorf and Dries, 2011). As colloids are more expensive than crystalloids and do not improve survival, the use of colloids is not justified (Bayer et al., 2012; Perel and Roberts, 2012; Perel et al. 2013).

CHAPTER THREE

3.0 MATERIALS AND METHODS

This chapter presents the procedures and approach through which data was gathered for the study. Research methodology according to Gravetter, and Forzano, (2006) refer to the techniques used to structure a study, gather and analyze data in the course of research investigation. In addition, it consists of a set of orderly disciplined procedures, styles and strategies to acquire and analyze information. In the current study therefore, areas covered under this study include the research design, population, sample size and sampling techniques, data collection tools and procedures. Further, this chapter outlines briefly the data analysis procedure, validity and reliability of data as well as ethical considerations for the study.

3.1 Profile of the Study Area.

The study was conducted at Komfo Anokye Teaching Hospital (KATH) in Kumasi, the capital of Ashanti Region of Ghana. The hospital was formally known as Kumasi Central Hospital. It was established in 1955. It gained a teaching hospital status in 1975 for the training of medical students from Kwame Nkrumah University of Science and Technology. KATH is the second largest hospital in Ghana under the auspices of Ministry of Health and has a bed capacity of 1000. A newly-established ultra-modern Accident and Emergency Centre with a bed capacity of 120 was built in 2009. KATH is accessible to about 80% of the population of Ghana. Patients from the Ashanti, Northern, Upper East, Upper West, Central, BrongAhafo and Western regions and neighboring countries such as La Cote d'Ivoire, Burkina Faso, and Togo are admitted due to its strategic location in the middle belt of Ghana (Figure 3.1). The nursing strength is 796 which are made up of all categories of nurses (Anon, 2009).

Departments

The hospital has 14 directorates and 15 units. The Directorates Include, Trauma Orthopedics, Emergency Medicine, Anesthesia and Intensive Care, Child Health, Ear, Eye, Nose and Throat (EENT), Diagnostics, Domestics, Medicine, Obstetrics and Gynecology, Oncology, Polyclinic, Oral Health (Dental), Pharmacy and Surgery. The Units Include Chaplaincy, General Administration, Health Insurance, Human Resource, Information Technology, Internal Audit, Planning, Public Relations, Quality Assurance, Research and Development, Security, Social Welfare, Supply Chain Management, Transfusion Medicine, and Technical Services (Anon, 2009).

3.2 Research Design

Burns and Grove (2001) described research design as a blueprint for conducting a study that maximizes control over factors that could interfere with the validity of findings. In his contribution to better understand research design, Kumar (2005) also described it as a procedural plan that is adopted by researchers to answer research questions vividly, accurately, objectively and economically.

The study adopted the retrospective design on burns patients that have been presented at the Burns Unit of the Komfo Anokye Teaching Hospital, Kumasi. This study reviewed records within the period of May 2009 to April 2014. The study considered all cases presented to the Burns Intensive Care Unit (BICU) and D2C.

Data was primarily a secondary type extracted with a standardized prepared sheet from the clinical records of burns in-patients for the 5-year period under review.

In this study, the quantitative methodology has been adopted to help find answers to the research questions. The researcher deems the quantitative paradigm fit for this

study because it is able to produce quantifiable data that can be generalizable to the study population, and in fact that is the strength of a quantitative research methodology supported by most prior researchers (Gravetta and Forzano, 2006).

Inclusion criteria

This study includes all folders of patients who were admitted at Komfo Anokye Teaching Hospital for plastic surgery and burns related problems.

Exclusion criteria

The study excluded patients who were not admitted to the burns units at KATH within the period.

3.3 Study Population

A population is the entire set of individuals of interest to the researcher. Amoani (2005) refers to a study population as the totality of whatever objects or measurements that the researcher is investigating. The study participants are drawn from the folders of burns patients who were admitted at the Burns Intensive Care Unit (BICU) and D2C ward. The researcher gathered 770 folders of burns in-patients for the 5-year period under review which constituted the total population for the study.

3.4 Sample Size

In an academic study of this nature, it is sometimes not possible to include the entire population to participate in the study and thus requires taking a sample. A sample according to Bouma and Atkins (1995) is a subset of a population, and the number of elements in the sample is also referred to as the sample size. Bouma and Atkins further describe a sample as a set of individuals who participate in the study as obtained from the study population. They posit that the more accurately we expect the data to reflect the population, the larger will be the sample size and the more

reliable and valid the results based on it will become. Simply put, a sample should be representative enough of the population. Out of the target population of 770, a sample size of 300 folders of admitted cases were selected for the study. The composition of the sample size for the current study is presented on Table 3.1.

Table 3.1 Composition of Sample Size

Year	Frequency	40% Sampled
2009 (May-December)	66	26
2010	139	56
2011	191	76
2012	177	71
2013	142	57
2014 (January-April)	55	22
Total	**770**	**300**

Source: Research data, 2014

However,eight folders were found not completely accurate with the needed information and so were rejected to round the sample size to 300 participants.

3.5 Sampling Techniques

Simple random sampling adopted for this study helped to correctly sample a folder in a random manner. In-patients' folders were retrieved and categorized based on the years they fall. Each year group was then arranged in tens from which folders were randomly selected.

A sample of 40% was selected from each year group. This decision had a empirical support from Alfonso (1990) who suggests that if a population for a study is few hundred a sample size of 40% or more will do; if several hundred a 20% sample or more is representative enough; if a few thousand a 10% sample size will

do; and if several thousand a 5% or less sample size is appropriate. On the basis of the preceding illustrations the researcher takes this sample size representative enough for the study.

3.6 Data Collection Tool

A standardized Data Extraction Sheet (DES) was carved from Global Burns Registry Data Collection Form to elicit the relevant information from the folders. In achieving this, variables that can adequately measure and assess the trend of burns cases were used. The DES was structured into 2 parts, of which part one deals with the demographic characteristics of the patient's whiles the second part considers the burn trauma information. Data was purely close-ended with a minimum of 5 questionnaire items under general clinical information, anatomy of burns, causes of burns, degree of clinical suspicion and patients' treatment and discharge.

3.7 Data Analysis

Data extracted from the folders was coded and entered into Microsoft Access 2007 database and transported to Strata version 12.0, and was then subjected to quantitative analysis. This analysis was summarized using standard descriptive statistics in frequencies and percentages displayed with the aid of bar charts and frequency distribution tables. The study further estimates the trend of burns cases using Linear Regression Model.

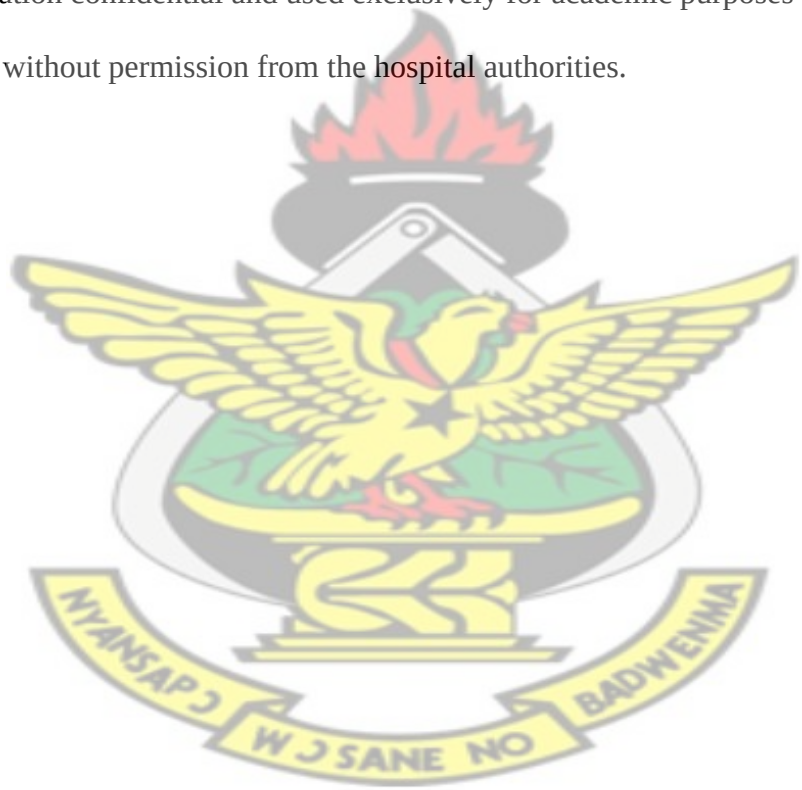
3.8 Validity and Reliability

To ensure valid and reliable data, great care was taken by the researcher to record data correctly as they appear on the selected folders. The structured questionnaire and the entire research process were subjected to assessment and scrutiny by an

experienced supervisor so that findings obtained as a result could be reliable to a reasonable extent.

3.9 Ethical Considerations

Ethical issues in research ensure that no participant or the institution under study is harmed in any way as a result of the study. Prior to the conduct of the study, the researcher registered the study at the Research and Development Unit of KATH and subsequently sought ethics approval from Committee on Human Research, Publication and Ethics of KNUST. An assurance was then given to hold every bit of information confidential and used exclusively for academic purposes and for no other reason without permission from the hospital authorities.



CHAPTER FOUR

4.0 RESULTS OF THE STUDY

The main objective of this study was to estimate the trend and mechanism ofburn cases at the Burns Unit of the Komfo Anokye Teaching Hospital for the last five years (i.e., May 2009 - April 2014). To be able to deal with this objective exhaustively, five specific objectives were formulated and used to guide data collection for the study. Based on this, the results of this study are presented to represent the core components of the trend and mechanism of burn cases in the study facility.

This chapter aims at the presentation and analysis of data received from study participants as extracted from their folders from the burns units at KATH –Kumasi. Analysishasbeen made in line with the research questions to help achieve the research objectives.The chapter first analyses the demographic features of participants and follows up in line with the research objectives to cover the trend of burns cases, prevalence of burns at KATH, causes of burns, degree and extent of burns, as well as survival rate of burns.

4.1 Demographic Features of Participants

The demographic features of participants covered the age categories, gender, days taken to report to the hospital, for which data obtained are presented in Table 4.1.

Table 4.1 Demographic Features of Participants

Variable	Frequency (N= 300)	Percentage
Age:		
Under 5 years	125	41.67%
5-14 years	50	16.67%
15-24 years	45	15.00%
25-34 years	37	12.33%
35-44 years	24	8.00%
45-54 years	12	4.00%
55-64 years	4	1.33%
65 years and above	3	1.00%
Gender:		
Male	154	51.33%
Female	146	48.67%
Days taken to report to the hospital:		
Same Day	147	48.88%
Day 1	53	17.67%
Day 2	30	10.10%
Day 3 and above	70	23.34%

Source: Research data, 2014

Table 4.1 shows that 48.67% of the respondents were females and 51.33% were males. Males therefore dominated in burns cases by a margin of approximately 3%. With regards to age distribution, it is seen that respondents who were under 5 years constituted majority (41.67%) of burns patients within the study population followed by the age group 5-14 which was represented by 16.67%. Patients at age group 15-24 and those 25-34years are respectively represented by15% and 14.3 %. The age group 25-34 had an occurrence rate of 12% and 8% for age 35-44, 4% for 45-54 years age group and trailed by age 55-64 and those above 65years with 1% each.

Obviously, patients under 5years had the highest prevalence of burns the lowest incidence of burns occurred among people aged 55 years and above. The remaining age ranges are somehow evenly distributed.

Touching on the number of days elapsed before burns are reported at the hospital, Table 4.1 discloses that approximately 49% of the cases are reported at the hospital the same day. Whilst 17.7% of the cases are reported a day later, 10% were seen to be reported 2 days after the burns incident with a little above 23 % reporting 3 days or more after burn injury. The observation is that over half (51%) of burns cases are delayed for more than a day before reporting for treatment at the hospital.

4.2 The Trend of Burns Injury at KATH

As part of its objectives, the study sought to determine the trend of burns injuries at KATH within the 5-year period (May 2009-April 2014) under review. Data gathered on this was captured in Table 4.2.

Table 4.2 Burns Admitted Cases from May 2009 to April 2014

Year	Frequency	Percent
2009	26	8.7
2010	53	17.7
2011	73	24.3
2012	70	23.3
2013	56	18.7
2014	22	7.3
Total	300	100.0

Source: Research data, 2014

Within the period, Table 4.2 depicts that the year 2011 recorded the highest burns cases with 24.3% of the total burns cases recorded for the period. This was followed by 23.3% in 2012 approximately 19% for 2013, 17.7% in 2010 with 8.7% in 2009 trailing with 7.3% in 2014. To clearly show the trend of occurrences, the data has been presented as Figure 4.1.

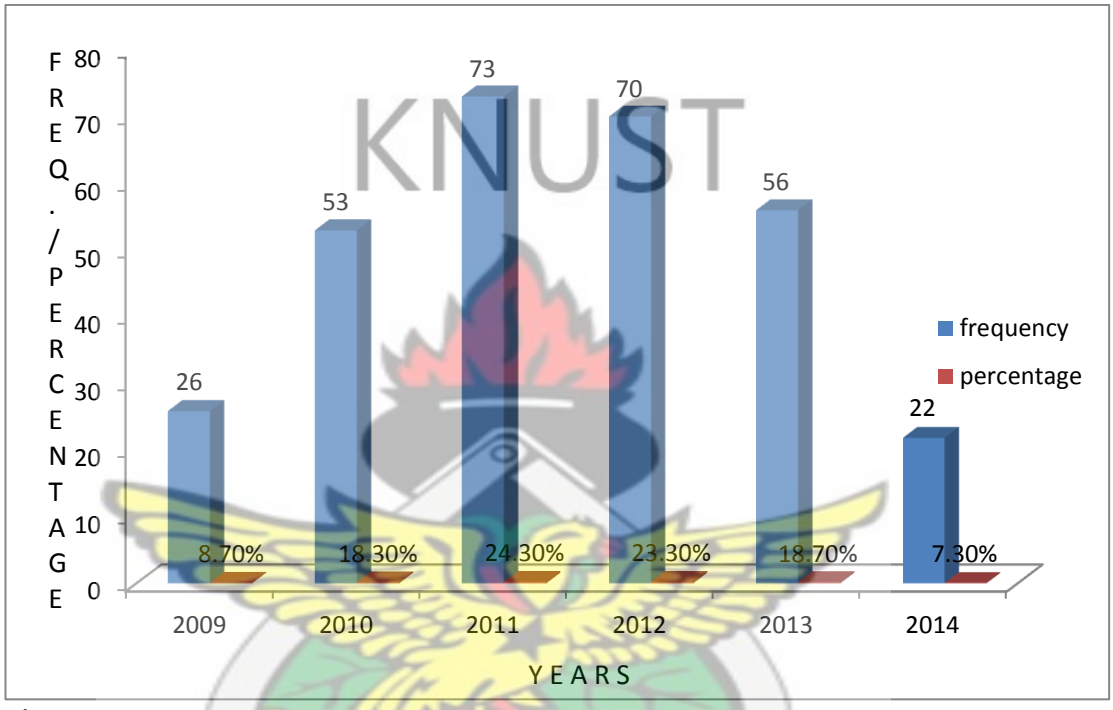


Figure 4.1 The Trend of Burns Cases

As it can be observed from Figure 4.2, reported burns cases show an increasing trend from 2009 through 2010 to 2011but declined in 2012 towards 2013 and 2014.The researcher diagnosed further to determine the exact time of the day when burns usually occur. It could be noticed from Table 4.1 that only 2% of cases occur in the early hours of the day before 6am and between the hours of 7am to 1pm the study recorded 32% of burns cases. Whilst a little less than 17% occur in the night between 8pm and 11pm the hours of 2pm and 7pm predominantly saw the burns cases. The scenario on hours of burns cases is presented as Figure 4.2.

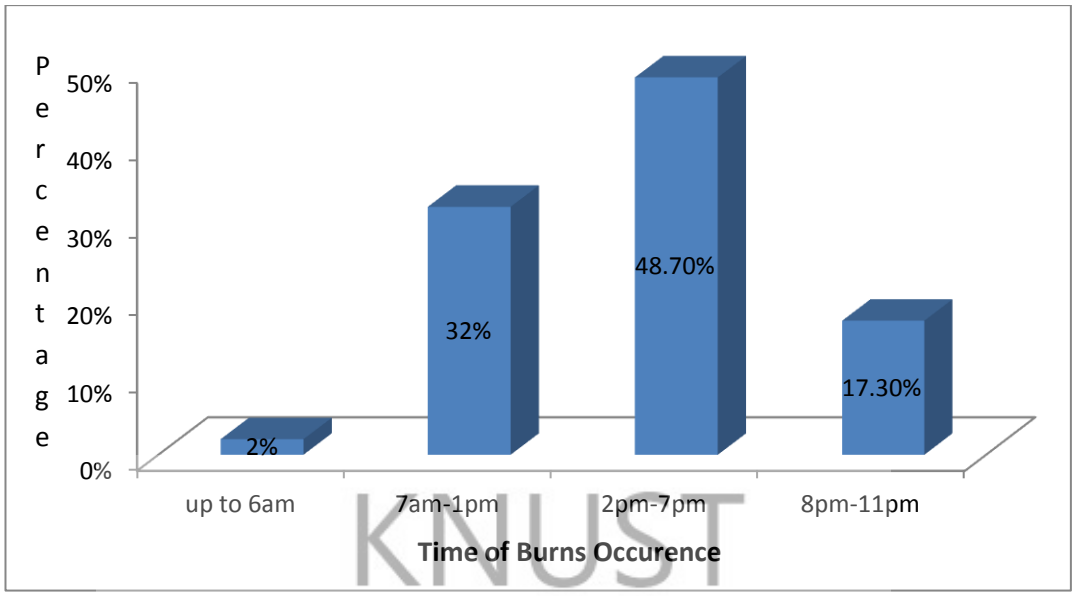


Figure 4.2 Hours of Burns Incidence

Comparing dawn and night on one hand and the broad daylight on the other hand, Figure 4.2 vividly shows a predominant rate of about 80.7% of burns cases between the hours of 7am to 7pm. The degree of occurrence as related to time seems to reflect the period (2pm-7pm) where most domestic use of fire, gas and other hot materials happen.

Sourcing further to look at the intent of burns cases the researcher wanted to know about intentional (self-harm), assault cases and unintentional. Table 4.1 recorded that only 6% of the cases could be attributed to intentional self-harm, 2% resulting from assaults, and as much as 83% known to be unintentional with 8% of them which could not be determined. The questionnaire items to determine if other factors contribute to the burns cases revealed on the table a little over 1% influenced by drugs and almost 11% contributed by epilepsy whilst nearly 88% of the cases could not be attributed to any factors.

4.3 Prevalence of Severe Burns at KATH

Among other trauma emergencies recorded at KATH over the 5-year period under review, the researcher sourced the prevalence of burns cases. Record of trauma emergencies have been captured in Table 4.3

Table 4.3 Five-year Statistics of Selected Trauma Emergencies

Trauma Emergencies	Year					
	2009 (May-December)	2010	2011	2012	2013	2014 (Jan-April)
RTA	1862	3538	3678	2985	1960	777
Burns	**66**	**139**	**191**	**177**	**142**	**55**
Snake Bite	24	72	85	66	31	16
Gunshot	16	80	92	173	111	51
Assault	Nil	327	554	456	297	123
Foreign Body	Nil	38	78	49	27	2
Total	**1968**	**4194**	**4688**	**3906**	**2568**	**1024**

Source: Research data, 2014

Among the selected trauma cases at KATH within the study period, burns rank third to road traffic accidents and assault. Upon the statistics gathered for the study a trend analysis in respect of total selected trauma emergencies as against burns cases was developed and presented as Figure 4.3.

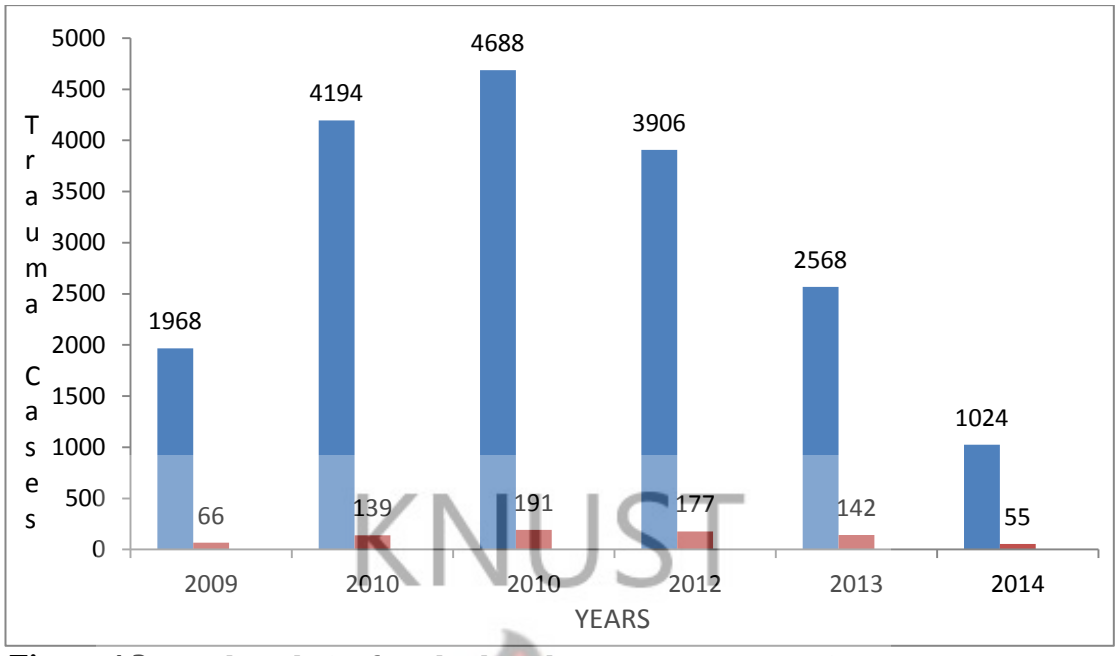


Figure 4.3 Trend Analysis of total Selected Trauma Cases as against Burns Cases

Furtherance to the determination of burns prevalence rate at KATH for the period May 2009 to April 2014, the computation is presented in Table 4.4.

Table 4.4Burns Prevalence Rate at KATH

Year	Trauma Emergencies	Burns	Prevalence Rate (%)
2009	1968	66	3.4
2010	4194	139	3.3
2011	4688	191	4.1
2012	3906	177	4.5
2013	2568	142	5.5
2014	1024	55	5.4
Total	**18348**	**770**	**4.2**

Source: Research data, 2014

Burns prevalence rate at KATH calculated as (Burns ÷ Total Trauma cases) x 100 recorded, for 2009 and 2010 showed approximately 3% with approximately 4% and 5% respectively for 2011 and 2012. The year 2014 experienced the highest rate of 5.4%, but on average the prevalence rate of burns over the study period from May 2009 to April 2014 stood at 4.2%.

4.4 Main Causes of Burns at KATH and Intent

Studying the mechanism and management of burns might not be complete without knowing the possible causes of burn reported at the KATH. Data gathered on the causes of burns within the period of the study is as presented on Table 4.5

Table 4.5 Causes of Burns at KATH

Cause of Burns	Frequency	Percentage(%)
Flame (Fire)	105	35.0
Hot Surfaces	18	6.0
Hot liquid Steam or Gas	161	53.7
Electrical occurring	10	3.3
Chemical occurring	6	2.0
Intent		
Intentional self-harm	25	8.3
Unintentional	251	83.7
Undetermined intent	24	8.0

Source: Research data, 2014

Table 4.5 shows hot liquid and gas causing most of burn injuries (53.7%) found within the period under review. This was followed by flames with 35% of burn cases and hot surfaces 6%. Burn injuries caused by electrical was minimal at 3.3% whilst chemical burn injuries had the least cause of 2%. Hot liquid steam and gas as the highest cause of burn injury arguably indicate that women and children could be the most vulnerable group of burns victims as women most often are close to such

causative agents in their domestic functioning. And children by virtue of curiosity may get in touch with these burning materials.

Table 4.6 Distribution of Cause of Burns Intent against Total Body Surface Burns (TBSB)

Intent	Mean TBSB
Intentional self harm	34.52
Unintentional	27.08
Undetermined intent	39.58

An assessment of the intent of cause of burns observed on the TBSB as indicated on Table 4.6 clearly shows that, on average about a third of TBSB are caused by intentional self-harm. Again, an average of a little more than one-quarter of all TBSB were found to be caused unintentionally. This was inconsistent with a prior study (Gallal and Silvers, 2000) which found most of the burns caused accidentally and only 4.3% of burns being suicidal.However, TBSBs for which the intent of cause could not be determined had an average of about two-fifth. Therefore, the intent of cause of most of the TBSB as recorded at KATH within the study period is unascertained.

4.5 Degree / TBSA of Burns Victims Reported at KATH

As part of the analysis of trend and mechanism of burns there was the need to establish the degree and TBSA of burns reported at KATH over the study period. The study categorized the degree of burns under first, second and third degree. The 1st degree burns, otherwise called superficial burns, involves the loss of the epidermis. In this type the epithelium repairs itself very efficiently by mitosis, a process which takes 7 to 10 days.

The 2nd degree burns also called partial-thickness burns are burns involving the destruction of some of the dermis. Repairs take about 7 to 14 days depending on the depth of dermal destruction.

The 3rd degree or full-thickness burns involves total loss of the whole thickness of the dermis. These wounds heal only by regeneration of dermal cells from the intact dermis around the edges of the wounds. Statistics recorded for the study can be seen from Table 4.6.

Table 4.6 Degree/TBSA of Burs Patients

Age group	Degree of burns of respondents			
	1st Degree (5.8%)	2nd Degree (80.9%)	3rd Degree (13.3%)	Total(100%)
Under 5	10(3.3)	109(36.3)	9(3.0)	(42.6%)
5-14	5(1.6)	42(14.0)	3(1.0)	(16.6%)
15-24	2((0.7)	31(10.3)	11(3.7)	(14.7%)
25-34	0(0.0)	26(8.7)	11(3.7)	(12.4%)
35-44	1(0.3)	19(6.3)	4(1.3)	(7.9%)
45-54	0(0.0)	9(3.0)	2(0.6)	(3.6%)
55-64	0(0.0)	4(1.3)	0(0.0)	(1.3%)
65+	0(0.0)	3(1.0)	0(0.0)	(0.0%)
TBSA	**(6.0%)**	**(80.7%)**	**(13.3%)**	**(100%)**
< 5%	2(0.7)	8(2.7)	1(0.3)	(3.7%)
5-10%	10(3.3)	41(13.7)	3(1.0)	(18.0%)
11-20%	3(1.0)	60(20.0)	4(1.3)	(22.3%)
>20%	3(1.0)	133(44.3)	32(10.7)	(56.0%)

Source: Research data, 2014

Table 4.6 discloses that close to 6% of admitted cases of burns within the study period were 1st degree burns. With approximately 81% of them being 2nd degree burns and almost 14% of them being3rd degree type. The highest incidence of the burns was noted to be 2nd degree burns and the least being the 1st degree type.

On the severity of burns, a less than 5% TBSA for children under 5 years and aged persons is considered minor burns and 5-10% is deemed moderate whilst 10%or more for the same age category is also described as major burns. In respect of adults a less than 10% TBSA is considered minor, 10-20% is described as moderate and greater than 20% also taken as major burns. Data obtained for the study gave the scenario in Table 4.7.

Table 4.7Assessing TBSA on Ages of Participants (Based on the American Standards)

Age Categories	TBSA				
	<5%	5-10%	10-15%	15-20%	> 20%
Under 5years	5	24	10	19	68
5-14years	1	9	11	7	22
15-24years	3	5	3	3	31
25-34years	0	1	5	4	27
35-44years	0	1	1	3	19
45-54years	0	2	1	1	8
55-64years	0	1	2	0	0
65years +	0	0	0	0	3

Source: Research data, 2014

From Table 4.7, TBSA described as minor for young and old age recorded only 1.7% for children less than 5 years and none for the aged over 65years.

Moderate TBSA of 5-10% for young and the aged above 65 years recorded 8.3% and again none for those above 65 years. However, for major burns of TBSA greater than 10% for young and the aged, the study revealed 42% of the victims being affected. In effect, with minor injury, the victim is likely to survive provided health care was sought on time but the victim has higher chances of death if major burns are encountered.

The same thing applies to the situation of adults, where 7.7% suffered minor injuries and 13% of victims experienced moderate burns with as much as 33% sustaining major injuries of more than 20% TBSA, thus significantly affecting their chances of surviving the burn injury. The aged victims who were over 65 years did not record any minor injury but only 1% sustained major injuries.

4.6 Survival Rate of Burns

Although burns could be fatal, many people survive it. Estimates of survival could be determined by the TBSA of the burn and the age of the burn victim. Mathematically, survival rate could be estimated as 100% - (TBSA + Age of the victim). This implies that the two main variables involved are the TBSA and the age of the victim, holding a 100% constant value. The TBSA of burns for the various age categories of burns cases recorded within the study period is displayed as a bar chart (Figure 4.4).

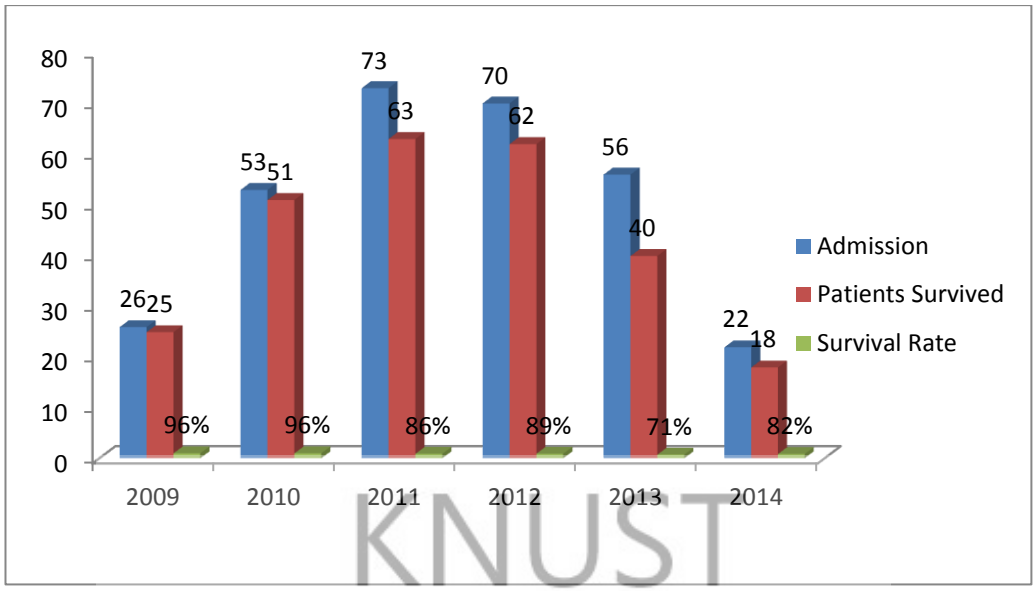


Figure 4.4 Survival Rate of Burns Victims

Figure 4.4 indicates that there were 26 burns cases reported at the hospital in 2009 out of which 95% survived whilst 96% and 85% survived in 2010 and 2011 respectively. Again, it could be observed from Figure 4.4 that 89% of burn victims survived in 2012, 71% survived in 2013 and 82% also survived in 2014. Once again, the survival rate shows mixed patterns without constant improvement. It can be seen from Figure 4.4 that the year 2009 and 2010 recorded the highest survival rate followed by 2012 and 2014 trailing by the year 2013. Generally, the 5-year period (May, 2009 – April, 2014) observed an average survival rate of burns victims at 86% implying an average mortality rate of 14%. Although, this figure looks appreciable pragmatic measures should be instituted to improve upon it because it borders on human life.

CHAPTER FIVE

5.0 DISCUSSION OF RESULTS

This study was conducted to estimate the trend and mechanism of burn injury that are reported and received attention at the Burns Unit of the Komfo Anokye Teaching Hospital (KATH) in Kumasi in the Ashanti Region of Ghana. The period for which these cases were taken spanned five years, from May 2009 to May 2014. Five (5) specific objectives were formulated from the main objective to help deal with the core issues involved.

This chapter discusses the results of data collected for the study beginning with the demographic characteristics of participants covering their ages, gender, days taken to report burn cases at the hospital and the time of burns occurrences. Data gathered on the trend of burns, prevalence and main causes of burns, degree and TBSA, and the survival rate of burns victims at KATH for the 5-year period under review.

5.1 Demographic Characteristics of participants

Empirical support for the inclusion of age and gender of participants in any epidemiological study has once again been supported by Analatic, Ozerdem, Delay,Kesiktas,Acarturk and Seydanglu (2002). The present study was carried out on 300 participants comprising of 51.33% males as against 48.67% females, and thus revealing an approximate 3% dominance of males over their females. This though is at variance with earlier studies (Subramanyam, 1996) which frequently found females as sustaining most burns injuries.

Further, it was noted from the study findings that about two-fifth of the study population were less than 5 years followed by the age group 5-14 years.

The youth age of between 15 and 44 years were represented by 41% and the aged between 45 and 65 years showed only 6% of the study participants. These findings do not fully confirm earlier studies (Subramanyam, 1996) where over half of burns cases were age between 21-40 years, yet high incidence of burns among the youth merit serious attention.

Burns trauma is known to be so painful and fatal that it is always expected that burns cases are reported to the hospital immediately for proper management. The study therefore investigated as part of the demographic features of patients, how long it took burns victims to report at the hospital. The study revealed about half of the burns cases reporting to the hospital the same day burns occured. However, cases that were not reported immediately to the hospital were substantial and dangerous as delay might contribute to burn complications and possible high mortality rate.

5.2 Trend of Burns Cases at the Burns Unit of KATH from May 2009 to May 2014

The statistical information of the trend of burns cases that were reported, recorded and treated at KATH Burns Unit was presented in six cohorts, taken from May 2009, May 2010, May 2011, May 2012, May 2013 and April 2014. The presentation was done in such a way that the sex distribution of the patients was visible as well as their age ranges. In view of this over that period spanning five years, there were 154 males and 146 females.

With regards to age, children under five years were seen to be the highest category of individuals who sustained burns injuries over the period under study

compared to the other age groups used in study. The youth and the young adults of ages up to 45 years also experienced significantly high levels of burns injuries but the aged recorded less number of burn victims.

The implication of this finding is that children under five years are at risk of sustaining one form of burns or the other and the findings (results) should tell caregivers to be extra careful in taking care of children in that age category. Giving another implication of more children than adults sustaining injuries, Balseven-Odabaşı, Tümer, Keten and Yorganci (2009) affirm that childhood burns place enormous socio-economic burden on individuals, their families and health services. On their part, Rode, Millar, Castle and Lyle (2011) maintain that there are significant physical and psychological sequellae that are associated with non-fatal burns, with survivors requiring ongoing treatment, rehabilitation and regular surgical intervention.

In a further affirmation of many children sustaining burns and why the males dominate, in a study (Agbenorku, Manolo,Agbenorku and Fiifi-Yankson, 2013) made some revelations. They indicated that children account for almost half of the population with severe burn injury and children less than 5 years account for 50% to 80% of all childhood burns. Gallal (2000) explained that ignorance, negligence and irresponsible behaviors of some parents and caregivers might explain high incidence of burns among children. However, the findings that old people over 64 years had the lowest incidence of burns, perhaps explained by the Ghanaian social set up as older members are usually taken care of by the family lowering their exposure to hazardous situations.

Agbenorku, Manolo and Fiifi-Yankson (2013) further recall that in pediatric populations, scalds clearly dominate, accounting for 60% to 75% of all hospitalized burn patients, followed by flame and contact burns. Globally, the majority of children burnt are boys with a ratio of around 2:1 to girls and the mortality rate of males is greater than females.

During the period, burns cases reported at the hospital showed a mix pattern starting from May 2009 with 8.7% of burns cases and rise through 2010 with 17.7% and 24.3% in 2011. A downward trend was observed in 2012 with 23.3% to 18.7% in 2013 and finally dropped to 7.3% April 2014. Obviously, the year 2011 experienced the greatest burns cases within the 5-year study period.

Literature on burn injury across the globe indicates that it is a devastating health condition that is plaguing humankind all the time and that is peculiar to Ghana or the KATH catchment area. A case in point is the exposition given by Forjuoh (2006:122), who indicated that "*burn injuries are among the most distressing injuries and major global public health catastrophe affecting humankind*''. Additionally, the World Health Organization (2004) maintained that incidences of burn are the fourth most common type of trauma across the world and it comes after traffic accidents, falls, and interpersonal violence. Thirdly, Murray and Lopez (2006) had pointed out that unfortunately almost 90 percent of burn injuries occur in low to middle income countries and regions of the world that generally lack the necessary infrastructure to reduce the incidence of burns and manage the severity of those burns.

The study also found that almost half of the burns cases occur between the hours of 2pm and 7pm. Other studies (Subramanyam, 1996) observed a greater

number of burn cases within the hours of 6am to 2pm and (the current study compares with it because) both studies found maximum burn incidence during the periods when mostly cooking is done at home taking cognizance of the Ghanaian domestic setting. Significantly, low cases of burns were found in the night after 8pm and at dawn before 6am when most people might be asleep.

Touching on the intent of burns, as low as 8% of burn cases could be described as either self-intentional or assault but for a maximum of 83% the intention could not be traced and thus taken as accidental. This finding was therefore consistent with Barriar (1994) who established about 79% of burn cases being accidental. This finding could be explained on ignorance, poor safety standard measures, cooking with open fires like kerosene stoves and gas. In a similar study, Barriar (1994) associated most burns cases to other factors including drugs, epilepsy and diabetes mellitus. Findings in this study was rather inconsistent and found only 11% of burns cases influenced by epilepsy and only 1% revealed to be influenced by drugs. However, epilepsy as a contributing factor should not be ruled out because 11% of the cases observed were due to an epileptic attack.

5.3 Prevalence of Burns at KATH

Comparing with other trauma cases which included RTA, snake bite, gunshot, assault and foreign body that were reported at KATH during the study period, the prevalence rate of burns seems to be increasing as the years go by except between 2009 and 2010. Although the prevalence rate of burns reduced from 3.4% in 2009 to 3.3% in 2010, it has consistently been increasing from 2010 to 2013 recording 4.1%, 4.5% and 5.5% respectively only to settle at 5.4% in 2014 which was even the first quarter of the year. On average for the 5-year period under review,

burns prevalence rate stood at 4.2% implying that for every 100 trauma cases reported at KATH at least 4 of them would be burns cases.

5.4 Causes of Burns among the Victims

Once the degree of burns among the victims had been ascertained the causes of the burns were considered necessary because when the causes are determined it would help in the management of the condition since the responses satisfy the dictates of specific objective four and research question four. Consequently, the study revealed that hot liquid steam or gas related causes were the most causative agent of burns among the 300 victims with a proportion of 55.7%. The explanation given to this cause is that most of the victims had been using gas cookers which catch fire at the least mistake.

This sort of cause of burns comes under the thermal cause of burns. Herndon (2010) added impetus to the fact that fire and hot liquids are the most common causes of burns. It is said that domestic fires result in death, smoking causes 25% and heating devices cause 22%.The second prevalent cause of burn reported and treated at KATH Burns Unit is flame. Approximately 35% of the cases were due to flames or fire. This cause is also a thermal source as postulated by Forjuoh (2006). He explained that specific risk factors in the developing world in particular include cooking with open fires or on the floor as well as developmental disabilities in children and chronic diseases in adults.

Furthermore, the study showed that electrical and chemical causes of burns were minimally recorded respectively as 2.8% and 1.4%, not as high as that of thermal cause. Therefore literature (Hardwicke, Hunter, Staruch&Moiemen, 2012;

Marx, 2010) which confirm that chemical and electrical causes of burns are between 2% to 11% have once again been upheld.

5.5 Degree of Burns Victims Reported at KATH's Burns Unit

Apart from the trend and prevalence of burns that had been dealt with, it became necessary to look closely at the type of burns cases or better still the mechanism of burns in the study health facility. From the information gathered from folders of 300 burns patients four issues were looked at that are related to the mechanism of burns. This in effect means this section does not only look at the types of burns but also other related issues such as cause of burn, anatomy of burn and severity of the burn.

It was gathered that 5.8% of the 300 burn cases recorded at the Burns Unit had first degree burns. According to Khan and Solan (2014), first-degree burns cause minimal skin damage to the victim. They explain further that first degree burns are superficial in nature because they affect the outermost layer of the individual's skin. A burn victim with first-degree burn would most probably show signs that include redness, minor inflammation (swelling), pain dry and peeling skin, which would occur as the burn heals. From the perspective of LawyerShop.com (2014), with respect to a second degree burn, the first layer of a victim's skin is burned through, and second layer is affected but not completely destroyed. This source explains that a second degree burn is considered "minor" if less than 15 percent of the body is burnt. On its part, Injuryinformation.com (2014) indicates that a third degree burn is the most severe stage of injury, as all layers of skin are likely to have been damaged, as well as muscles, tendons, ligaments and possibly organs. In spite of this clear

distinction, Injuryinformation.com (2014) is alluding to the fact that a third degree burn affects the reticular dermis, which is supposed the deepest layer of skin, however the term "fourth degree" burn is attributed to the actual damage of tissues.

Again, about 80.7% of the burn victims sustained second degree injuries, which is said to affect the second layer of the skin. The effect would be said to be partial thickness, which is subdivided into two that is superficial and deep in order words the second layer could suffer superficial burn and deep burn. In giving further explanation to what the second degree burn is, Injuryinformation.com (2014) affirm that one of the key characteristics of a second degree burn is the breaking of the first layer of skin in the form of blistering and even bubbling as the secondary (papillary) layer of skin is breached and damaged. Besides, second degree burns normally feature red skin, as well as the visibility of the exposed papillary dermis. Moreover, with a second degree burn there is blistering of the body that leads to the presence of white fluids within the blisters and on the exposed secondary skin. Above all, there is a greater deal of pain involved with second degree burns, as two layers of skins have been compromised.The second highest occurring degree of burn was a third degree with a proportion of 13.3%. As was seen earlier in this section, a third degree burn is the severest form of burns anyone would suffer during a fire or accident as the case may be. Thus, Khan and Solan (2014) state that a third-degree burn causes a burn victim's skin to look waxy and white, charred, dark brown, raised and leathery. The study found that children under 5 years and young adults (the youth) were mostly affected by the second degree type of burns which had the highest occurrence (42.7%) and the least affected were adults above 65 years representing only 1%of total burn victims. This scenario was seen similar to Bengal (1990) who established

that the second degree burn is the commonest type of burn and mostly affects children under 5 years and the youth.

5.5.1 Severity of Burns among the Burns Patients Studied

The severity of burns has to do with the total body surface area (TBSA) that got burnt in the incident. Statistical details of the 300 burns patients whose folders were scanned showed the three categories of burns – minor, moderate and major for children, adult and the old (aged). Compared to the American Standards of TBSA burns adopted in this study, a less than 5% TBSA described as minor for young and old age recorded only 1.7% for children under 5 years and none for the aged over 65years. However, for major burns of TBSA greater than 10% for young and the aged, the study revealed 42% of the victims being affected. In effect, with minor injury, the victim is likely to survive provided health care was sought on time but has higher chances of death if major burns are encountered. On the side of adults, 7.7% suffered minor injuries and as much as 33% sustaining major injuries of more than 20% TBSA, thus significantly affecting their chances of surviving the burn injury. The aged victims who were over 65 years did not record any minor injury but only 1% sustained major injuries.

In all, the study has identified minor injuries of about 22% but major injuries ranking approximately 78%. This revelation is rather at the reverse side of Tintinalli (2010) who found that most burn injuries (70%) involve less than 10% TBSA, but confirmed the studies of Laloe (2002) who recorded nearly 50% of burn victims experiencing major burn injuries.The information that had been provided and discussed from the table and chart is given credence by scholarly view point on burns and this further helps to explain the severity of burns. Thus, severity of a burn

depends largely on the depth of tissue destruction and the amount of body surface affected.

Other factors including the patient's age and prior state of health, the location of the burn wound, and the seriousness of any associated injuries can also influence recovery from a burn.

For an appreciation of how the depth and spread of a burn affect the severity of the injury, some understanding of the anatomy and physiology of the skin is necessary. Human skin is composed of two layers: an upper layer called the epidermis, and a lower layer known as the dermis (or corium). The largest of the body's organs, skin performs a number of vital functions. Its foremost job is to separate the external environment from the body's interior. The epidermis, the outer surface of which consists of dead, cornified cells, prevents infectious microorganisms and other harmful environmental agents from gaining entrance to the body.

The dermis, by contrast, is made up of fibrous connective tissues that prevent the evaporation of body fluids. Embedded within the dermis and opening to the skin surface are the sweat glands. These secrete perspiration, the evaporation of which helps regulate body temperature. Perspiration also contains small amounts of sodium chloride, cholesterol, aluminum, and urea; it thus plays a role in regulating the composition of body fluids. The dermis also contains all of the skin's blood vessels and nerves, including sensory nerve endings that respond to touch, pressure, heat, cold, and pain. The skin therefore also serves as a sense organ that enables a person to adjust to changing environmental conditions. One final function of the skin is the synthesis of vitamin D, a compound essential to growth and maintenance,

particularly of bone. Vitamin D is formed by the action of sunlight on certain cholesterol compounds in the dermis. Destruction of the skin by deep or extensive burns can disrupt all of these functions, subjecting the victim to serious complications.

5.5.2 Anatomy of Burns Cases

By anatomy of burns, the study looked at the part of the body that got burn according to the formula that had been proposed by scholars, Lund and Browder. In this study, forty-three percent (43%) of burns patients recorded at KATH had their head and neck area burnt. This does not mean these victims had only the neck and head area burnt but other places could have been burnt. Therefore, it is further seen that a little more than 76% of the victims suffered burns in the trunk area, 72.3% suffered from arms area, further 64% sustained burn injury from the hands and wrist area.

Yet others, that is, 71.7% of the victims had their perineum area burnt and another 11.3% had thighs/legs area burnt. The proportion of the anatomy of burns is not so strange because they conform to the burns that occur in other jurisdictions and recorded in the health care facilities. They rather help health professionals to deal with them appropriately and exhaustively.

5.6 Survival Rate of Burns Patients at KATH

Literature had extensive information about the issue that victims of burns are prone to death. This assertion is attested to by Kalayi (2006), Lau (2006) and Sevitt (1979) who noted that burns are associated with relatively high mortality and morbidity worldwide, especially in the developing countries because there are not up-to-date facilities to manage those conditions. Similarly, it has been observed that

globally, burn injuries are responsible for about 265,000 deaths annually (Forjuoh, 1996). It is from this point that specific objective four was aligned to the issue of survival rate of burn victims who reported at the KATH Burns Unit.

The statistical information on the survival rate of the 300 victims in the present study recorded 96% surviving in the year 2009, 96% surviving in the year 2010 and 85% in 2011. The year 2012 also recorded 89% of survived patients with 71% in 2013 and 82% in 2014 also surviving. Overall, 254 persons survived from burn injuries amounting to 84.7% of the 300 cases that were reported at the Burns Unit during the period coveredby the study. The survival rate was estimated as:

Survival Rate = (254 ÷ 300) x 100; where, the number of survived burn patience=254, the total number of admitted burn patience=300. This survival rate of 84.7% might look high but loss of 46 burn patients (with mortality rate of 15.3%) is dreadful and supports Gallal (2000) position that burn injury is one of the most fatal human encounters in the community, which has to be managed critically. Most critically is the fact that the current mortality rate of burns far exceed global trend of which approximately 4% of burn victims admitted to a burn centre die from their injuries as reported by American Burn Association (2012). Other studies such as Peden, McGee and Sharma (2002) recalled that burns were the eighth commonest cause of mortality in the year 2000. Similar scenarios have been given in Ghana and India by Agbenorku et al (2013) and Gupta et al, 2011 respectively in their separate studies.

The issue of survival of burn victims cannot be discussed in isolation in the sense that several issues come to the fore. For instance the days that it took family members to send the burnt victim for medical attention, the age of the burn victim

and severity of the burn could help determine whether the person would survive or not.It is significant to note that a greater proportion of the victims survived but that did not go without some form of disability.

Consequently, it is reckoned that 1.0% of this total number admitted within the study period was discharged with some form of disability. In the same way, 10.7% of the victims did not wait for the health professional to finish their work and left the hospital against professional medical advice. In this sense they left with their disability.

The brighter spot is that a little over 39.0% were treated and discharged without any disability. The situation of 31.3% could not be determined during the data collection. It is possible those cases were still on admission and their state could not be determined off hand. It is only hoped that the health professional would deal with their situation without any mortality.

CHAPTER SIX

6.0 CONCLUSIONS AND RECOMMENDATIONS

This is the final chapter of the study which summarizes the main findings of the study, outlines conclusions and makes recommendations for the management of KATH, health practitioners and the general public to guard against burn injury and its concomitant fatality.

6.1Conclusions

After detailed analysis and discussion of data collected for the study, the study revealed that most burns reported at KATH are related to domestic use of thermal materials such as gas, kerosene stoves, coal pots which easily catch flames with little negligence and disregard of fire precautionary measures. These burns were noted to be occurring during the working hours of the day between 2pm and 7pm.This is the period when meals are prepared in many homes rendering women and children more vulnerable to burns.

Majority of burns victims within the study period was males as against their female counterparts with a minimal difference of 8 patients. Again, it was found that children under 5 years constitute the most vulnerable group, which perhaps may be explained on child curiosity and parents' negligence and, the economic and social implications are numerous. This was followed by the active working population (the youth), but the aged above 65 years least experience burns.It was also observed that, although majority of burn victims report to the hospital the same day that burns occur, a substantial number of burn victims delay over 3 days before reporting at the hospital for treatment.

In total, as many as 770 burn cases were admitted at the KATH within the 5-year period from May 2009 to April 2014. Among these years 2011 recorded the highest incidence of 191 burn patients with the least of 55 patients recorded in 2014. The data used for the analysis covered only the first quarter of 2014.

Among the selected trauma emergency cases recorded within the period, burns rank third; road traffic accidents being the highest and assaults being second highest.The study established the highest prevalence rate of burns occurred in 2013 and an average of 4.2% within the 5-year period under review. Most burn injuries recorded were found to be the 2nd degree type and the affected age group was children under 5 years. Again, the 2nd degree burn inflicted the highest spread (TBSA) of injury >20%on burn victims.Most burn victims suffered major TBSA with few of them who encountered minor TBSA and also few of them who encountered minor and moderate TBSA.It was again established from the study that the year 2009 and 2010 recorded the highest survival rates of burn victims and 2013 recorded the lowest. The average survival rate of burns victims was found to be 86% reflecting a mortality rate of 14% within the study period.

Incidence of burns is obviously traumatic and its prevalence is high enough to merit serious policies, measures and strategies to limit its occurrence to the barest minimum. Burns cases reported at KATH are mostly of high degrees and TBSA. Thus, great care and management practices are required of the health facility (KATH).The average survival rate of 86% should be a concern for government and the general public to address.

6.2 Recommendations

Based on the research findings and conclusions outlined, the researcher made the following recommendations, to relevantstakeholders:

1. Ministry of Gender, Children and Social Protection: As a government institution, the Ministry needs to periodically embark on massive public education on burns menace, fatality, disability and other economic and social consequences to educate the public especially women to be vigilant on their children and be cautious on the safe use of thermal materials or gadgets.

2. Ambulance services: Significant delays in reporting burn cases at KATH may be attributable to uneasy access to burn centres. It is therefore recommended that district hospitals be resourced with enough ambulance services to carry out burns patients immediately to burns centres for treatment to forestall burn complications. This in effect would reduce mortality rate (which stands at 14%) and patients' morbidity situations.

3. Ghana Fire Service: Prevalence of burns presenting at KATH is alarming and demands immediate upgrade of logistics at the Ghana Fire Service to be able to face fire incidence squarely to reduce burn injury and save human life.

4. Ministry of Health: Unappreciable level of burn survival rate as reflected in the current study(86%) requires thatthe Ministry of Health increases the number of burns management staff at KATH and other district and regional health facilities. As a matter of policy, specific appreciable number of staff should be sponsored through higher learning and training sessions, even if it requires schooling abroad to get the necessary expertise to handle burns cases at the hospital.Establishment of training centres for burns management should be considered in the country to equip the health facilities with the right expertise to handle burns cases.

6.4 Suggestion for Further Study

In view of the findings and the outlined recommendations, the researcher suggests further studies into the management and cost of burns at KATH.

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APPENDIX A

DATA COLLECTION INSTRUMENT

KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY, KUMASI.DEPARTMENT OF COMMUNITY HEALTH.

QUESTIONNAIRE FOR COLLECTING DATA TO ESTIMATE THE TREND AND MECHANISM OF BURNS AT KOMFO ANOKYE TEACHING HOSPITAL (KATH).

RESPONDENTS ARE ASSURED OF CONFIDENTIALITY

DEMOGRAPHICS

1. Indicate the respondent (person providing the information) and fill out all relevant boxes providing information about the patient

i Respondent Patient

a.Husband ☐ b. Wife ☐ rent ☐ d. Siblings ☐ e Others ☐

ii Patient date of birth ……

iii Age ☐

If under 5 years of age, was the patient

a. Alone ☐ b. With an adult but unsupervised ☐ c. with an adult and supervised ☐

d. With other Children (<18 years old) ☐ e. Unknown ☐

iv. Gender

a. Male ☐ b. Female ☐

v. Date of Admission ....……..

vi. Hour Of day Admission ……..

GENERAL AND CLINICAL INFORMATION

2. Fill out the all relevant boxes indicating general and clinical information about the burn

i. Date burn occurred; ……..

ii. Hour of day burn occurred; …….

iii. Village, neighborhood or postal code where burn occurred;
……

iv. Total body surface of burn; ……..

v. Associated smoke inhalation injury;

a. Yes ☐ b. No ☐

vi. Associated injury;

a. No associated injuries ☐ b. abdominal trauma ☐ c. Chest Trauma ☐

e. Eye injury ☐ f. Long bone fracture ☐ g. Spinal Cord Injury ☐

h. Traumatic brain injury ☐

ANATOMY OF THE BURN

3. Fill out the relevant boxes indicating the anatomy of the burn

i. Head and Neck;

a. None ☐ b.Scalp ☐ c. Face ☐ d. Eye ☐ e. Neck ☐

ii. Trunk;

a. None ☐ b. Chest, abdomen, back or buttocks ☐ c. Perineum or genitals ☐

iii. Arms;

a. None ☐ b. Shoulder and / or axilla ☐ c.Upper arm / or forearm ☐ d.Elbow ☐

iv. Hands and wrists;

a. None ☐ b. Wristc☐ck of hand ☐ Palme. ☐ ingers and /or thumb

v. Legs ☐

a. None ☐ b. Thigh and /or Lower leg ☐ Knee ☐ d. Ankle ☐ e. Foot ☐

DEGREE OF BURNS

4. Fill out all relevant boxes indicating the degree of the burn

a. First Degree ☐ b. Second degree ☐ c. Third Degree ☐

HOW THE BURN WAS CAUSED

5. Tick the appropriate box in the top row indicating how the burn was caused and then fill out the appropriate Colum below

i. Flame (occurring in which setting);

a. Household ☐ b. Occupational ☐ c. Public ☐

- If household related to ;

a. Cooking ☐ b. Heating ☐ c. Lighting ☐

d. House fire (single) ☐ House fire (multiple) ☐ f. Intentional flame burn ☐

g. Playing with fire ☐ Others ☐

- If Occupational(Type of Occupation);

a. Food preparation ☐ b. Petrochemical ☐ c. Textiles ☐

d. Construction ☐ e. Agriculture ☐ f. Fireworks/related ☐

g. General industry ☐ h. Others ☐

- If Public related to;

a. Road Traffic crash ☐ b. Bonfires ☐ c. Fireworks ☐

d. Spilled liquids ☐ e. playing with fire ☐ f. Assault ☐

g. Terrorism or war ☐ h. Other ☐

ii. Hot surface related to;

a. Cooking ☐ b. Household heating ☐ c. House Appliance ☐

d. Household lighting ☐ e. Occupational activity ☐ f. Other ☐

iii. Hot liquid steam or gas related to;

a. Cooking ☐ b. Bathing/Washing ☐ c. Occupational activity ☐ Other ☐

iv. Electrical occurring in which setting;

a. Household ☐ b. Occupational ☐ c. Public ☐

- if Household related to;

a. High Voltage ☐ b. Low Voltage (< 1000 Volts) ☐ c. Lighting ☐
d. Other ☐

- if occupational related to;

a. High Voltage ☐ b. Low Voltage (< 1000 Volts) ☐ c.Lightingd ☐ her ☐

- if Public related to;

a. High Voltage ☐ b. Low Voltage (< 1000 Volts) ☐ c. Lighting ☐
d.Other ☐

v. Chemical occurring in which setting;

a. Household ☐ b.Occupational ☐ c.Public ☐

6. Burn caused intentionally?

a. Intentional self-harm ☐ b. Assault ☐ c. Unintentional ☐
d. Undetermined intent ☐

DEGREE OF CLINICAL SUSPICION

7. If undetermined intent was selected above, what is the degree of clinical suspicion that the burn was caused intentional?

a. None ☐ b.Low ☐ c.Medium ☐ d.High ☐

8. Contributing factors;

a. None ☐ b. Alcohol ☐ c. Drug ☐ d. Epilepsy ☐

e. Dementia Psychiatric ☐ f. Physical or mental disability ☐
g. Other ☐

9. Number of People burned in this incident

a. 1 person ☐ b. 2 people ☐ c. 3-5 people ☐

d. 6-9 people ☐ e. 10 and more people ☐

PATIENT TREATMENT AND DISCHARGE

10. Indicate the patient treatment and discharge;

i. Date of discharge

ii. Hour of day patient discharged

iii. Surgery during hospital stay

a. Yes ☐ b. No ☐

iv. Condition on discharge from facility;

a. Dead ☐ b. Transferred to another facility ☐

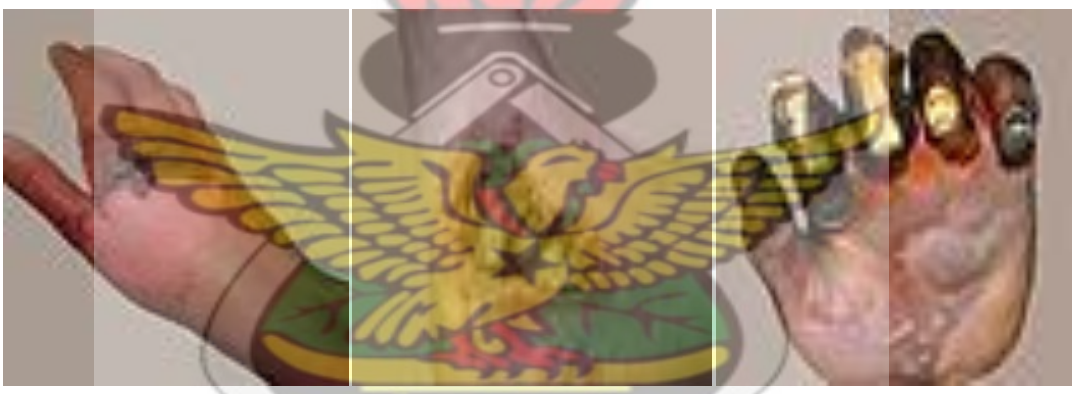
c. Left against medical advice ☐ d. Discharged home with disability

e. Discharged home without disability ☐ f. Unknown ☐

APPENDIX C

Figure 2.1 Photographic Films of the Types of Burns and TBSA

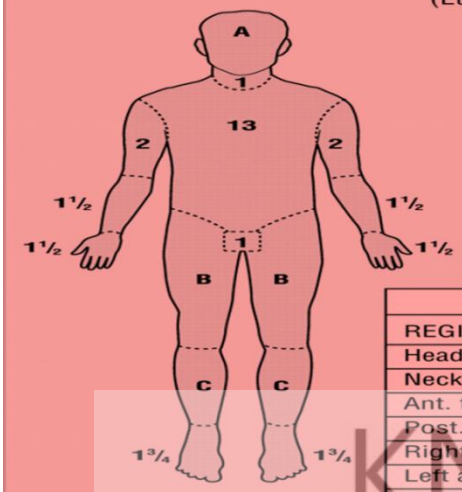
Superficial (1st Degree Burn) Superficial Partial-Thickness (2nd Degree Burn)

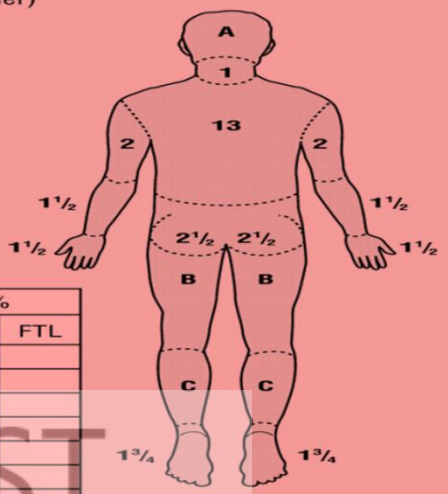


Partial-Thickness (2nd Degree) Burn Full Thickness (3rd Degree) Burn Deep Full Thickness (4th Degree) Burn

% Total Body Surface Area Burn

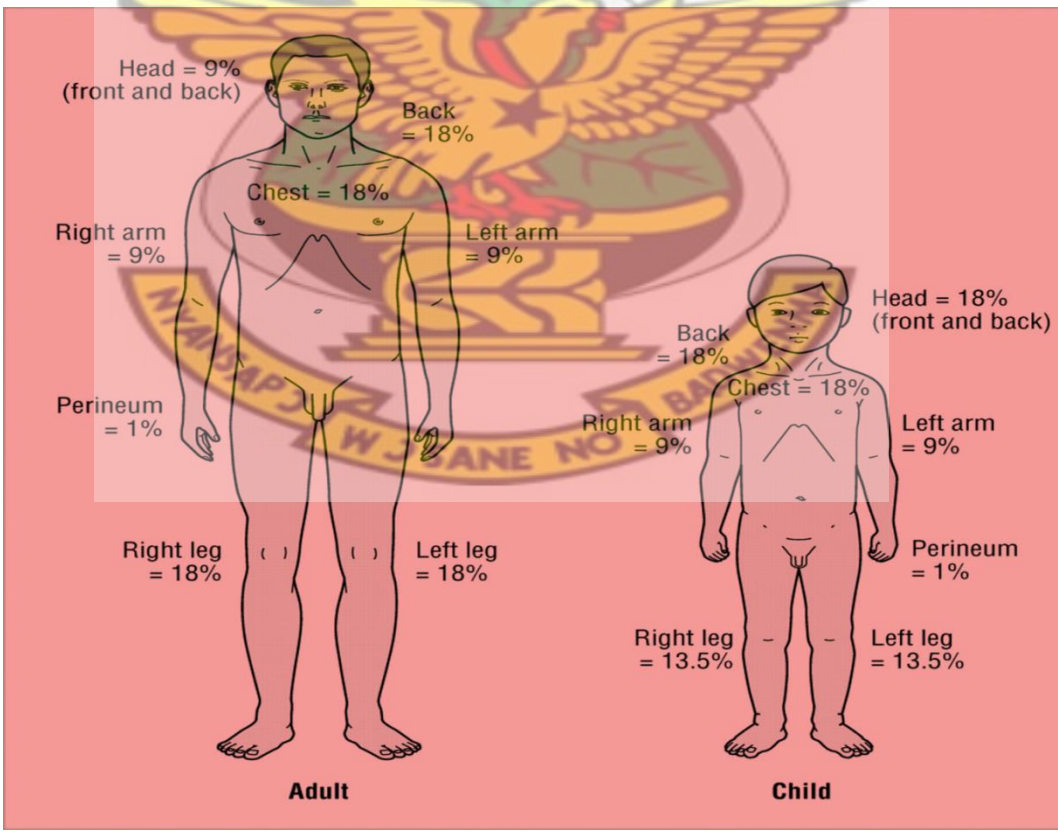
Be clear and accurate, and do not include erythema
(Lund and Browder)





	%	
REGION	PTL	FTL
Head		
Neck		
Ant. trunk		
Post. trunk		
Right arm		
Left arm		
Buttocks		
Genitalia		
Right leg		
Left leg		
Total burn		

AREA	Age 0	1	5	10	15	Adult
A = ½ OF HEAD	9½	8½	6½	5½	4½	3½
B = ½ OF ONE THIGH	2¾	3¼	4	4½	4½	4¾
C = ½ OF ONE LOWER LEG	2½	2½	2¾	3	3¼	3½



SUMMARY OF CONTENT

This research was primarily conducted to estimate the trend and mechanism of burns at KATH for a five-year period – May, 2009 to April, 2014. The study was divided into six chapters each with sections and sub-sections to treat the various aspects of the chapters.

Chapter One introduced the study and was devoted to discuss the design, research problem, purpose and the specific objectives of the study. Further, this chapter outlined the research questions, significance, limitations, the scope and how the study was organized. The second Chapter reviewed relevant literature to explain the concept of burns, types or causes of burns, signs and symptoms and classification of burn injuries. Again, the pathophysiology, vulnerability and risk factors of burns were also discussed on this chapter. The chapter continued with the causes of death of burns patients, some complications, prevention and controversies in burn patient care.

Chapter Three of the study took care of the study materials and methods adopted to collect and analyze data. Under this chapter the design for the study, population, sample size and sampling techniques were elaborated. Tools for data collection and analysis together with an assurance of validity and reliability of results were explained and due cognizance of research ethics was ensured. Results of the study wereanalyzed on Chapter Four in line with the research objectives. Chapter Five discussed the research results with some prior literature evidence to buttress it. The final Chapter six summarized the study findings, concluded the entire study and outlined some recommendation for stakeholder consumption.

The study found prevalence rate of burns at 4.2% and a mortality rate of 14%. Majority (81%) of burns cases at KATH was found to be the2nd degree type with a Total Body Surface Area (TBSA) greater than 20%. Based on the research findings and recommendations, the researcher recommends for a further study in the management and cost of burns at KATH.