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STUDY OF FACTORS AFFECTING MORTALITY IN BURN PATIENTS ABOVE 18 YEARS OF AGE

Thesis submitted to

NATIONAL BOARD OF EXAMINATION, NEW DELHI

In partial fulfillment of the requirements

For the award of the degree of

DIPLOMATE OF NATIONAL BOARD

(GENERAL SURGERY)

BY

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Under The Guidance of

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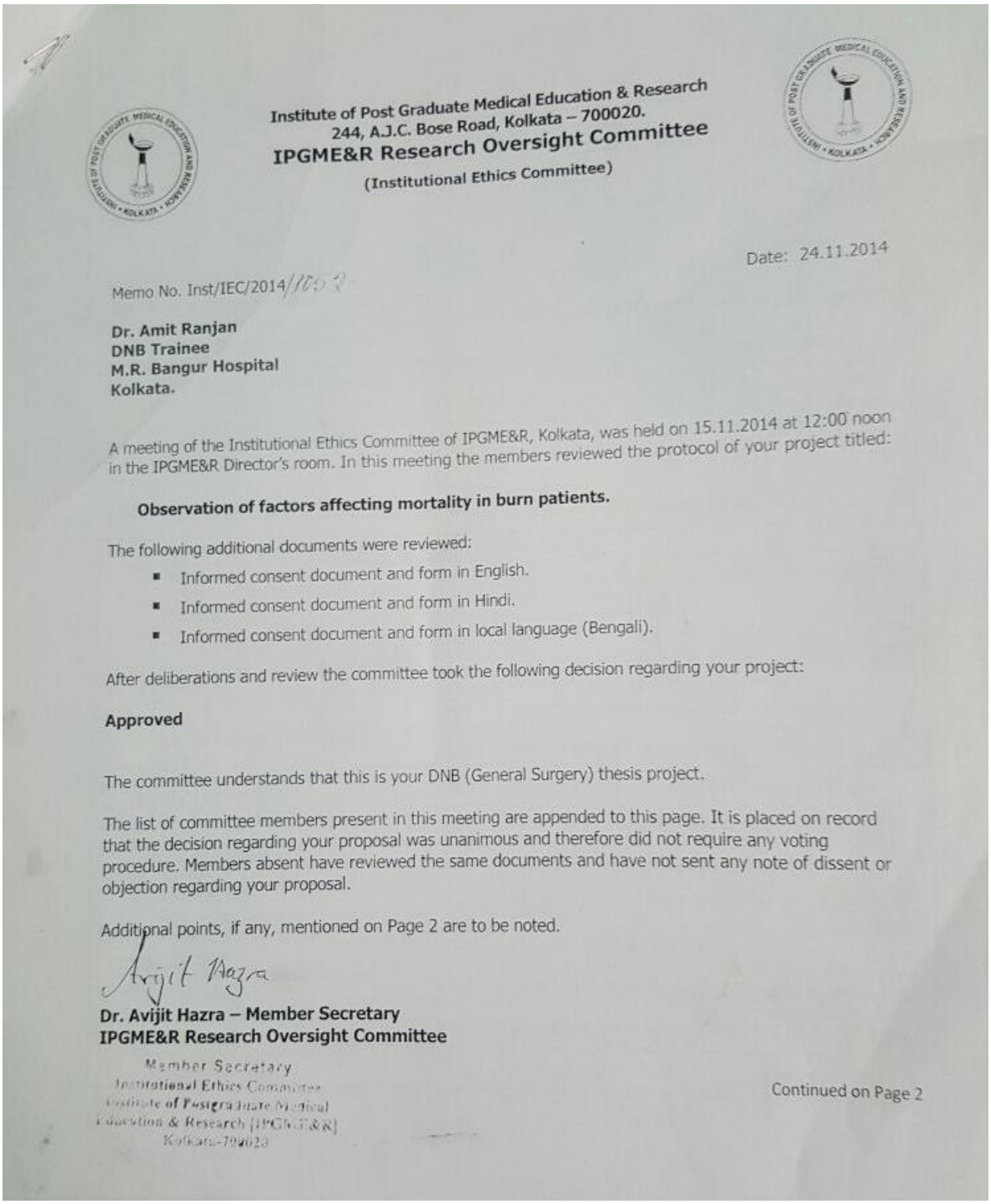

Institute of Post Graduate Medical Education & Research
244, A.J.C. Bose Road, Kolkata – 700020.
IPGME&R Research Oversight Committee
(Institutional Ethics Committee)

Date: 24.11.2014

Memo No. Inst/IEC/2014/1003

Dr. Amit Ranjan
DNB Trainee
M.R. Bangur Hospital
Kolkata.

A meeting of the Institutional Ethics Committee of IPGME&R, Kolkata, was held on 15.11.2014 at 12:00 noon in the IPGME&R Director's room. In this meeting the members reviewed the protocol of your project titled:

Observation of factors affecting mortality in burn patients.

The following additional documents were reviewed:

- Informed consent document and form in English.
- Informed consent document and form in Hindi.
- Informed consent document and form in local language (Bengali).

After deliberations and review the committee took the following decision regarding your project:

Approved

The committee understands that this is your DNB (General Surgery) thesis project.

The list of committee members present in this meeting are appended to this page. It is placed on record that the decision regarding your proposal was unanimous and therefore did not require any voting procedure. Members absent have reviewed the same documents and have not sent any note of dissent or objection regarding your proposal.

Additional points, if any, mentioned on Page 2 are to be noted.

Avijit Hazra

Dr. Avijit Hazra – Member Secretary
IPGME&R Research Oversight Committee

Member Secretary
Institutional Ethics Committee
Institute of Postgraduate Medical
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Kolkata-700020

Continued on Page 2

Institute of Post Graduate Medical Education & Research
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IPGME&R Research Oversight Committee
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Additional points to be noted

- The Committee expects that any amendments to the Study Protocol, Informed Consent documents or other relevant documents would be brought to its notice.
- A brief project completion report is to be submitted to the IPGME&R Research Oversight Committee. If project duration exceeds 1 year from commencement, a brief annual progress report should also be submitted.
- IPGME&R Research Oversight Committee is registered with Central Drugs Standard Control Organization (CDSCO), Government of India, in consonance with Rule 122D of the revised Drugs & Cosmetics Rules 1945 – Registration No. ECR/35/Inst/WB/2013. It functions in accordance with revised Schedule Y and Indian Council of Medical research (ICMR) guidelines.

List of institutional ethics committee members who attended the meeting on 15.11.2014

SN	Name & role in the committee	Gender	Designation
1	**Prof. Subir Kumar Dutta** [Chairperson (Acting) and Basic medical scientist]	Male	Ex-Dean of Faculty of Medicine, University of Calcutta & Retired Professor of Pathology
2	**Prof. Pradip Kumar Mitra** [Basic medical scientist]	Male	Director, IPGME&R and Professor of Pathology
3	**Prof. Dipanjan Bandyopadhyay** [Clinician]	Male	Medical Superintendent cum Vice-Principal, IPGME&R and SSKM Hospital and Professor of Medicine
4	**Prof. Jayanta Chatterjee** [Clinician]	Male	Head, Department of Nuclear Medicine, IPGME&R
5	**Prof. Bijay Kumar Majumdar** [Clinician]	Male	Head, Department of Plastic Surgery, IPGME&R
6	**Prof. Amal Santra** [Basic medical scientist]	Male	Scientist, Department of Gastroenterology, IPGME&R
7	**Prof. Rathindranath Dutta** [Clinician]	Male	Former Head, Department of Dermatology, IPGME&R
8	**Prof. Rajendra Pandey** [Clinician]	Male	Head, Department of nephrology, IPGME&R
9	**Dr. Bobby Pal** [Public health expert]	Female	Assistant Professor, Department of Community Medicine, IPGME&R
10	**Mr. Debdut Mukherjee** [Legal expert]	Male	Advocate, Calcutta High Court
11	**Mr. Arunangshu Shekhar Jana** [Social worker]	Male	Social worker, Mahendraganj, Dist South 24 Parganas
12	**Mr. Swapan Kumar Sarkar** [Lay person]	Male	Stenotypist, Office of Dean of Student Affairs, IPGME&R
13	**Prof. Avijit Hazra** [Pharmacologist & Member secretary]	Male	Professor, Dept. of Pharmacology, IPGME&R

Avijit Hazra 24/11/2014

Dr. Avijit Hazra – Member Secretary
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I am grateful to the support of God, my father **SRI RAM PRASAD SINGH** and my brother **DR. AJAY KUMAR SINGH** and my family members.

Place: KOLKATA

Date: **DR.AMIT RANJAN**

GOVERNMENT OF WEST BENGAL OFFICE OF THE
SUPERTENDENT M.R.BANGUR HOSPITAL
241, D.P.S ROAD, TOLLYGUNGE, KOLKATA – 700033

CERTIFICATE

This is to certify that DR.AMIT RANJAN has prepared this thesis entitled "STUDY OF FACTORS AFFECTING MORTALITY IN BURN PATIENTS ABOVE 18 YEARS OF

AGE" in the department of general surgery, under the guidance of DR. JOYDIP ROY, MS, M.R.BANGUR hospital, Tollygunge, Kolkata-33, in partial fulfillment of regulations for the award of D.N.B. Degree in General Surgery by National Board of Examinations.

Place: Kolkata

Date: **SUPERINTENDENT**

M.R.Bangur Hospital, Tollygunge
Kolkata-33

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This is to certify that **DR.AMIT RANJAN** has prepared this thesis entitled **„STUDY OF FACTORS AFFECTING MORTALITY IN BURN PATIENTS ABOVE 18 YEARS OF AGE**' under my supervision and guidance at **M.R.BANGUR hospital Tollygunge, Kolkata-33** in partial fulfillment of regulations for the award of **D.N.B**. **Degree in General Surgery** by **NATIONAL BOARD OF EXAMINATIONS**.

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CERTIFICATE

This is to certify that **DR.AMIT RANJAN** has prepared this thesis entitled **„STUDY OF FACTORS AFFECTING MORTALITY IN BURN PATIENTS ABOVE 18 YEARS OF AGE**' under my supervision and under the guidance of **DR.JOYDIP ROY, MS,** of **M.R. BANGUR HOSPITAL**, **TOLLYGUNGE KOLKATA-33** in partial fulfillment of regulations for the award of **D.N.B. Degree in General Surgery** by **National Board of Examinations**.

Kolkata

Date:

DR.ASIS BANERJEE

MBBS(cal),MS(cal),
HOD CUM DNB CO-

ORDINATOR

DECLARATION

This thesis entitled '**STUDY OF FACTORS AFFECTING MORTALITY IN BURN PATIENTS ABOVE 18 YEARS OF AGE**' is submitted to **NATIONAL BOARD OF EXAMINATION** in partial fulfillment of the board regulations for the award of **D.N.B. Degree in general surgery**.

The work was done by me under the guidance of **Dr. JOYDIP ROY, MBBS, MS** of **M.R.BANGUR hospital ,Tollygunge,241 D.P.S. Road Kolkata-33.**

I have not submitted this work to any other university before.

Kolkata-33 **Dr. AMIT RANJAN**

Date:

CONTENTS

INTRODUCTION

With progressive industrialization and increased use of inflammable substances for domestic heating purposes, incidence of accidents is rising. At the same time the safety education and its extension to public has not been kept in pace with rapid progress in industrial development. In absence of suitable precautious, fires and other accidents may take the place of pathogenic microbes and may jeopardize the health and economy of a developing country.

Burn injuries are major health hazards throughout the world and occupy a position near the top as a cause of trauma related deaths. Besides being accidental, a major proportion of burns in India is suicidal and homicidal. The burn injury is one of the most serious and devastating forms of trauma that man can sustain. Millions of people around the world are hospitalized for the treatment of burns each year and thousands die. The daily cost of care for a burn victim is tremendous. The economic loss to any nation is staggering and must be measured not only in currency but in the permanent loss of millions of productive years. The loss is magnified by the fact that 50 percent of major burns occur during the formative and productive years of life.

As in all trauma related deaths, burn death generally occurs immediately after the injuries or weeks later as a result of multisystem organ failure. Of all burns, 66% occurs at home and fatalities are predominant in the extremes of age, the very young and older adults. The most common causes are flames and scald burns[1]. Scald burns are most common in victim upto 5 yrs of age.[2]

Burn

Causes

- Flame—damage from superheated, oxidized air
- Scald—damage from contact with hot liquids
- Contact—damage from contact with hot or cold solid materials
- Chemicals—contact with noxious chemicals
- Electricity—conduction of electrical current through tissues

Depths

- First degree—injury localized to the epidermis
- Superficial second degree—injury to the epidermis and superficial Dermis
- Deep second degree—injury through the epidermis and deep into the Dermis
- Third degree—full-thickness injury through the epidermis and dermis into subcutaneous fat
- Fourth degree—injury through the skin and subcutaneous fat into underlying muscle or bone

Determination of burn size estimates the extent of injury. Burn size is assessed by "RULE OFNINE"[4].

In adults,

Upper extremity & the head and neck------ 09% each

The lower extremities & the anterior and posterior trunk---------- 18% each

Perineum and genitalia---- 01%

In children,

each upper extremities--------	09%
Head and neck---------	18%
Each lower extremities---------	14%
Anterior trunk--------	18%
Posterior trunk--------	18%

The present study is to observe the factors which lead to mortality and morbidity in burn patients so that we can have a proper protocol by which we can try to reduce the mortality and morbidity.

On a rough estimate, there are approximately six million burn injuries annually in our country (Sawhney et al, 1993)[5]. Out of this half to one million patients require hospitalization. A severe burn is a traumatic catastrophe while burns of intermediate severity produce ill health of varying degrees and sometimes cause permanent disability. Psychological trauma associated with burn adds to further major public health problem.

'Just another burn' is the statement most often made on the arrival of a burn victim at emergency department. The suddenness of accident, the visibility of damage, pain, fear and reactions of patient's relatives all add to create an atmosphere of tension. As the burn patient arrives at emergency department immediate need is urgent resuscitation and relief of pain and as soon as the condition of patient allows detailed history is obtained either from the patient or his relatives. The severity of burn is estimated from total body surface area burn and depth of burn wound. Estimation of extent and depth of burn helps in establishing the criteria for hospitalization of patient, to classify the wounds as minor, moderate or critical for purpose of management, for calculating the initial fluid requirements, to know the prognosis with regard to survival, expected time of healing and need for any surgical interventions. The

management of burn requires an interactive multidisciplinary team approach which is least expensive and most efficient method of treating major burn injury. They often require years of supervised rehabilitation, reconstruction and psychosocial support as the quality of burn care is no longer measured only by survival but also by functional and cosmetic outcome. In extensive burns even if one is successful in winning the battle of life for his patient he may probably be doing it at the cost of a social death and leaving patient to a life of seclusion and depression. Hence, the old adage **'An ounce of prevention is better than a pound of cure'** is best exemplified by burns and its sequel as more than 90 percent of all burns are preventable by using common sense and taking ordinary precautions. Nutritional support may be more important in patients with large burns than in any other patient population. Not only does adequate nutrition play a role in acute issues such as immune responsiveness, but the hypermetabolic response in burn injury may raise baseline metabolic rates by as much as 200%.[6] This can lead to catabolism of muscle proteins and decreased lean body mass that may delay functional recovery.[7] Early enteral feeding for patients with burns larger than 20% TBSA is not only safe, but it may help prevent loss of lean body mass,[8] slow the hypermetabolic response,[9] and result in more efficient protein metabolism.[10] If the enteral feeds are started within the first few hours after admission, gastric ileus can often be avoided.

Although there have been tremendous advances in the burn management in the last three decades but the benefits have not filtered through to a vast majority of the burn victims. During modern days, the management of patient with particular attention to the severity of shock, respiratory support, renal function, fluid and electrolyte balance, better local wound care and nutrition status of patients have assumed great significance

and helped in reducing the morbidity and mortality. Many patients with extensive burn, who would formerly have died in the first 48 hours from shock, today survive this phase of illness because of better understanding in the management of shock with proper fluid and electrolyte balance, blood or plasma transfusion, respiratory support, corticosteroids and other supportive measures. In spite of extensive treatment in first few days they fall prey subsequently to infections, metabolic disturbances, renal failure, anaemia, hypoproteinaemia and other complications which are less understood and for which treatment is more troublesome. Burn wound provides a large, warm, moist and protein rich medium for growth of micro organisms from endogenous and exogenous sources. Heating of tissues result in direct cell rupture or cell necrosis and the damaged tissue acts as a nidus for infection. The patient is also more susceptible to infection due to depressed immune system; burn wound will almost inevitably be colonized by micro organisms within 24 to 48 hrs. This may in addition be a bacteraemia or septicaemia and metastatic infection may develop at other sites. Bacteraemia is a common cause of mortality in a severe burn and may occur at any time during the 1st week until the point when all the wounds have entirely healed.

With advancement in fluid resuscitation 11 and the advent of early excision of the burn wound,12 survival has become an expectation even for patients with severe burns. Because of increased prehospital safety measures, burn patients are being transferred longer distances to receive definitive care at regional burn centers; recent data from one burn center with a particularly wide catchment area confirmed that even transport times averaging 7 hours did not affect the long-term outcomes of burn patients.13 age and burn size, as well as inhalation injury, continue to be the most robust markers for burn mortality.[14] Age, even as a single variable, strongly predicts mortality in

burns,[15] and in hospital mortality in elderly burn patients is a function of age regardless of other comorbidities.[16]

Thus a mere increase in survival time has been achieved in major burn victims without any significant reduction in mortality rate. Recent researches have improved our understanding of some of these ill-understood complications and in many ways increased the effectiveness of treatment for burns of moderate severity. But continued failure to reduce mortality in cases of burn of major degree has led to revival of interest in possible role of toxins from burns tissues and cell mediators in the serum of convalescent patients.

It has long been anecdotally noted that two patients of similar ages and burn size may have very divergent responses to their burn injuries. Attention is being increasingly turned to identifying genetic differences among burn patients and how they affect response to injury. Specific allele variants have been linked with increased mortality in burn patients.[17] It may be that genetic differences may predispose burn patients to severe sepsis,[18] perhaps by downregulating the immune response.[19] Inflammation and the Host Response to Injury is a prospective, multicenter, federally-funded study that aims to define specific genetic pathways that differ in the response to both burns and traumatic injury.

AIMS AND OBJECTIVES

1> Tocategorizetheburninjuriesaccordingtomodeofinjury,depth&site. 2> To study the effects in different age groups.

3> To observe the factors leading to mortality in these patients. 4>To preventmortality andmorbidityinsalvageablepatients.

REVIEW OF LITERATURE

Interests in injuries caused by fire, dates back to the early days of mankind. As early as 800 B.C., references have been found in 'Sushruta Samhita' regarding symptoms, treatments and pathological disturbances in burn. "Heat could cause inflammation" was known to Galen (130 to 210 A.D.). Paulnes Aeginata advocated application of light earths mixed with vinegar to prevent blister forming.

During the twelfth century Arabian civilization had reached its zenith and with the crusades the best ancient learning was promulgated to a greater extent to the western world. The British were among the first to use gun powder on the continent at the battle of Crecy. The first book devoted to burn was written by William Clows (1540-1604) in 1591, "a proved practise for all young chirugians concerning burning with gunpowder and wounds made with gunshot". Clows advocated greesy dressing compounded of many drugs and had special ointments for the eyes and eyelids.

Fabricins Hildanus (1560-1631) in Switzerland gave the first exhaustive description of burn, their classification and treatment in his book "De combustionibus" in 1607 and was the first to classify burn into three degrees. Richard Wiseman (1676) written on account of his personal experience that a part burnt superficially is far more painful than that a deep bum. He followed Fabricins Hildnus in classifying burns in three degrees. "If the burn be superficial, it raised the cuticle up in blisters; if it goes deeper into the skin causes an eschar, if it burns deeper into the flesh the force of fire makes a hard crust with contraction". The latter type of burn was called a scaphelus or gangrene by most of his contemporaries.

In 1799, Sir James Earle published his monograph on the immediate

treatment of burns which recommended again the refrigerant doctrines of Anicinna and Rhazas. The application of cold to a burnt limb has always been popular because it allays pain and if applied immediately it is said to prevent blister formation and limit the changes in the area of erythema. Local circulatory changes were first investigated by Hastings (1820) but it was Dupuytren (1932), a surgeon in Paris who classified the burn region according to depth into six degrees of injury.

In July, 1823 postmortem changes found in patients who died of burns were reported from Edinbum. The patient 'Joseph Swan' has an ulcer of the stomach and "William Cumin" had gastric congestion. In 1835, Henry reported perforation of stomach following burn. Finally in 1842, Curling published his paper as a result of which another eponym became firmly established in medical literature as Curling's ulcer.

In ancient time the basis of classification of burn was on surface appearance, erythma, vesication, crusting and charring. Goldbalt (1927) classified burns into three degrees i.e. erythema forming, blister forming and eschar forming. Depending on the thermal agent causing injury he also classified burn into six degrees. Wallace (1949)[20] simplified the classification of burn into superficial and deep. Jackson and Lee (1963)[21] classified burn on several important factors relating to mortality such as surface area and depth of burn, presence of significant metabolic problem and some age factors –

Type I - Burn of first and second degrees with less than 50% of body surface area, no metabolic problem, not requiring skin grafts, heal with no scarring with 100% recovery.

Type II - Full thickness burns of less than 20%, no serious metabolic problems rarely requiring parenteral fluid, require skin grafts, have good prognosis except for significant mortality in neonates, older ones and those with

debilitating chronic diseases.

Type III - Full thickness burn of 20-40% characterized by shock in acute phase, significant metabolic alteration, have good prognosis in the younger age group with higher mortality in middle age and older patients.

Type IV - Full thickness burn of 40-80%, severe shock, serious mortality risk from sepsis and bronchopneumonia, nutritional and metabolic problem

,requiring skin grafting with homografts and multiple corps of autografts, a mortality rate of 40-80% depending on the age, extent of burn and other factors.

Type V - Burn over 80% or over 40% in age group above 70 yrs and have almost 100% mortality.

Evans (1963)[22] classified burns depending on the level of skin destruction as follows -

1. Superficial - In which level of skin destruction is limited to epidermis which heals rapidly with minimal scarring and needs no skin graft.
2. Partial thickness - Involving whole of epidermis and part of dermis.
3. Full thickness with the loss of epidermis and entire dermis and slow or nonexistent healing, needs skin grafting.

The initial diagnosis of depth in not easy. The first degree burn shows erythema and transient blistering. In the second degree, semiopaque blister may form with a slipped appearance in their bases. Third degree burns may show actual leathery charring or dead white appearance. However, in many burns the appearance is not well defined. A bluish red mottling with or without blistering way occur in either a partial thickness or full thickness burn and again in most burns the heating effect on the skin is not uniform so that the same are mixed with partial thickness and full thickness areas shading one into the other.

Certain tests have been devised to know the depth of burn. Jackson (1953)[23] described the use of sterile needle to test sensation. Analgesia may indicate full thickness skin destruction although a temporary loss of sensation can occur in partial thickness burns particularly in certain areas. Tempest, in 1961, used intravenous injection of dyes which stain visible tissues. Lawson Wlodeck and Webster (1961) introduced infrared scanning which was accurate in predicating depth of 90% of 55 skin burns, they studied.

The burn area is measured as percentage of local body area for which in 1951 Wallace[20] gave a 'rule of nine' for calculation of total body surface area of bum. Little modification has been done in the head and neck area burn for calculation in cases of children. Lynch and Blocker developed 'Rule of five' for estimating extent of burns in children.[24]

The factors influencing mortality in cases of severely burned patients are

age, sex, severity of burn, site of burn; time elapsed before hospitalization, nature of first aid used before hospitalization and causes of burns. The proportion of body surface area involved and the age of the patient age two factors of prime importance which influence mortality (Germann G et al, 1997[25];Donati L et al, 1998[26]). It was observed that burn mortality was directly proportional to the percentage of body surface area burn and increasing age of burn patients.

Herruzo-Cabrera R et al[27] in their observation on mortality evolution study of burn patients in a critical care burn unit, Madrid, Spain over three periods 1971-83, 1984-87 and 1988-91 consisting of total 2859"" patients compared incidence of fatal burns during the three periods standardizing for age, body bum surface area and burn depth and found that taking first period as a reference the mortality reduction in 2nd and 3rd period was 14% and 37% respectively. Early surgical treatments, nasal, pharyngeal, intestinal and burn

surface decolonization and catheter puncture prophylaxis lead to reductionin mortality.

Inhalation injury in burn patients is an important comorbid factor in burn injury which increases the mortality rate substantially.Tredget EE et al[28] in their study at Firefighters Burn treatment unit, Edmonton, Canada between 1977-1987 on 1705 thermally injured patients admitted here observed that

124 patients suffered concomitant inhalation injury diagnosed by bronchoscopy. Patients with inhalation injury suffered from larger total body surface area burn 39.7%±2.5 versus 12.2%±0.3 than those without inhalation injury. Inhalation injury increased the number of deaths from burn injury 34.7% versus 1.7% independent of age and total body surface area burn with a three folds prolongation of hospital stay. The maximum detrimental effects of inhalation injury in burn patient outcome occurred when it coexisted with moderate (15-29% TBSA burn) to large (30-69% TBSA burn) thermal injuries.

De-Souza D et. al[29] in their study between Jan.1990 to April 1995 at University Hospital, Saopolo, Brazil on admitted bum patients observed that 80.8% of burn victims were hospitalized within 24 hours of burn. Occupational and/or domestic accidents were responsible for 78.6% of the burns which were mainly caused by a direct flame (71.2%) with alcohol being the flammable fluid most frequently used. The average patients treated was a male of 9 yrs. of age or less with 20-40% burned body surface who received care within 24 hrs of burn injury. They observed mortality rate of 18.8% for all patients which increased with burned body surface and age. The mortality rate was significantly higher for self inflicted burns (42.9%) than for accidental burns (20.2%).

Yowler CJ et al[30] during their study between Jan.1991 to Dec. 1995, observed that early amputation of extremity was associated with a 13.6%

mortality rate and delayed amputation with a 50% mortality rate. They concluded that earlier identification of nonsalvegable limbs maydecrease infectious complications and improve the chances of patient survival.

Convington et al[31]in 1996, in their study on prognostic indications in elderly patients with burn found that preinjury health problems were present in more than 2/3rd of patients and when 2 or more than 2 were present there was higher incidence of complications 65.4% versus 45.3% and mortality rate of 53% versus 33.5%. Older age groups were more prone to have infections (76.2% in 86-96 yrs. Age group) and a fatal outcome when systemic sepsis occurred (100% in 86-96 yrs. Age group).

Marrow, Smith et al[32] (1996) in their 6 yrs of study on aetiology and outcome of burns in 449 casesagedbelow16yearsobservedthatmajorityof death occurred in patients below 4 yrs of age (4.7%) with no difference in mortality in male or female patients. Mortality rate increased with increase in total body surface area burn as mean burn size for survivors was 13.1%±0.5 and that for non survivors was 55.3%±5.7. They concluded that major predictors of mortality were burn size,age and associated inhalationalinjury. They also found that most common type of burn injury was scalds in below 4 years age group and flame burn in older children.

Most of the burns are domestic and this fact has been supported by most of the writers [TejerinaCAetal1991[34] andMahaluxmivalaS,1997[33]].

Mahaluxmivala S et. al[33] (1997) analysed 90 cases admitted over an 18 months period having mean age 14.9 ± 1.5 yrs with a range of 6 months – 55 yrs and observed that domestic burns formed the majority of cases (71%). Of the total scalds and flames accounted for 90 percent of the burns.The mean of total body surface area burn was 23% ± 2.4 with range of 3-98%. The overall mortality rate was 5.6% while mortality in critical burns was 14.3%. They

concluded that total body surface of burn was main factor influencing mortality.

Marsh D et al[35] in their 1 year study between Nov.1992-Oct. 1993 at Karachi's two adults burn units observed that females (57%) outnumbered males and were younger on average 25.1 versus 27.6 yrs. Female had more severe burns than males (57% versus 50% of total body surface area). Burns were most often associated with flames (33 out of 47) but stove bursts caused most severe injury (52% total body surface area). Patients were predominantly young uneducated female houseworkers, clothed in loose attire who were injured during daylight at home around a floor level stove, unaware of fire safety and who received no first aid. They observed a case fatality rate of 56%.

Raff T et al[36] (1996) during their 5 year study on 498 burn patients identified following variables to have a significant influence on mortality - age, total body surface are burn, full thickness burn, inhalational trauma, sex, alcohol abuse, nicotine abuse, pre-existing neurological diseases and cardiovascular diseases. Of all the above factors mentioned age and total body surface of burn have the most important influence on the outcome. Of minor weight was inhalational trauma followed by full thickness burn and sex. Total body surface area of burn was found to be most discriminative variable followed by age. In the group upto 20% total body surface area burn, age was the only additionally significant variable regarding the outcome. In the group with total body surface area burn 20-60%, age, sex and alcohol abuse became important variables. In patients upto 72 yrs with a medium risk of mortality (20-70%) inhalational trauma, alcohol abuse, combined alcohol and nicotine abuse, sex, preexisting neurological and cardiovascular diseases significantly influenced outcome. In older patient inhalation trauma was the only additional variable of importance.

Weber JM and Tompkins DM[37](1993) observed that infection and its sequelae continue to be the leading causes of morbidity and mortality for the thermally injured patients. They found that early excision of the burn wound and prompt wound closure, administration of systemic antibiotics topical antimicrobial agents and mechanical isolation have improved survival.

Lewendowski R et al[38](1993) in their study on burn injuries in the elderly at Royal Brisbane Hospital observed that elderly males were more likely to be admitted than females. No high risk period of the day, week or year could be identified for this group. Flame burns and scalds were most common as was the association with cooking and bathing activities. Mortality rates were related to the percentage of total body surface area burn and inhalation injury. Complications were mainly pneumonias and venous thrombosis and reflect the need in this age group of maintaining active morbidity and a quick resolution of burn injury. Infection may play an important role in increasing mortality rate so proper nutrition, meticulous wound care and early wound coverage is vital to prevent sepsis.

Kowal-Vern A et. al[39](1994) in their study on 60 burn patients at Loyola University Medical Center, Illinois observed that the mechanism of injury was by flame (25 cases), explosion and flame (19 cases), scald (12 cases), electric (3 cases) and chemical (1 case). 12 patients had an associated inhalation injury, 14 patients had sepsis syndrome. Of the total 60 patients male dominated (47 cases) and only 13 were female. The average age was 37 yrs (range 1.5-70 yrs) and average percent burn was 32% (range 4- 95%). The overall mortality was 13%.

Smith DL et al[40](1994) in their study on effect of burn size, age and inhalation injury of mortality following bum injury on 1447 consecutive burn patients over a five and half year period observed that increasing burn size,

advancing age and presence of inhalation injury were all associated with an increased mortality. Using multivariate analysis inhalation injury was found to be an important variable in determining outcome but the most important factor in predicting mortality was percent total body surface area burn (accuracy=92.8%) or a combination of percent total body surface area burn and patient's age (accuracy = 93%). Adding inhalation injury only slightly improved the ability to predict mortality (accuracy=93.3%).

Mc Manus AT et al[41](1994) in their 10 yrs of study at US Army Institute of Surgical Research, Texas on 2519 patients with large burns (20% or more of total body surface area) compared the incidence of gram negative bacteraemia (GNB) and mortality in patients hospitalized in either an open ward (OW) or a single bed isolation (IW) environment and found that the incidence of GNB was higher in the OW cohort (31.2%) than the IW cohort (12%). The post-injury time of first GNB was delayed in the IW versus the OW cohort (28.9 days Vs

11.8 days respectively). For patients who had GNB in the OW cohort, mortality was higher than predicted. Such increased mortality was not present in the IW cohort. Multiple antibiotic resistant gram negative pathogens were endemic in the OW cohort. There was no evidence of cross infection or endemic conditions with multiple antibiotic resistant gram-negative pathogens in the IW cohort. These results suggest that improvements in isolation of burned patients were associated with decreased incidence of GNB, delayed post injury time of GNB and improve survival.

Tejerina C et al[34], in their study on elderly burn patients over age 60 yrs between Jan. 1988 to Jan. 1991, observed that fire flames were the most common cause of burn (65.2%) and produced the most extensive lesion. 85% of the accidents occurred at home and winter was the season of highest incidence. The mean burn area was 21.6% and mortality rate was 33.3%.The

most common cause of death was hypovolaemic shock during first 24 hours and Pneumonia in later stages.

Koller J et al[42](1994) analysed epidemiological data of 1119 acute burn injuries, and found that there was a distinct male predominance in almost all age groups and average male to female ratio of 2.1:1. Children represented 38.1% of all treated patient. The age group with the highest no. of patient was in children 0-3 yrs (21.1%) and in adults 16-30 yrs. (17.6%). The majority of accidents were caused by hot liquids (43%) followed closely by flame and/or explosion (36%). The majority of accidents occurred at home (81.5%) followed by at work place (18.5%). The overall mortality rate was 7.3% but it was very low in cases of children (0.7%).

The most common cause of death during first 24 hours was hypovolaemic shock and this fact has been supported by most of the writers (Jackson and Lee,1963[21]; Tejerina C et al, 1991[34]). The patients who survived the phase of shock are later invaded by the next chief enemy i.e. infection. Mc Manus AT [41](1994) observed that infection in a burn patient was brought by contact and air borne transmission of pathogens by the agencies of dust, fine droplets from respiratory tract of patient, attendants or doctors and nursing staff. Infection may covert the superficial burn into deep burn and death followed from bacterial toxemia, septicemia, bronchopneumonia and other infective complications.

Burn wound provides a large, warm, moist and protein rich medium for growth of microorganisms from endogenous and exogenous sources. The bacteriological monitoring of the burn wound is carried out with surface and swab cultures and burn wound biopsies (Huggers J Pand Robson Me, 1986[43]).The most commonly recovered organisms were various types of Staphylococcus (Still JM et al,[44] 1998; David J. Coleman[45],2000). The next most

common pathogen includes Pseudomonas followed by Proteus, E. Coli, Klebsiella and Strep. Faecalis. Fungi and Viruses are also being increasingly isolated.Inpatientshospitalizedinopenwardtheincidenceof gram negative bacteraemia is very high (31.2%) as compared to isolation ward (12%) [Mc ManusATet al[41],1994;GlennD.WardenandDavidM.Heimback,1999[46]].

ZogoviCJetal[47] (1996)intheirstudyonacuterenalinsufficiencycaused

by burn injury observed that the factors influencing the renal function in burn patients are decreased cardiac output, respiratory failure with hypoxia and acidosis, toxaemia and sepsis. Acute renal failure in early phase occurred due tohypovalemiaandhypoperfusionofthekidneysandinlatephaseoccurred after a week as a consequence of infection and endotoxaemia. Development of acute renal failure is a very unfavourable prognostic sign. They studied 100 cases of burn aged between 14-65 years involving 25-75% of total body surface area and observed that in 3/4th patients picture of early renal failure developed with oliguria immediately after infliction of the burns with rapid increase in serum urea and creatinine levels. In rest l/4th patients, acute renal failure occurred on 8^{lh} day following infliction of burn (late form of ARF). In their study, anuria was present in 34% of patients and oliguria in 25%. Early phase ARF occurred in 59 patients, 38 patients had no sign of ARF while late ARF developed in 3 patients. ARF associated mortality rate among these patients was 23%. 77% of their patient's survived and such high percentage of survival is based on early diagnosis of ARF, understanding of shock associated with burn injury, adequate therapeutic approaches including both medical treatment and haemodialysis along withearlysurgicalmanagement.

Tetanus is uncommon in burn injury (Evans, 1963). Routine prophylaxis was advised by Korlof (1956).

Anaemia and hypoproteinemia are late comers. Children are at a special risk because of higher basal metabolic requirements, increased body surface area in relation to weight, decreased endogenous caloric reserves and increased requirements for growth and development. Curreri PW. and Luterman A[48].(1978) suggested that hypermetabolism can be minimized by keeping the patient in a warm environment and by use of occlusive dressings to limit the evaporative losses. They also suggested that oral feeding should replace the enteral route by fifth post burn day to meet the predicted calorie requirements and if the patient is unable to take orally a nasogastric tube may be placed. Zogovi CJ et al[47](1996) observed that the genesis of burn disease associated anaemia is multifactorial and include haemorrhage, haemolysis and decreased erythropoietin level.

An observational study on burn patients regarding its various etiologies was conducted by Khan TS et[49] in Kashmir in India during 2010-2011 and they concluded that Patient's ages ranged from 1 to 65 years with a mean age of 24.2 ± 7.6 years. The most common class of the population burnt were school going children (32.70%) followed by housewives (19.10%). Eighty percentage of patients belonged to rural areas and 20% to urban areas. Flame burns were more common in females (52.1%), electric burns were more common in males (93.3%) and scalds were more common in children (64.3%). Most of the burns were accidental (96.4%). 64.5% of patients reported within 24 hrs to hospital. 56.3% of patients had mixed degrees of burns, and 22.7% had third degrees of burns. Mortality was 11.8% and most common causative agent responsible was flame. The outcome was significantly associated with mode of injury, degree, depth, extent, causative agent and gender.

Aynur Atilla et.al[50] have conducted study on 465 burn patients at a tertiary hospital in turkey during year 2009 t0 2011 and found following results. Mean age of the patients was 18.6±22.0 years (median=6.1-87) and two hundred and eighty-two (62.2%) patients were younger than 18 years of age. Of the patients, two hundred and ninety-two (62.8%) were female and one hundred and seventy-three (37.2%) were male. Mean TBSA was 18.0%±14.0 (range 0-95%). Cause of injury was recorded in four hundred and thirty-two patients. Of the patients, one hundred and eighty-eight (43.5%) had scald injury, one hundred and sixteen (26.9%) had flame injury, forty (9.3%) had electrical injury, twenty-seven (6.4%) had contact injury, and sixty (13.9%) had liquid injury (hot fluids, boiling jam).

Kulkarni V et.al[51] have conducted study in Burn ward of Government Hospital, Gulbarga, Karnataka(South India) on 91 burn patients and found that a total 91 swabs from burns wound infection were collected from the patients of Burn Ward, out of which 83 were positive. Pseudomonas Sps (33.73%) and S.aureus (27.71%) accounted for 61.44 %of the positive cases as single aetiological agents. Klebsiella sps and E.coli accounted for 22.88% of the cases. The remaining 15.65% of cases had mixed aetiological agents. The results revealed the dominance of Gram negative organisms.

Chamania S et. al[52] conducted a retrospective analysis of the burn wound infection at the Burn unit of the Choithram hospital Indore, was done from 1st July to 31 st December 2011 and found that the highest incidence was of Pseudomonas aeruginosa (43%). Methicillin resistant Staphylococcus Aureus (MRSA) was seen in 12% patients.

Shankar G et.al[53] studied in district hospital of north Karnataka on 240 burn patients and found that out of 240 burn patients admitted during the

study period, 134(55.83%) were females. Majority (54.58%) were between 21 and 40 years of age. Flames caused 83.75 % injuries (P = 0.001163). Maximum numbers (81.66%) were accidental followed by 9.58 % alleged suicidal and 8.75% alleged homicidal injuries. At the time of injury, 48.75% victims were wearing synthetic clothes (P=0.0000001). It was observed that the majority of the males (55.66%) recovered, whereas mortality was 51.47% in females (P = 0.0000001). The overall mortality rate was 37.50%.

MATERIAL AND METHODS

In a cross–sectional, prospective, observational study, i studied different factors affecting mortality in burn patients admitted in M. R. BANGUR HOSPITAL,TOLLYGUNGE,KOLKATA-33on157patients.

STUDY SITE:- M R BANGUR HOSPITAL

241,DPSROAD,TOLLYGUNGE KOLKATA-33.

STUDY POPULATION:- Patientsadmittedindifferentsurgicalwardsand BURN UNIT of M R BANGUR HOSPITAL.

STUDY DESIGN:- A Prospective , cross-sectional , observational study.

SAMPLE SIZE:- The number of subjects required for this study was 156.56 ~ 157 with power 71%. (Rates of deaths due to burns was 23.3% i.e. p= 0.233 as per the study by Batra AK[60]). The formula used for sample size calculation was as follows:-

$$n = (4pq)/L^2$$

Where

n= required samplesize

p=0.233 (as per the study by Batra AK) q = 1 - p

L = Loss %

TIME FRAME:- From January 2014 to December 2015.

INCLUSION CRITERIA:-

1) Patients >18yrs of age

2) All burn patients admitted in M R Bangur hospital without any co-morbid conditions like Diabetes, hypertension, cardiac diseases, hepatic diseases,

respiratory diseases etc.

3) All types (thermal, electric, chemical, scald) of burns are included.

4) All degrees of burns are included.

EXCLUSION CRITERIA:-

1. Patients <18yrs of age

2. All burn patients with co-morbid conditions mentioned above.

3. Old burns

4. Burns in pregnancy to avoid pregnancy related complications.

SAMPLING TECHNIQUES: Patients were selected with the help of computer generated random numbers by the process of randomization.

METHODS:-

- The patients with burn injuries who require institutional management shall be admitted in burn unit at MRBH.
- After adequate exposure and through clinical examination, % of burn and involvement of anterior chest, head and neck and other parts involved noted.
- History regarding age, sex, religion, occupation, locality, types of burn and whether first aid was taken or not was mentioned.
- Patients was managed by the following ways: -

i) Respiratory support - Patient who had direct thermal damage to upper

respiratory tract or cyanosis, respiratory depression or glottis oedema, in them adequate airway was established. Oropharyngeal suction was done and 100% oxygen inhalation given. Bronchodilators were given in mild to

moderate cases. In severe cases, endotracheal intubation was done,

ii) Fluid therapy - All cases with a burn of 15% or more body surface area in adults and 10% body surface or more in children were given fluid by intravenous route. Fluid requirements were calculated by using Parkland's formula. In the first 24 hours following burns, Ringer's lactate solution was infused in a volume 4 ml/kg/percent of burn surface area. Half of the calculated requirement was transfused in first eight hours and each quarter volume in subsequent eight hour periods respectively. After that fluid given according to the hydration status of the patients.

iii) Urinary output - A foley's catheter was introduced in cases of burn with more than 20% involvement of total body surface area or all patients with a burn involving perineal region for daily monitoring of urinary output.

iv) Clinical daily observation - For thirst, hydration, restlessness, pulse, B.P., respiratory rate, urine output.

v) Analgesia and Sedation - Pethidine inj. 25-100 mg intramuscular dose, depending on patient's age was given. Sedative were repeated after 4-6 hours as desired.

vi) Tetanus prophylaxis - All cases were given 250 IU of tetanus immunoglobulin intramuscularly and 0.5 ml of tetanus toxoid intramuscularly regardless of their immune status in separate arm.

vii) Oral intake - Oral intake was not restricted in patients if tolerated.

viii) Antacid Prophylaxis - Patients were given injections of ranitidine (H_2-receptor antagonists) till normal oral intake had been resumed. Thereafter, oral ranitidine tablets along with antacid gels were given.

ix) Systemic chemotherapy - Initially the antibiotics were started in broad spectrum combinations and were changed later on according to the reports of culture and sensitivity of swab from the burn wound.

x) Nutrition - Oral feeding was instituted as early as patients can tolerate. High protein diets in shape of milk, egg, meat, proteinex granules were given. Multivitamins, iron supplements were also given.

xi) Daily mouth wash and proper hygiene - was maintained. Postures were changed 2 hourly to avoid bed sore and patients were encouraged to sit and walk. Pressure points were washed with spirit and covered with talcum powder to avoid bed sores.

MANAGEMENT OF THE BURN WOUND:

All cases were managed by closed method of dressing. After restoration of patient from shock the wound was cleaned under proper sedative with normal saline. Topical silver sulphadiazine cream 1% was applied and wound covered with a layer of paraffin gauze (Jelonet). A layer of gauze followed by a layer of cotton pads were applied and held in place with a gentle compressing bandage: The dressings were changed daily or alternate day depending on the amount of soakage of dressings and condition of wound.

The burn injury involving the face, perineum and buttocks were treated by open method and after proper cleaning the wound was left open to dry. The exudates along with the superficial layer of burnt skin formed a protective layer of crust. In cases of deep burn, the slough was allowed to separate and left a clean uninfected granulation tissue to allow for skin grafting. The patient's were kept under mosquito nets.

For those cases with circumferential full thickness burns of chest or the extremities, urgent escharotomy was done to release the constricting effect.

In cases with deep burns involving extremities Plaster of Paris slab was applied and proper physiotherapy done to prevent the development of contracture.

In cases of full thickness burn when healthy granulation tissue had formed, they were covered with split skin graft taken form high area of patient with a Humby's knife.

Investigations sent are:-

a) Hb% at the time of admission and after 48 hrs
b) TC and DC of WBC
c) R/E of Urine
d) Plasma protein estimation
e) Blood urea/serum creatinine estimation
f) Culture and sensitivity of pus from burnt surfaces on day 1 and day 6.
g) Serum electrolytes - Sodium, Potassium .
h) Plain X-ray chest PA view-in cases of respiratory complications,
i) ECG in case of electric burn

- During day to day assessment of patients surgical interventions like debridement and split thickness skin grafting done if required.
- Outcome in the form of death or discharge with duration of stay in hospital was noted.
- Cause of death in the following heading was conformed-
    i. Shock and renal failure
    ii. Septicaemia
    iii. Anaemia and hypoproteinaemia

The factors influencing the mortality were found out in relation to age, sex, extent and severity of burn and various complications observed during the course of management of the 157 cases who succumbed to burn injury.

STUDY PROFORMA:

TITLE OF STUDY: - STUDY OF FACTORS AFFECTING MORTALITY IN BURN PATIENTS ABOVE 18 YEARS OF AGE.

1. Case Serial No.
2. Registration No.
3. Name
4. Age
5. Sex
6. Religion
7. Occupation
8. locality
9. Date of burn……. Time……
10. Date of admission…..... Time……

11. Duration between time of burn and arrival at hospital 12. % of burn and parts involved

13. Status of first aid- adequate, inadequate or not taken 14. Urine output in 1st 24 hrs

15. Agents responsible for burn--

a. Flames
b. Scald
b. Chemical
d. Electric
e. Others (Radiation/Inhalational Burn)

16. Place of burn-

a. Domestic—Kitchen/ Outside kitchen
b. Outside Home

17. Investigations:

a) Hb% at the time of admission and after 48hrs

b) Serum electrolytes like sodium and potassium

c) Bacteriology on day 1 and day 6

18. Duration of stay in hospital
19. Surgical interventions done or not
20. Cause of death-

OBSERVATIONS

The present work was carried on 157 patients of burn out of which 52 patients died.

Statistical Analysis was performed with help of Epi Info (TM) 3.5.3 which is a trademark of the Centers for Disease Control and Prevention (CDC).

Using this software, basic cross-tabulation and frequency distributions were prepared. χ^2 test was used to test the association between different study variables under study. Corrected χ^2 test was used in case of any one of cell frequency was found less than 5 in the bivariate frequency distribution.

Fisher exact test was used where χ^2 test was not applicable.

Test of proportion (Z-test) was used to test the significant difference between two proportions. t-test was used to test the significant difference between means.

Odds ratio (OR) with 95% Confidence Interval (CI) was calculated to measure the different risk factor. Significance level was set at 0.05 and confidence intervals were at 95 percent level. Thus $p \leq 0.05$ was considered statistically significant.

Table-1: Age Distribution

Age Group (in years)	Number	%
19-29	44	28.0%
30-39	30	19.1%
40-49	29	18.5%
50-59	24	15.3%
60-69	16	10.2%
70-79	10	6.4%
80-89	4	2.5%
Total	157	100.0%

The mean age (mean ± s.d.) of the patients was 42.93±16.87 years with range 19 – 82 years and the median age was 41.0 years.

Most of the patients (47.1%) were within 40 years of age which was significantly higher than that of other ages (Z=4.30;p=0.0001). Only 8.9% of the patients were with age ≤70 years. Thus the burn injuries were more prevalent within the 40 years of age.

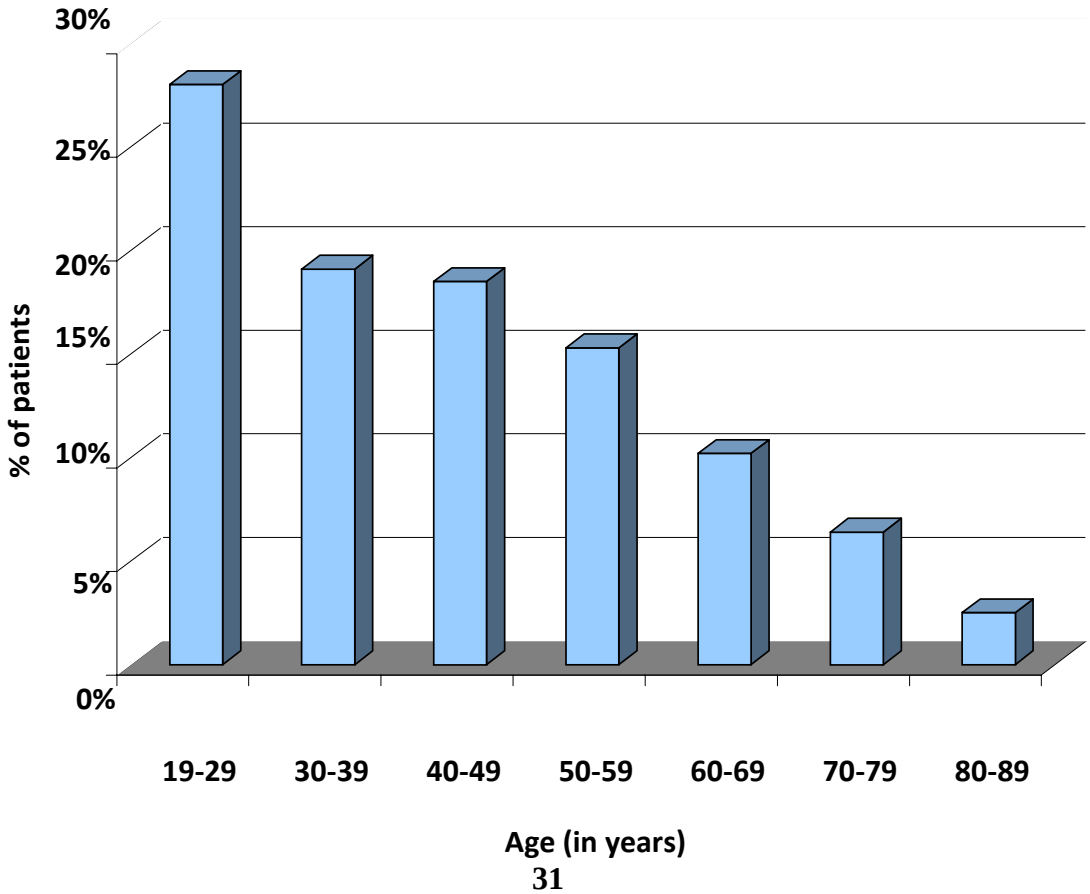


Table-2: Gender Distribution

Gender	Number	%
Male	52	33.1%
Female	105	66.9%
Total	157	100.0%
Male:Female	1:2.01	

Proportion of females (66.9%) was significantly higher than that of males (33.1%). The Male:Female ratio was 1:2.01. So females were more prone to have a burn injury.

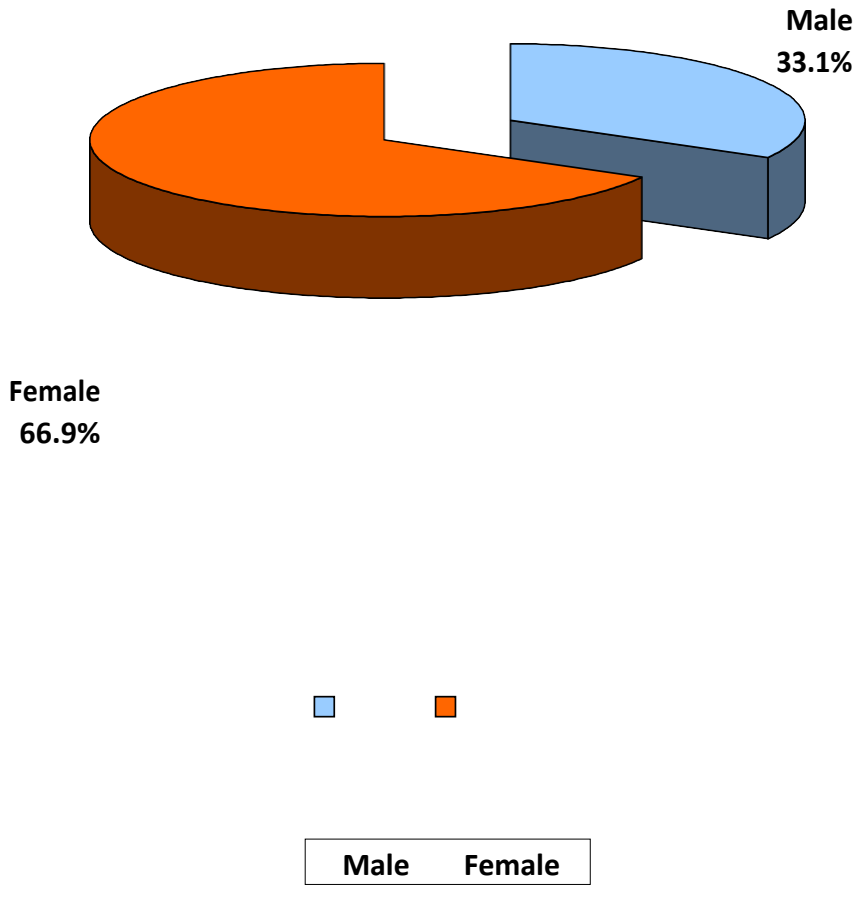


Table-3: Age and Gender distribution

Age Group (in years)	Male (n=52)	Female (n=105)	TOTAL
19-29	15	29	44
Row %	34.1	65.9	100.0
Col %	28.8	27.6	28.0
30-39	10	20	30
Row %	33.3	66.7	100.0
Col %	19.2	19.0	19.1
40-49	11	18	29
Row %	37.9	62.1	100.0
Col %	21.2	17.1	18.5
50-59	8	16	24
Row %	33.3	66.7	100.0
Col %	15.4	15.2	15.3
60-69	5	11	16
Row %	31.3	68.8	100.0
Col %	9.6	10.5	10.2
70-79	2	8	10
Row %	20.0	80.0	100.0
Col %	3.8	7.6	6.4
80-89	1	3	4
Row %	25.0	75.0	100.0
Col %	1.9	2.9	2.5
TOTAL	52	105	157
Row %	33.1	66.9	100.0
Col %	100.0	100.0	100.0
Mean±s.d.	41.75±15.73	43.52±17.45	

$\chi^2 = 1.24$; p=0.97; NS- Not Significant

Chi-square test showed that there was no significant association between age and gender (p=0.97).

The mean age (mean ± s.d.) of the males was 41.75±15.73 years with range 19 - 82 years and the median age was 40.5 years.

The mean age (mean ± s.d.) of the males was 43.52±17.45 years with range 19 – 81 years and the median age was 41.0 years.

t-test showed that there was no significant difference in the mean age of the male and females (t_{155}=1.26;p=0.21). It may be concluded that prevalence of burn injuries were more or less equally distributed over age among males and females.

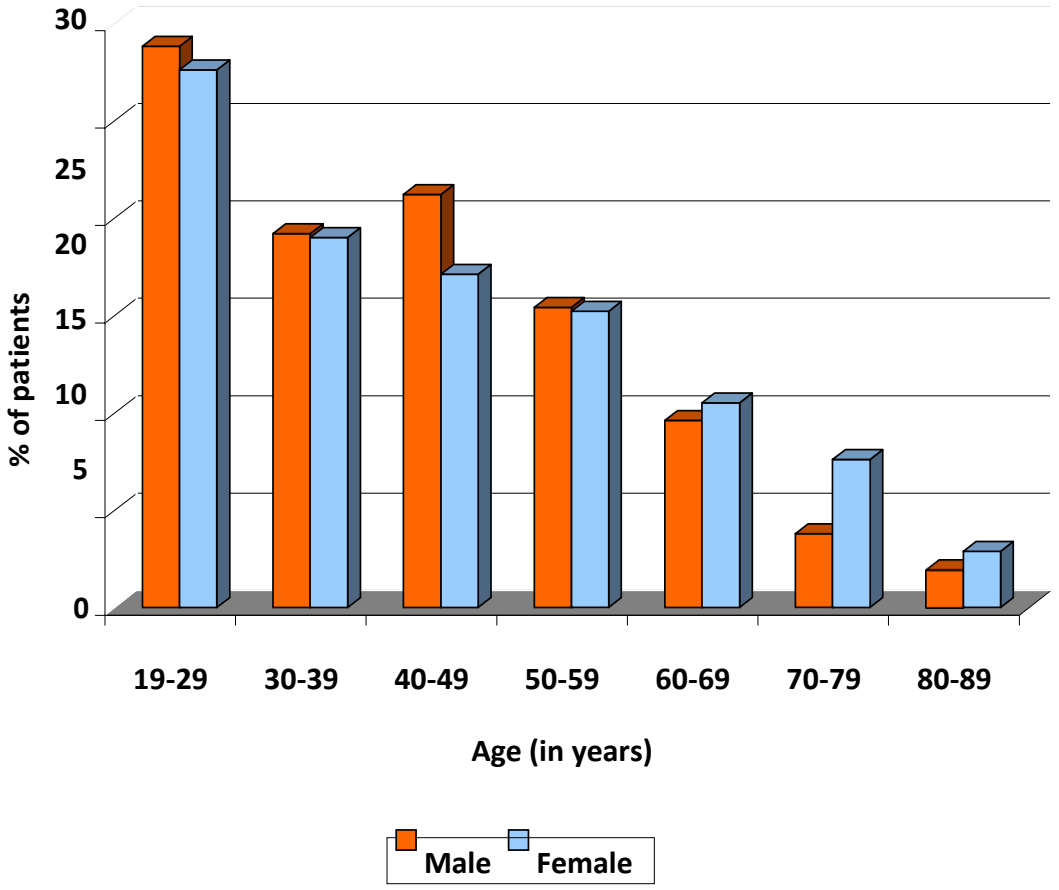

30
25
20
15
10
5
0
% of patients
19-29
30-39
40-49
50-59
60-69
70-79
80-89
Age (in years)
Male
Female

Table-4: Distribution of religion

Religion	Number	%
Hindu	135	86.0%
Muslim	20	12.7%
Christian	2	1.3%
Total	157	100.0%

Most of the patients (86.0%) were Hindu which was significantly higher than that of other religion (Z=10.36;p=0.0001). Only 1.3% of the patients were Christian.

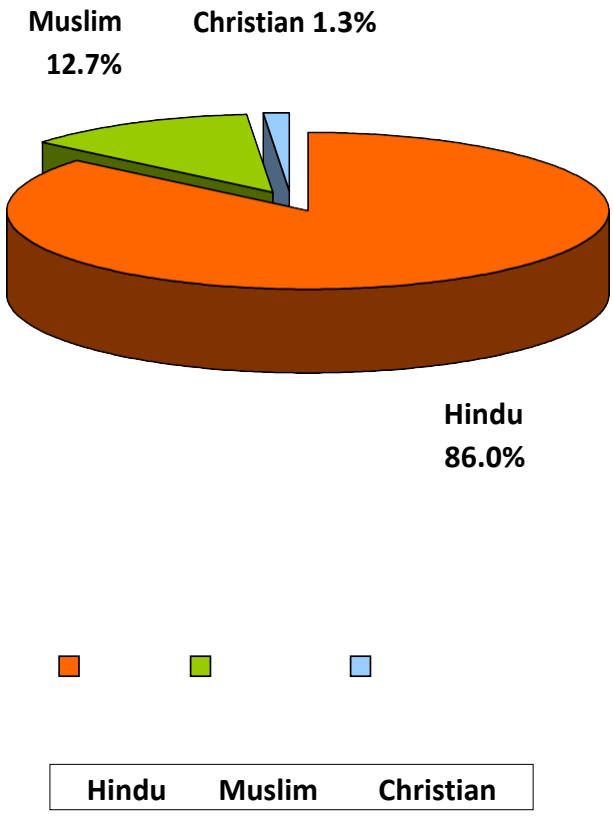


Table-5: Distribution of occupation

Occupation	Number	%
House Wife	85	54.1%
Farmer	22	14.0%
Student	18	11.5%
Service	11	7.0%
Others	21	13.4%
Total	157	100.0%

Most of the patients (54.1%) were house wife which was significantly higher than that of other occupation (Z=5.98;p=0.0001). Only 7.0% of the patients were in service.

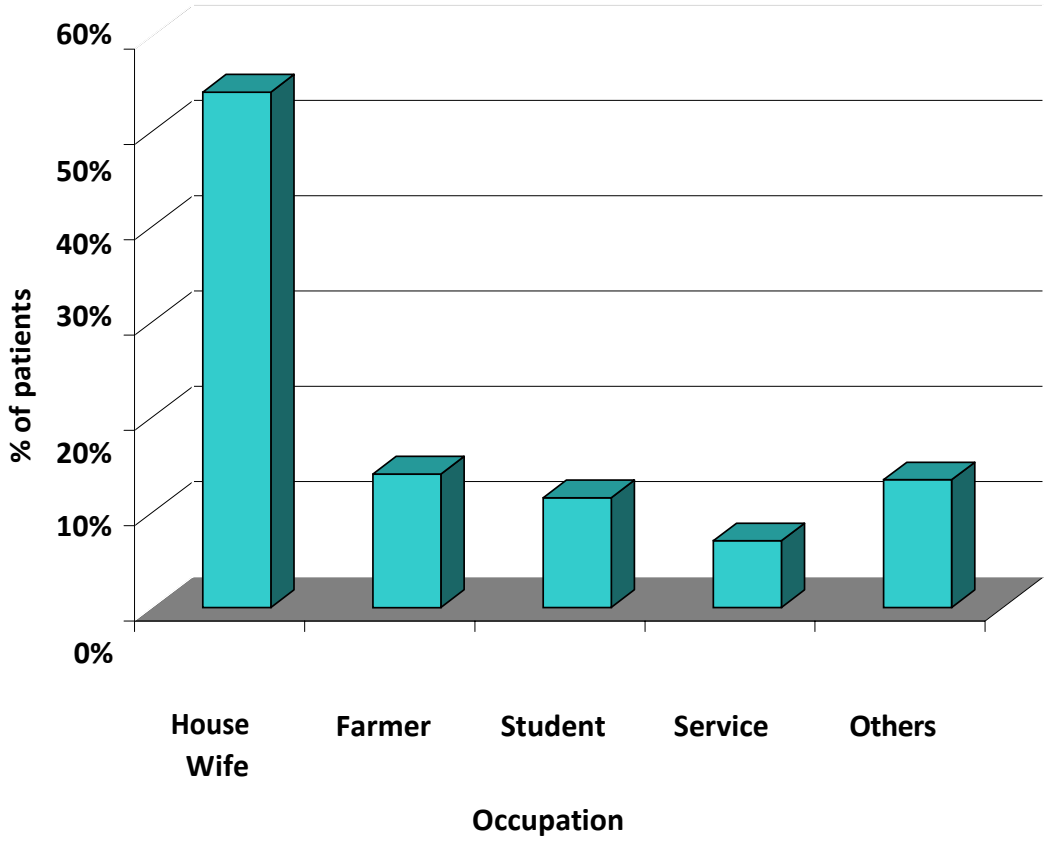


Table-6: Distribution of place of residence

Place of residence	Number	%
Rural	128	81.5%
Urban	29	18.5%
Total	157	100.0%

Most of the patients (81.5%) were from rural area which was significantly higher than from urban are (18.5%) (Z=8.90;p=0.0001).

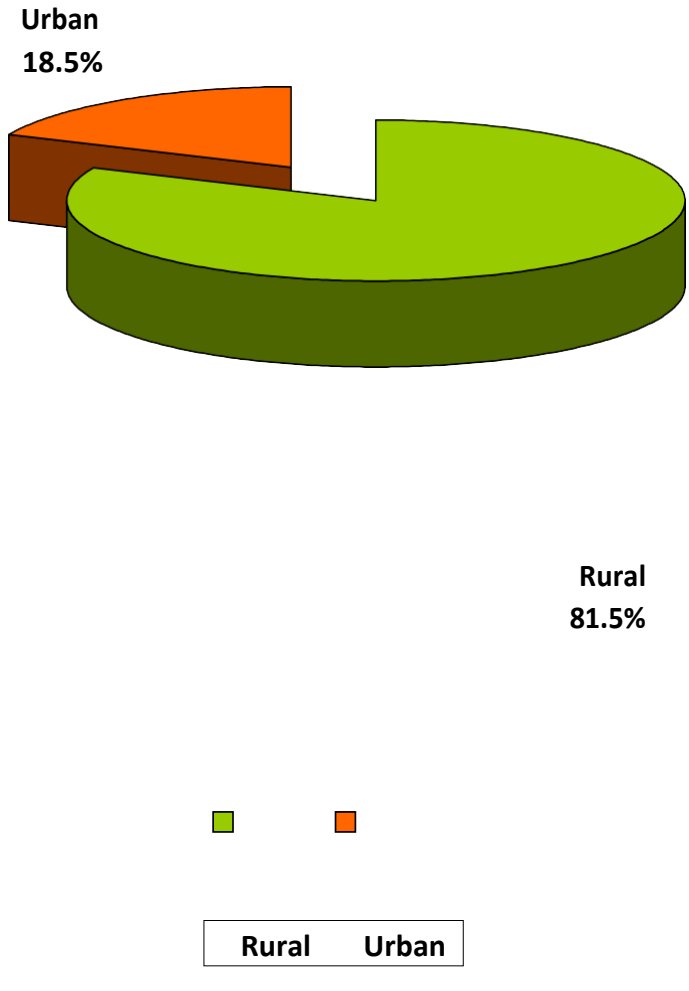


Table-7: Distribution of type of burn

Type of burn	Number	%
Flame	113	72.0%
Scald	34	21.7%
Electrical	6	3.8%
Chemical	4	2.5%
Total	157	100.0%

Flame (72%) was the most significantly common cause of burn injuries (Z=7.12;p=0.0001) followed by scald (21.7%). Only 2.5% of the patients were having burn injuries from accident of chemicals.

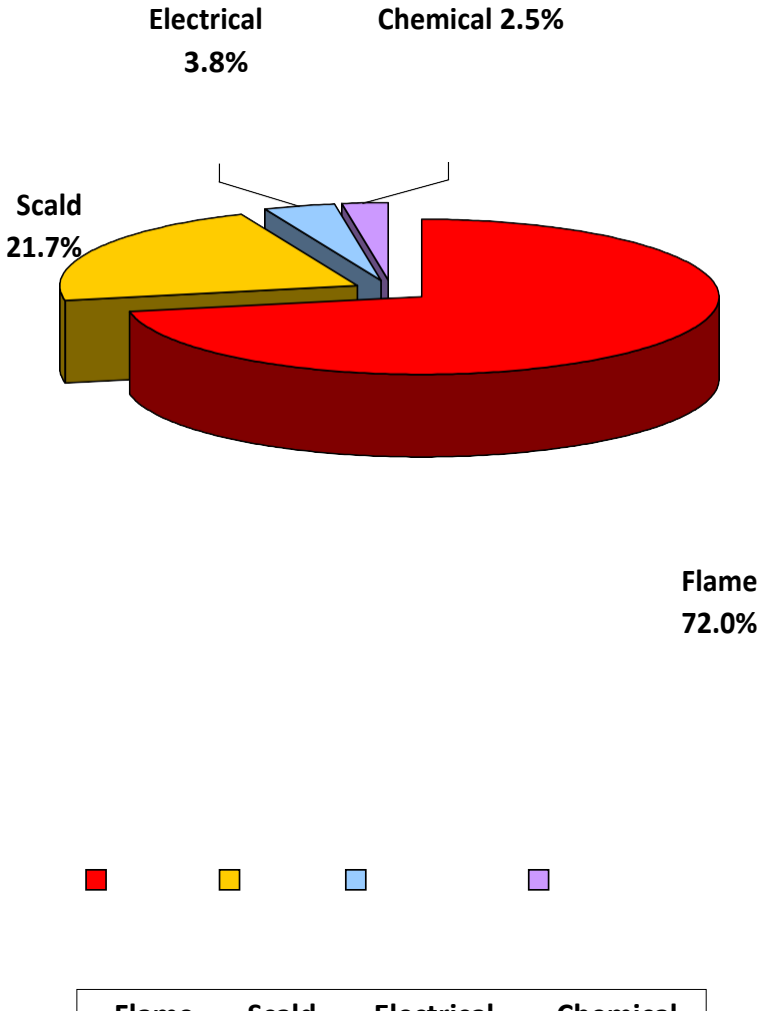


Table-8: Distribution of place of burn

Place of burn	Number	%
Kitchen	88	56.1%
Outside Kitchen	51	32.5%
Outside Home	18	11.5%
Total	157	100.0%

Most of the burn injuries occurred in the kitchen (5.61%) followed by outside kitchen (32.5%) and outside home (11.5%). Among them kitchen was the significantly common place of burn injuries (Z=36.35;p=0.001).

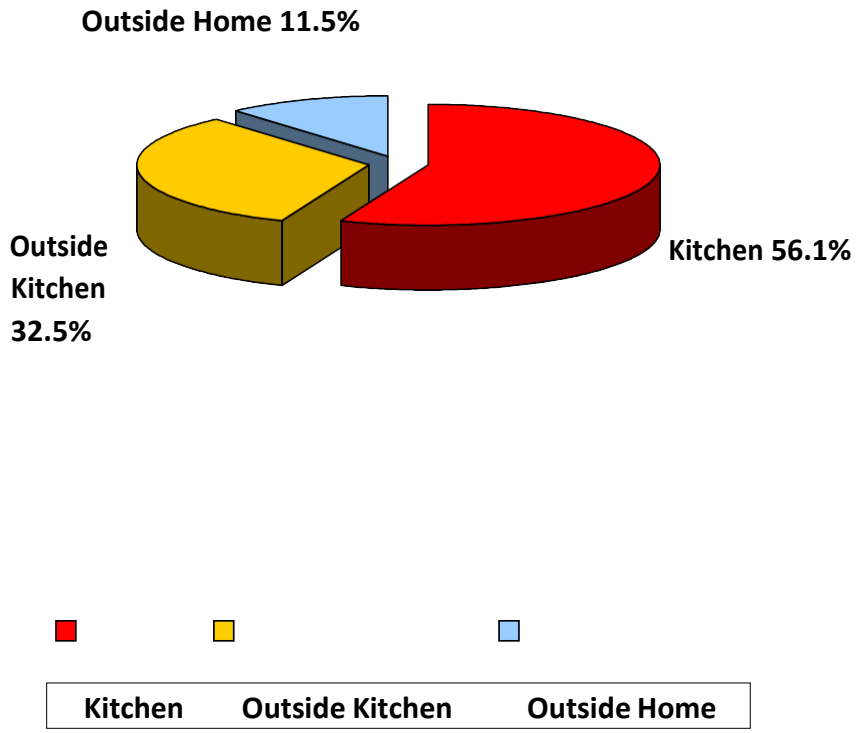


Table-9: Distribution of percentage of burn

Burn (in %)	Number	%
<10	2	1.3%
10-19	21	13.4%
20-29	28	17.8%
30-39	24	15.3%
40-49	23	14.6%
50-59	18	11.5%
60-69	8	5.1%
70-79	8	5.1%
80-89	14	8.9%
90-100	11	7.0%
Total	157	100.0%

The mean percentage of burn (mean ± s.d.) of the patients was 45.08±25.17% with range 8 – 95% and the median was 42.0%.

Most of the patients (72.6%) were with burn injuries 10-59% (Z=6.39;p=0.0001). Only 1.3% had burn injuries within 10%.

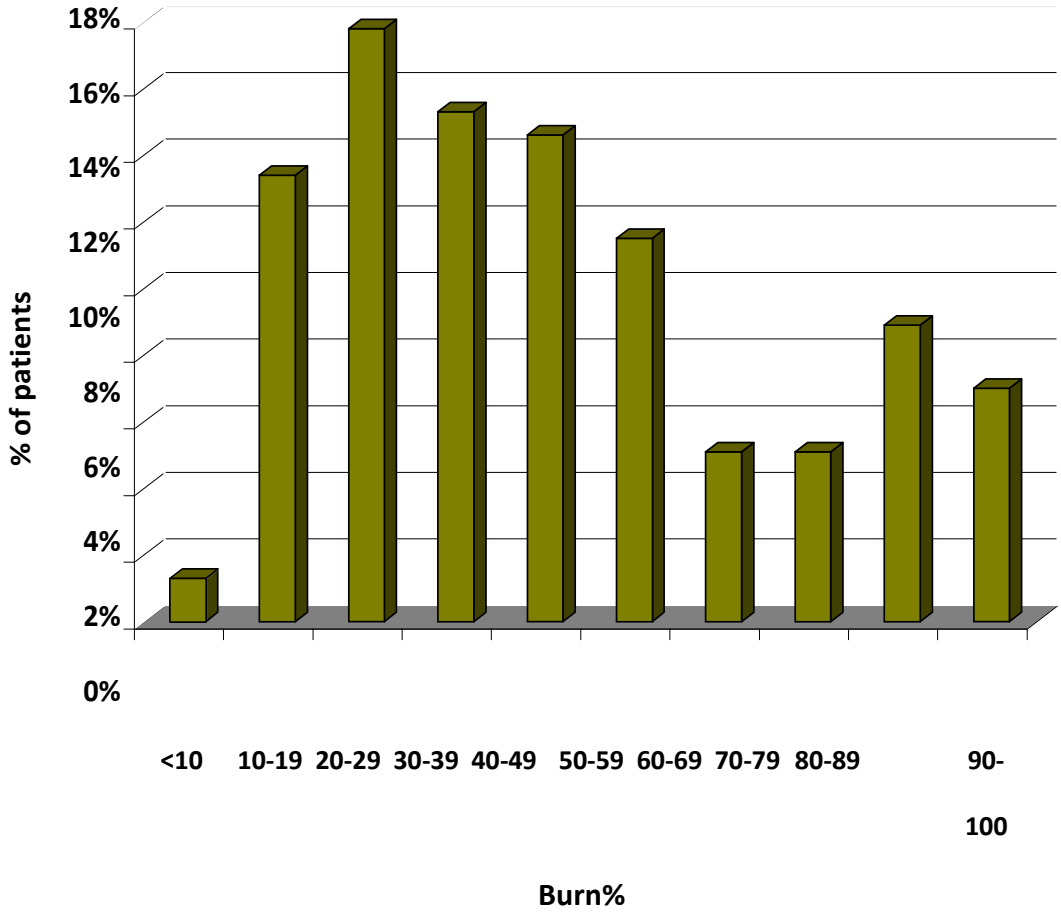


Table-10: Status of first aid

Status of first aid	Number	%
Adequate	17	10.8%
Inadequate	76	48.4%
No first aid	64	40.8%
Total	157	100.0%

Most of the patients were having inadequate first aid (48.4%) and no first aid (40.8%) (Z=11.08;p=0.00001). Only 10.8% had adequate first aid.

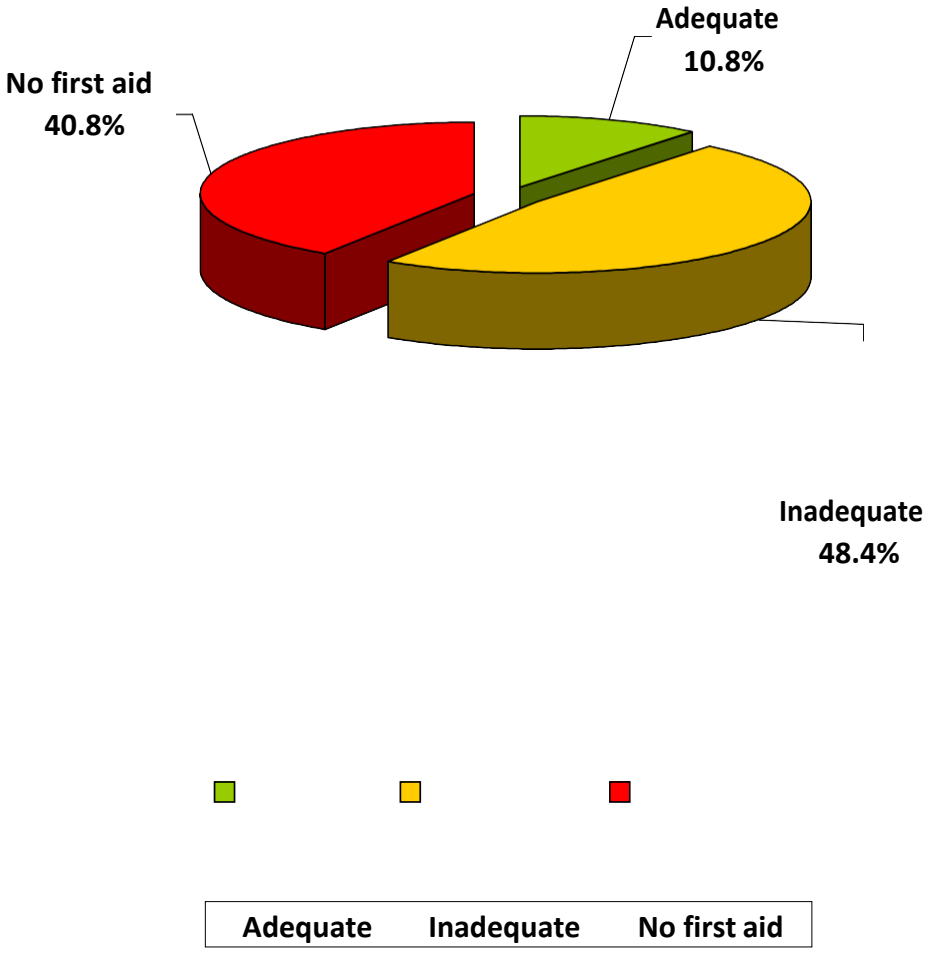


Table-11: Distribution of duration of burn

Duration of burn (in hours)	Number	%
<10	53	33.8%
10-19	68	43.3%
20-29	28	17.8%
30-39	7	4.5%
40-49	1	0.6%
Total	157	100.0%

The mean duration of burn (mean ± s.d.) of the patients was 13.47±8.35 hours with range 1 – 42 hours and the median was 12.0 hours.

Most of the patients (77.1%) were with duration of burn injuries <20 hours (Z=8.39;p=0.0001). Only 0.6% had burn injuries with duration > 40 hours.

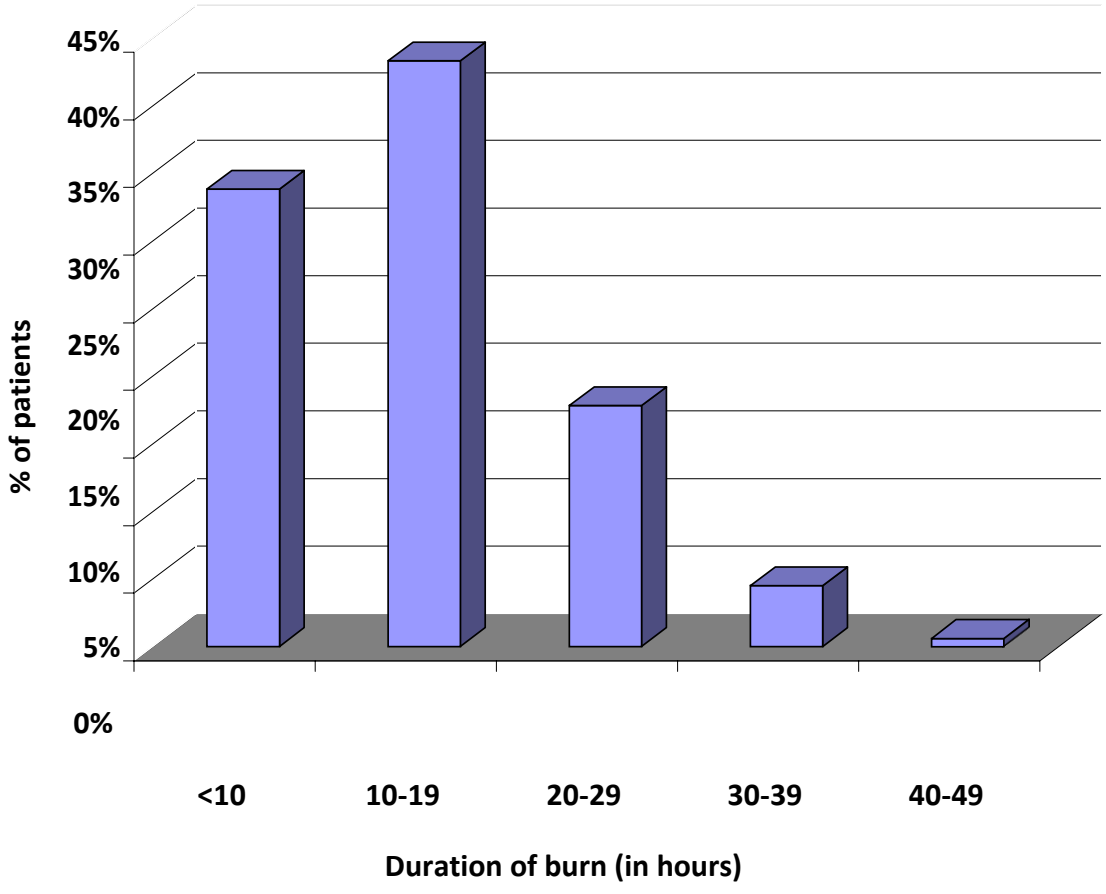


Table-12: Urine output in 1st 24 hours

Urine output	Number	%
Oliguria	79	50.3%
Anuria	12	7.6%
Normal	66	42.0%
Total	157	100.0%

50.3% of the patients had oliguria followed by normal (42.0%) urine output in 1st 24 hours but it was not significant (Z=1.13;p= 0.25). 7.6% of the patients had anuria. Overall 57.9% had abnormal urine output.

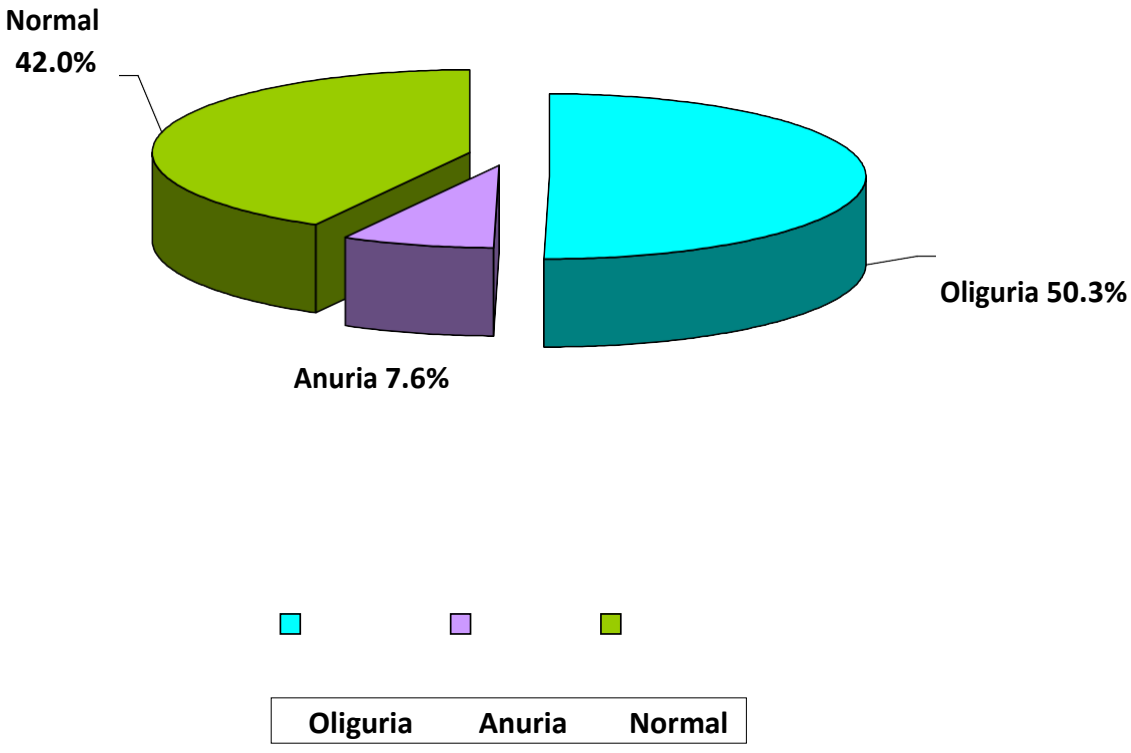


Table-13: Level of haemoglobin at admission

Hb (in gm %)	Number	%
6.0 - 8.4	7	4.5%
8.5 - 11.0	69	43.9%
>11.0	81	51.6%
Total	157	100.0%

The mean level of Hb at admission (mean ± s.d.) of the patients was 11.85±2.20 gm% with range 6.0 – 17.80 gm% and the median was 12.0 gm%.

Most of the patients (51.6%) were having level of Hb>11.0 gm%. but it was not significantly higher (Z=1.09;p=0.27). Only 4.5% of the patients had level of Hb between 6.0-8.4 gm%.

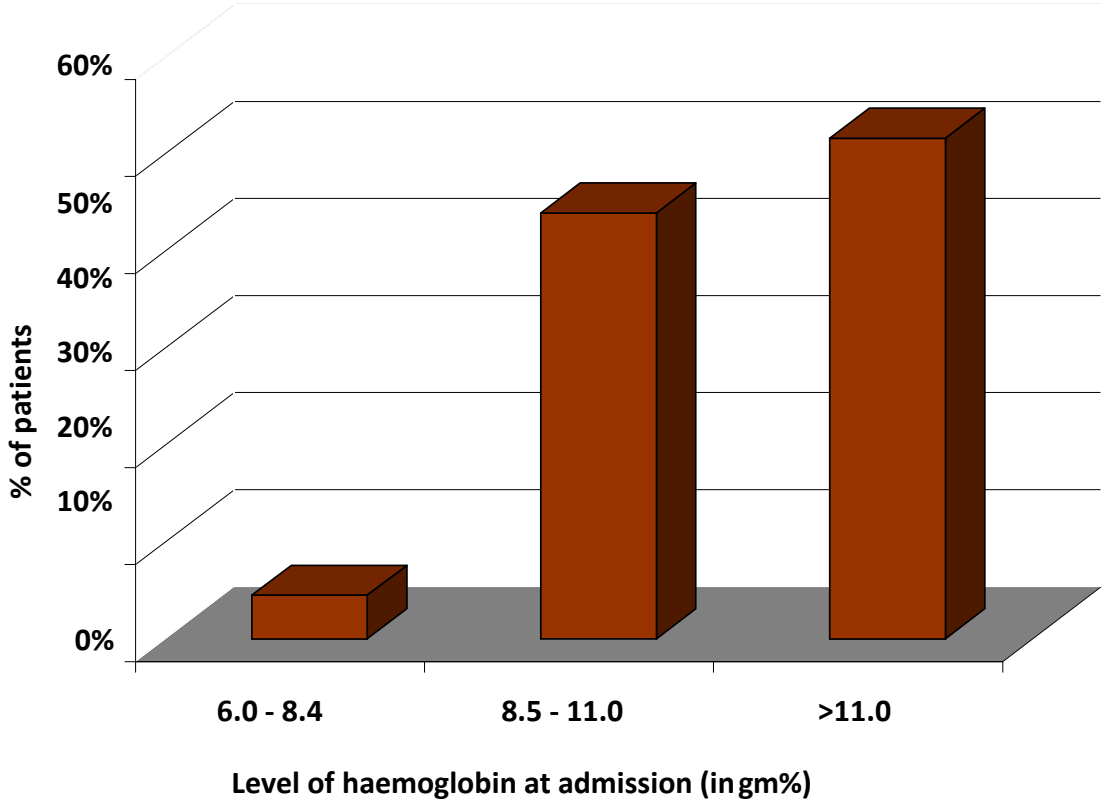


Table-14: Level of haemoglobin at 48 hours after admission

Hb (in gm %)	Number	%
<6.0	1	0.7%
6.0 - 8.4	17	12.6%
8.5 - 11.0	76	56.3%
>11.0	41	30.4%
Total	135	100.0%

The mean level of Hb at 48 hours after admission (mean ± s.d.) of the patients was 10.49±2.00 gm% with range 5.0 – 15.0 gm% and the median was 10.5 gm%.

Most of the patients (56.3%) were having level of Hb between 8.5-11.0 gm% which was significantly higher (Z=3.69;p=0.0002). Only 0.7% of the patients had level of Hb<6.0 gm%.

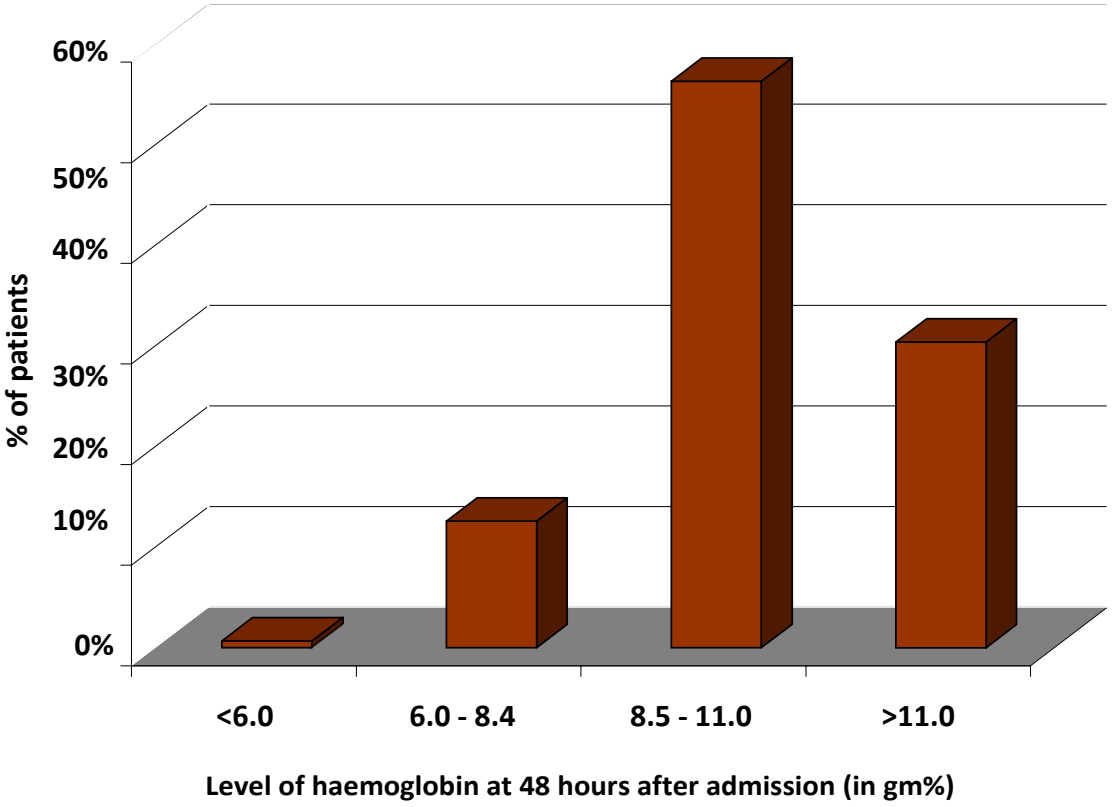


Table-15: Distribution of level of Na at admission

Level of Na (meq/L)	Number	%
<135 (Hypornatremia)	124	79.0%
135-145 (Isonatremia)	27	17.2%
>145 (Hypernatremia)	6	3.8%
Total	157	100.0%

The mean level of Na (mean ± s.d.) of the patients was 129.77±8.02 meq/L with range 111-154 meq/L and the median was 128 meq/L.

Most of the patients were having level of Na < 135 meq/L (79.0%) followed by between 135-145 meq/L (17.2%) (Z=8.74;p=0.0001). Only 3.8% had level of Na>145 meq/L.

Thus the prevalence of Hypernatremia was 3.8% and that of Hyponatremia was 79.0%.

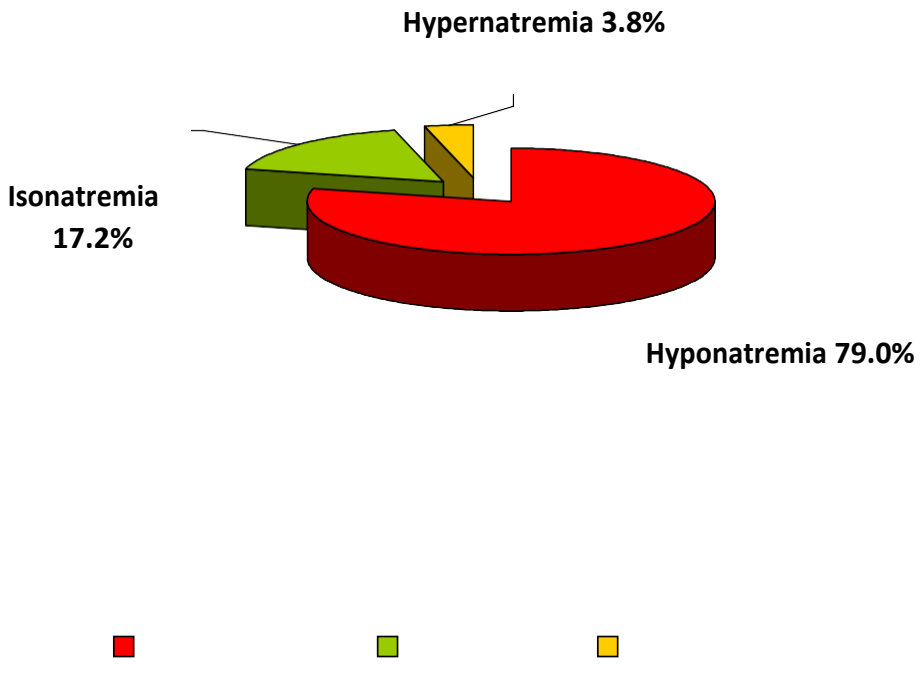


Table-16: Distribution of level of K at admission

Level of K (meq/L)	Number	%
<3.5 (Hypokalemia)	113	72.0%
3.5 – 5.0 (Isokalemia)	37	23.6%
>5.0 (Hyperkalemia)	7	4.5%
Total	157	100.0%

The mean level of K (mean ± s.d.) of the patients was 3.16±0.83 meq/L with range 1.6-5.4 meq/L and the median was 2.9 meq/L.

Most of the patients were having level of K<3.5 meq/L (72.0%) followed by level of K between 3.5-5.0 meq/L (23.6%) Z=6.85;p=0.0001). 4.5% had Hypokalemia.

Thus the prevalence of Hyperkalemia was 4.5% and that of Hyponatremia was 72.0%.

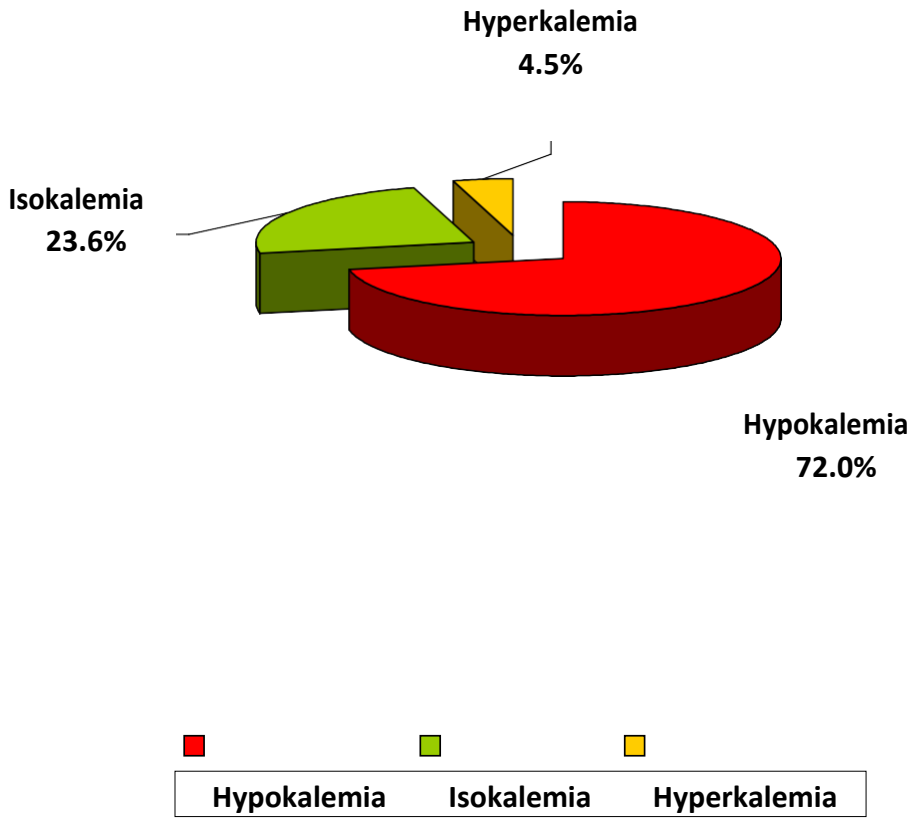


Table-17: Head & neck involvement of burn

Head & neck involve	Number	%
Yes	61	38.9%
No	96	61.1%
Total	157	100.0%

38.9% had head & neck involvement of burn.

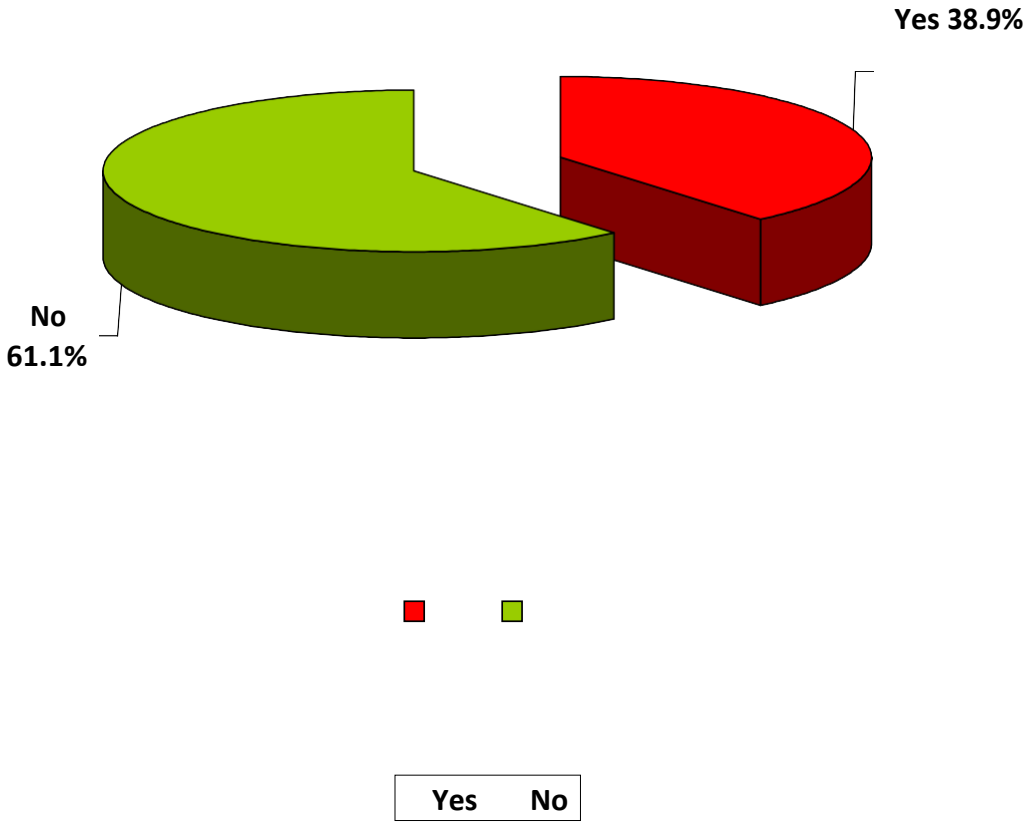


Table-18: Anterior trunk involvement of burn

Anterior trunk involvement	Number	%
Yes	53	33.8%
No	96	61.1%
Total	157	100.0%

33.8% had anterior trunk involvement of burn.

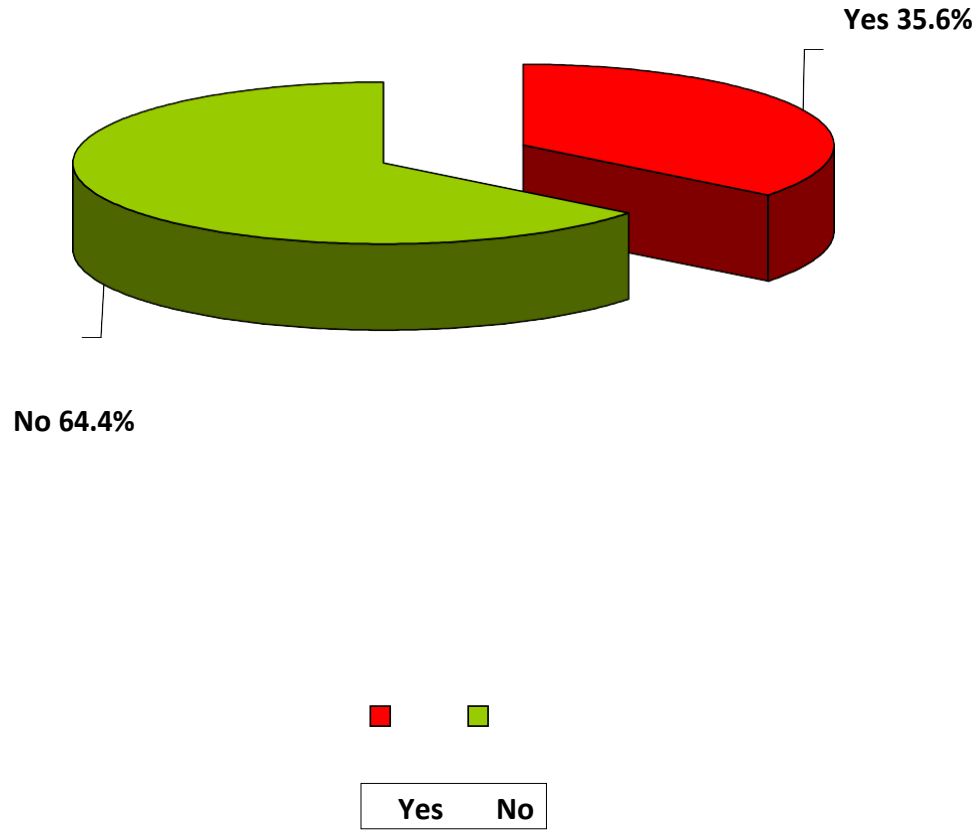


Table-19: Status of bacteriology at first day of burn wounds

Status of bacteriology at first day	Number	%
E. Coli	2	1.3%
Staph Aureus	18	11.5%
No	137	87.3%
Total	157	100.0%

12.8% had positive bacteriology at first day out of which 1.3% had E.Coli and 11.5% had Staph Aureus.

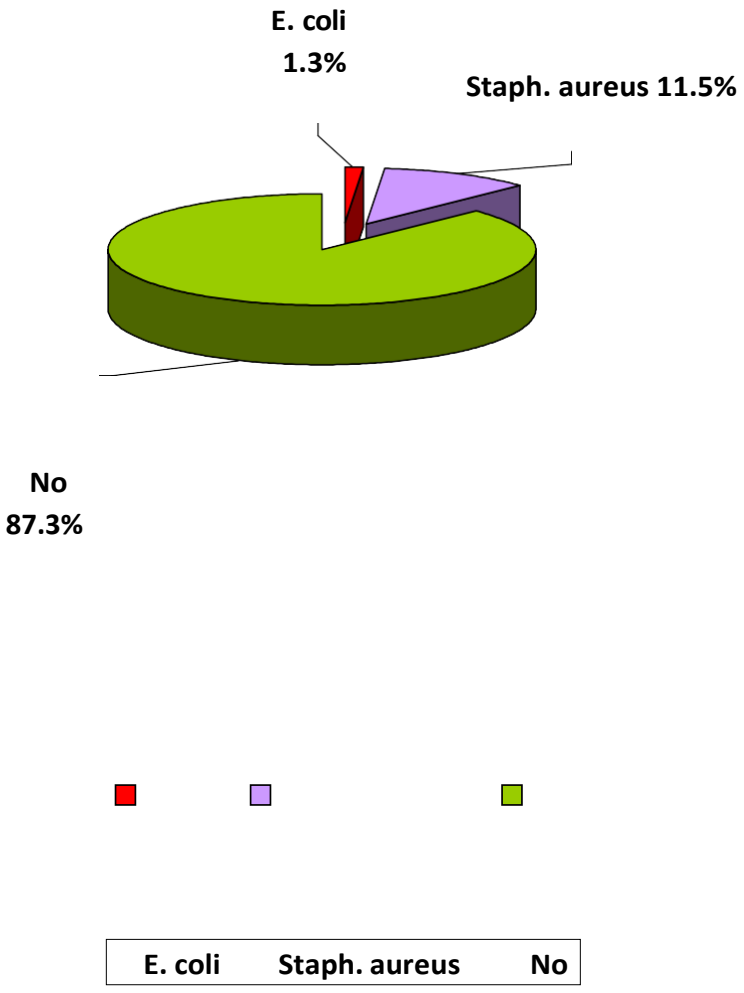


Table-20: Status of bacteriology at 6th day of burn wounds

Status of bacteriology at 6th day	Number	%
E. Coli	2	1.7%
Staph Aureus	31	26.1%
Pseudomonus	8	6.7%
Proteus	5	4.2%
No	73	61.3%
Total	119	100.0%

38.7% had positive bacteriology at 6th day out of which 1.7% had E.Coli, 26.1% had Staph Aeruus, 6.7% had Pseudomonus and 4.2% had Proteus. Among them infection caused by Staph Aureus was significantly higher (Z=3.79;p=0.0002).

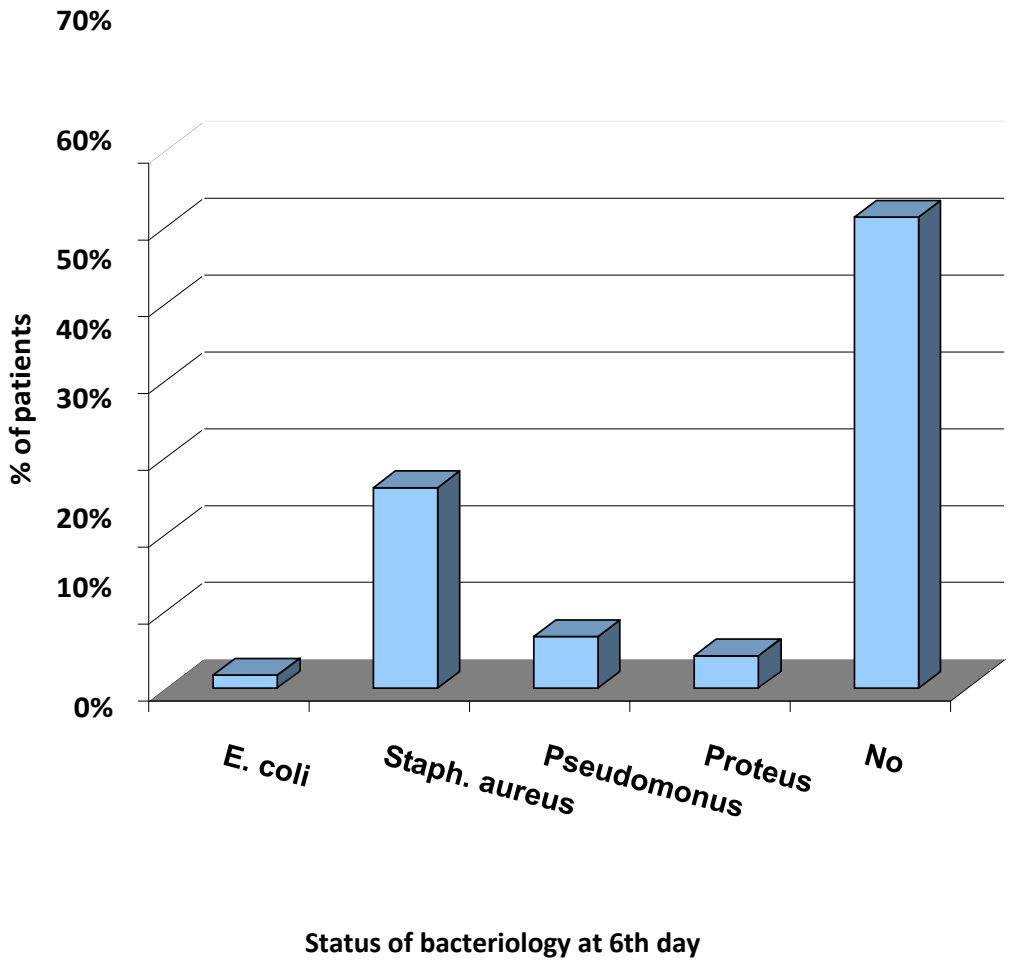
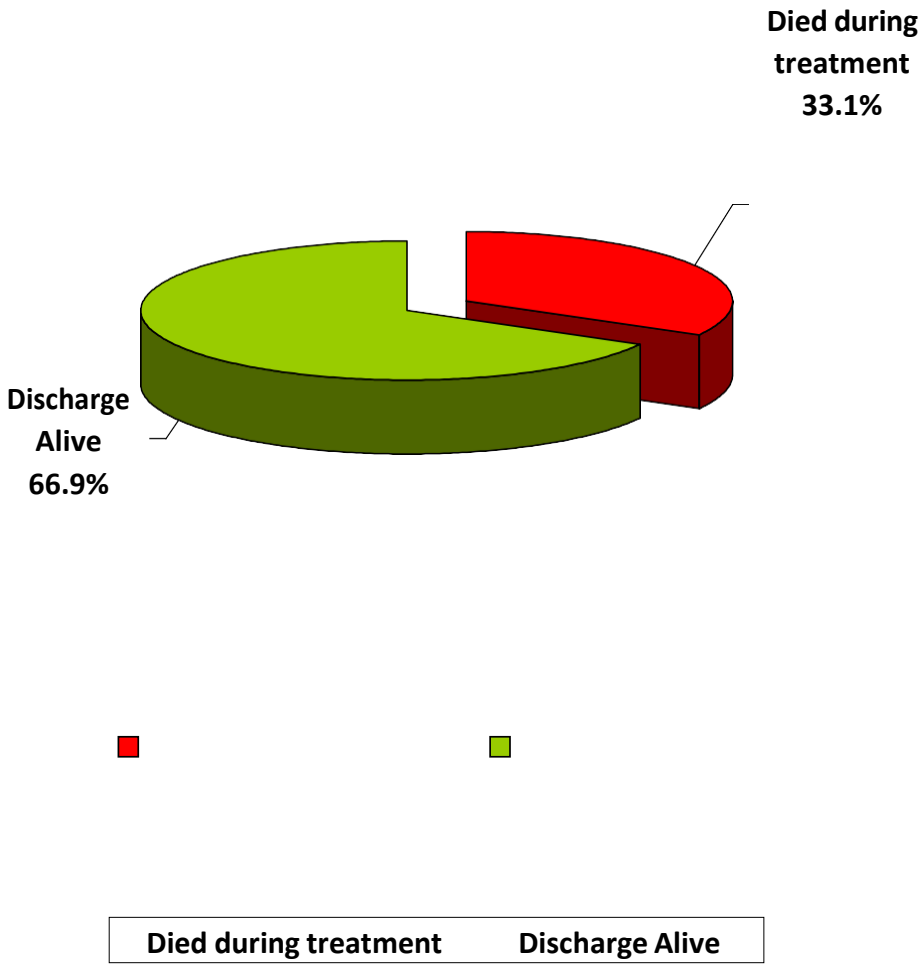


Table-21: Outcome

Outcome	Number	%
Died during treatment	52	33.1%
Discharge Alive	105	66.9%
Total	157	100.0%

Most of the patients (66.9% of the patients were discharged alive (Z=4.78;p=0.0001). But 33.1% of them died during treatment.



FOR THE PATIENTS DISCHARGED ALIVE:

Table-22: Requirement of Surgical Interventions for discharged alive'

Surgical Interventions	Number	%
Yes	77	73.3%
No	28	26.7%
Total	105	100.0%

Most of the patients (84.7%) were Hindu which was significantly higher than that of other religion (Z=9.88;p=0.001). Only 0.5% of the patients were Christian.

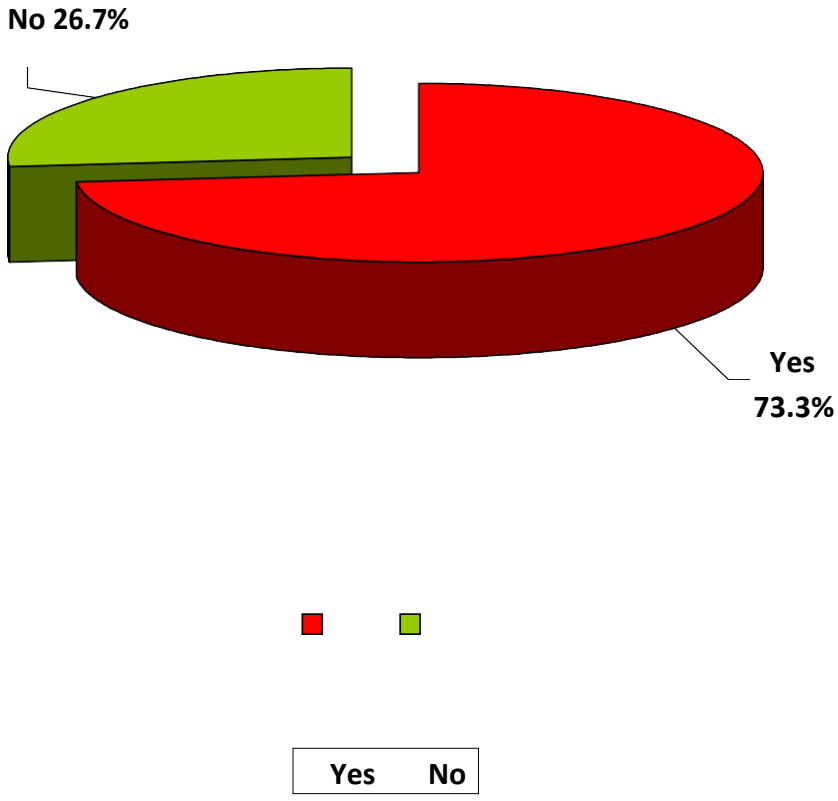
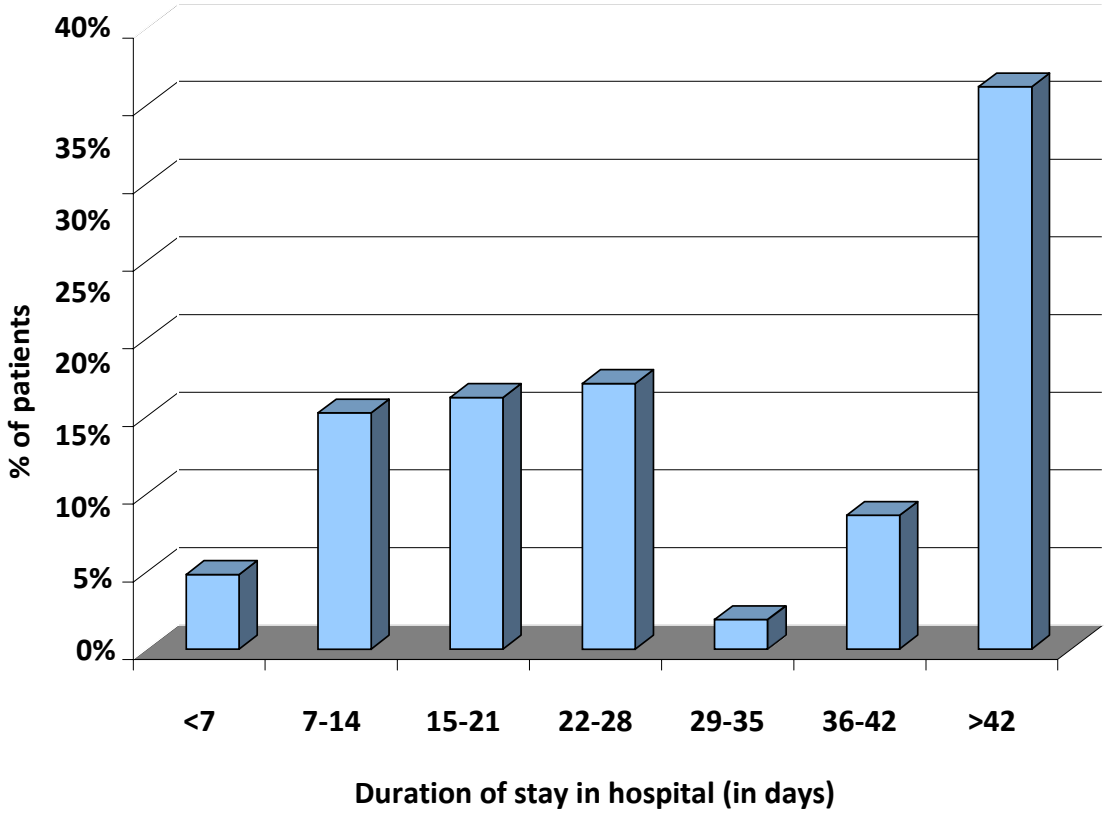


Table-23: Distribution of duration of stay in hospital

Duration of stay in hospital (in days)	Number	%
<7	5	4.8%
7-14	16	15.2%
15-21	17	16.2%
22-28	18	17.1%
29-35	2	1.9%
36-42	9	8.6%
>42	38	36.2%
Total	105	100.0%

The mean duration of stay in hospital for the patients who were discharged alive (mean ± s.d.) was 33.70±20.70 days with range 5 – 84 days and the median was 26 days.

Most of the patients (63.8%) were discharged within 6 weeks (≤42 days) which was significantly higher (Z=3.90;p=0.0001). Only 4.8% of the patients were discharged within one week (<7 days).



FOR THE PATIENTS DIED DURING TREATMENT:

Table-24: Distribution of duration of stay in hospital

Duration of stay in hospital (in days)	Number	%
<7	35	67.3%
7-14	9	17.3%
>14	8	15.4%
Total	52	100.0%

The mean duration of stay in hospital for the patients who were died during treatment (mean ± s.d.) was 6.90±7.6 days with range 1 – 31 days and the median was 3 days.

Most of the patients (67.3%) were died within 1 week (<7 days) which was significantly higher (Z=4.89;p=0.0001).

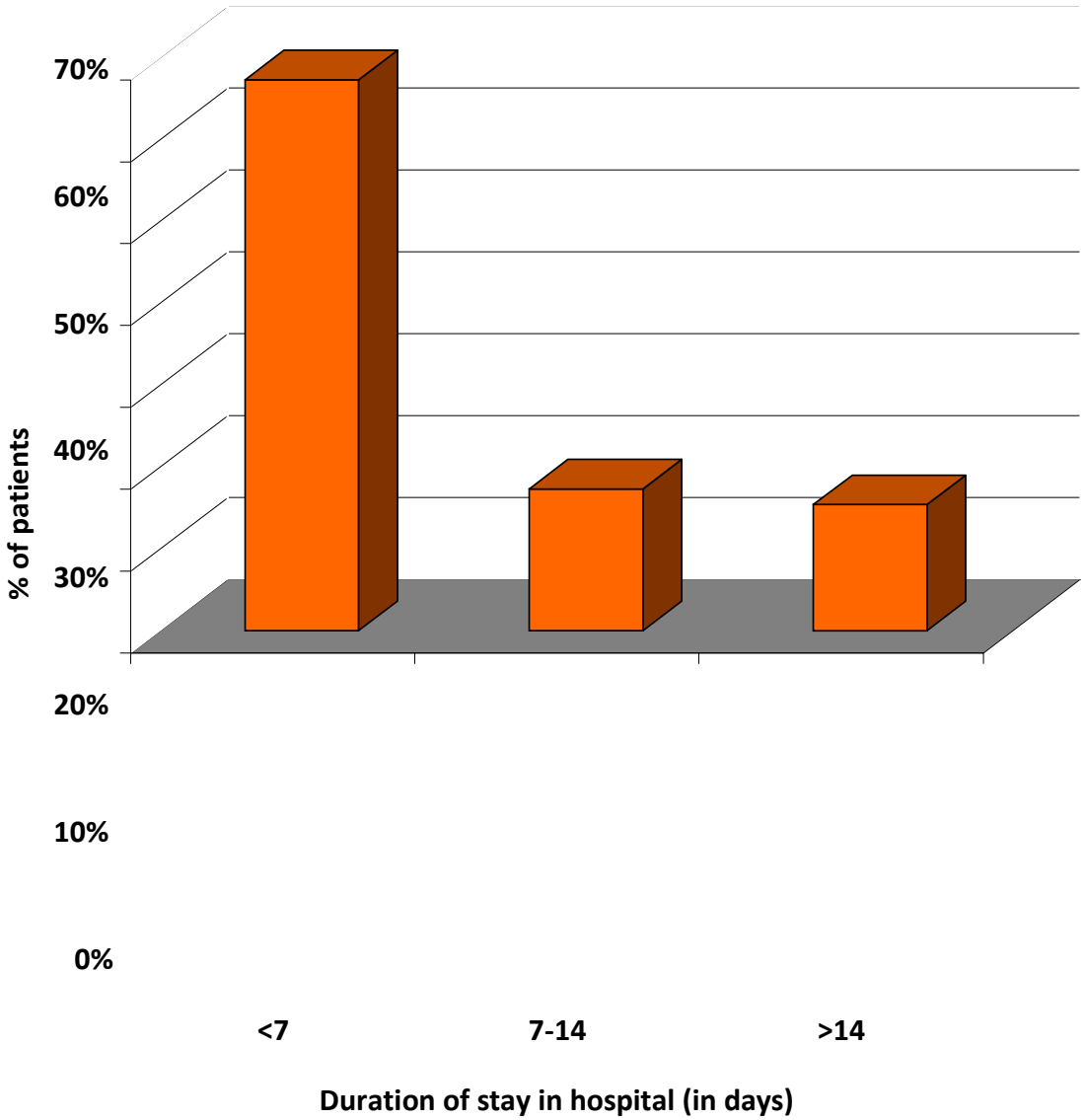
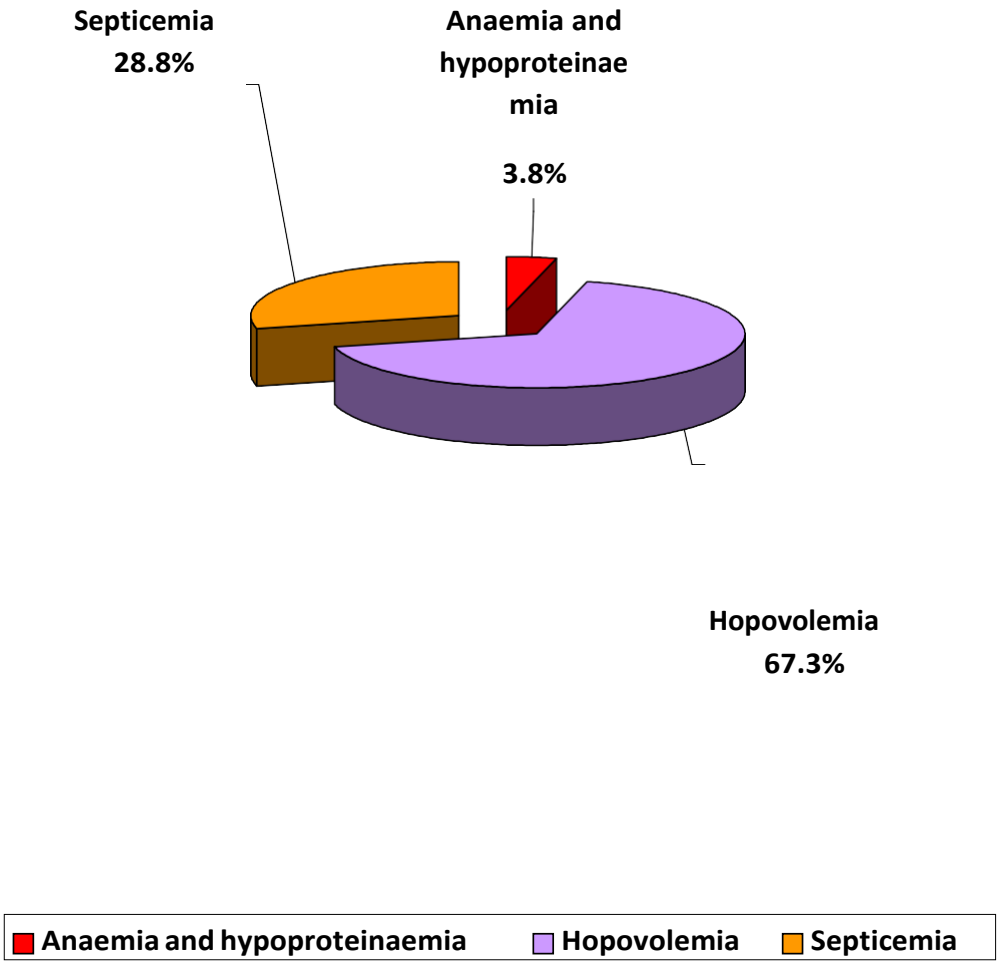


Table-25: Cause of death of the patients died during treatment

Cause of death	Number	%
Anaemia & Hypoproteinemia	2	3.9%
Hopovolemia	35	67.3%
Septicemia	15	28.8%
Total	52	100.0%

Most of the patients (67.3%) died due to Hopovolemia (67.3%) which was significantly higher (Z=5.44;p=0.001). Only 3.9% of the patients died due to were Anaemia & Hypoproteinemia.



Assessment of Risk Factors of death due to burn injuries:

Table-26: Age and outcome of the patients

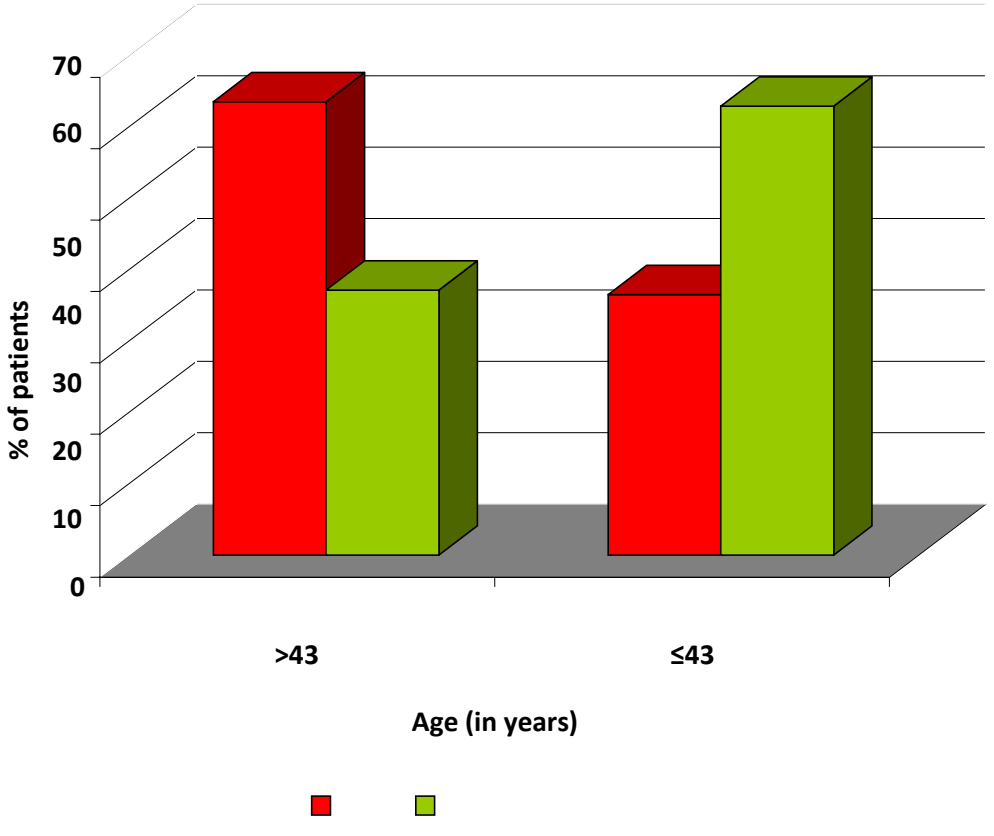
Age Group (in years)	Outcome		TOTAL
	Died	Discharge Alive	
>43*	33	39	72
Row %	45.8	54.2	100.0
Col %	63.5	37.1	45.9
≤43	19	66	85
Row %	22.4	77.6	100.0
Col %	36.5	62.9	54.1
TOTAL	52	105	157
Row %	33.1	66.9	100.0
Col %	100.0	100.0	100.0

* Mean age of the patients = 42.93 years ≈ 43 years

$\chi^2 = 9.70$; p=0.001; S-Significant

Chi-square test showed that there was significant association between age and outcome of the patients (p=0.001).

The risk of death was 2.93 times more among patients with age >43 years as compared to the patients with age ≤43 years [OR-2.93(1.47, 5.85); p= 0.001] and the risk was significant.



Died Discharge Alive

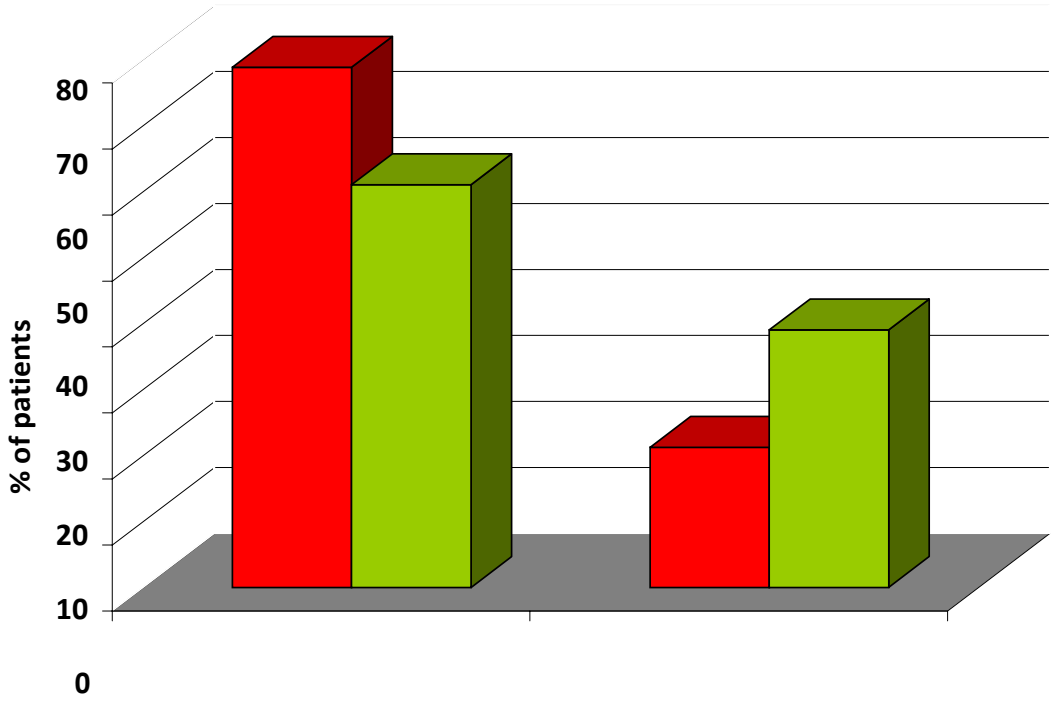
Table-27: Gender and outcome of the patients

Gender	Outcome		TOTAL
	Died	Discharge Alive	
Female	41	64	105
Row %	39.0	61.0	100.0
Col %	78.8	61.0	66.9
Male	11	41	52
Row %	21.2	78.8	100.0
Col %	21.2	39.0	33.1
TOTAL	52	105	157
Row %	33.1	66.9	100.0
Col %	100.0	100.0	100.0

$\chi^2 = 5.02$; p=0.02; S-Significant

Chi-square test showed that there was significant association between gender and outcome of the patients (p=0.02).

The risk of death was 2.38 times more among females as compared to males [OR-2.38(1.10, 5.16); p= 0.02] and the risk was significant



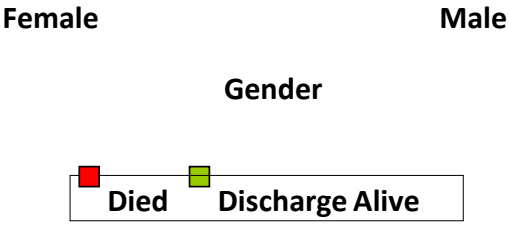


Table-28: Occupation and outcome of the patients

Occupation	Outcome		TOTAL
	Died	Discharge Alive	
House Wife	33	52	85
Row %	38.8	61.2	100.0
Col %	63.5	49.5	54.1
Service	2	9	11
Row %	18.2	81.8	100.0
Col %	3.8	8.6	7.0
Farmer	2	20	22
Row %	9.1	90.9	100.0
Col %	3.8	19.0	14.0
Student	4	14	18
Row %	22.2	77.8	100.0
Col %	7.7	13.3	11.5
Others	11	10	21
Row %	52.4	47.6	100.0
Col %	21.2	9.5	13.4
TOTAL	52	105	157
Row %	33.1	66.9	100.0
Col %	100.0	100.0	100.0

$\chi^2 = 12.57$; p=0.013; S-Significant

Chi-square test showed that there was significant association between occupation and outcome of the patients (p=0.013). House wives were more prone to be died due to burn injuries.

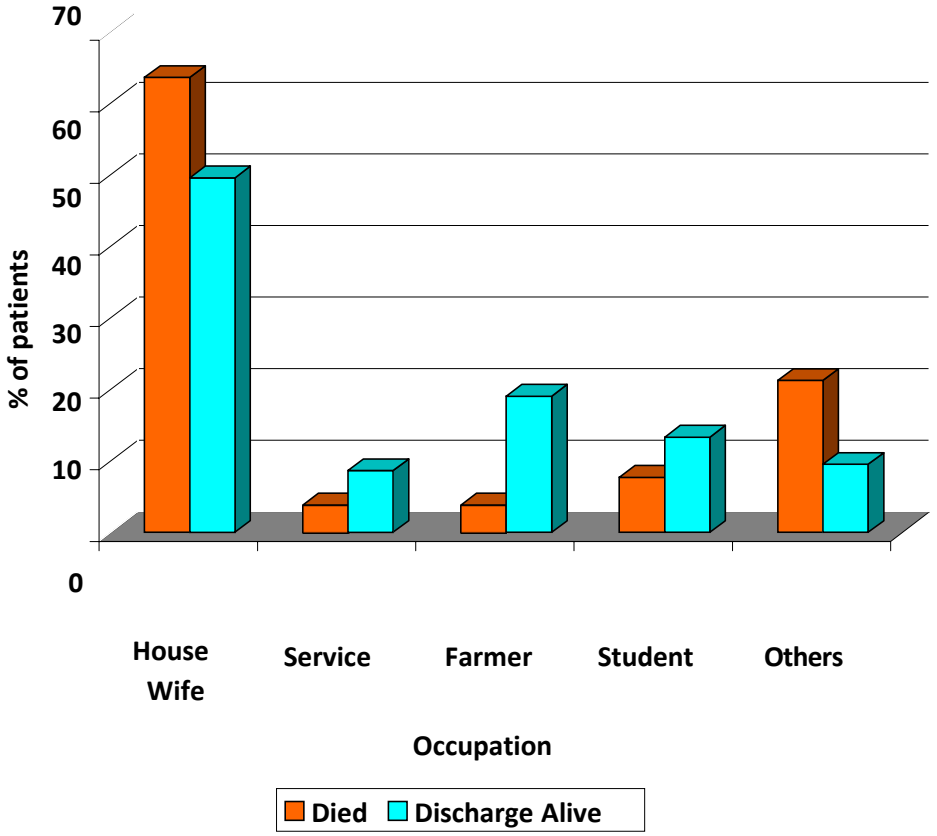

70
60
50
40
30
20
10
0
% of patients
House Wife
Service
Farmer
Student
Others
Occupation
Died
Discharge Alive

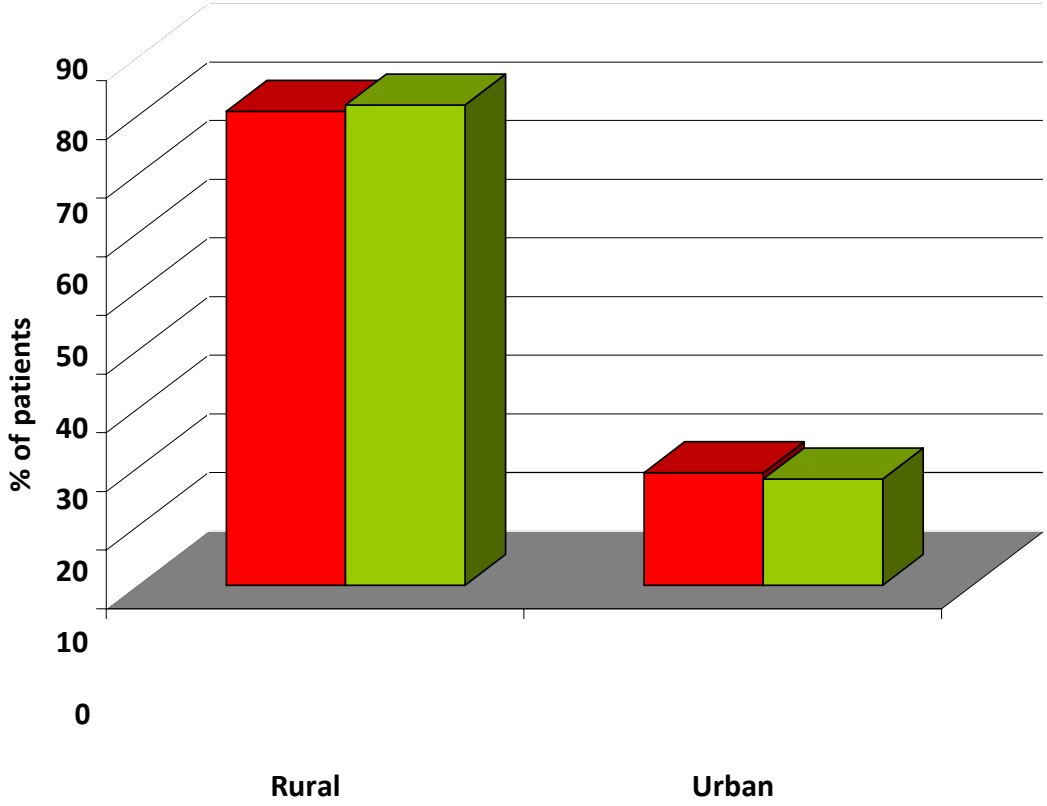
Table-29: Place of residence and outcome of the patients

Place of residence	Outcome		TOTAL
	Died	Discharge Alive	
Rural	42	86	128
Row %	32.8	67.2	100.0
Col %	80.8	81.9	81.5
Urban	10	19	29
Row %	34.5	65.5	100.0
Col %	19.2	18.1	18.5
TOTAL	52	105	157
Row %	33.1	66.9	100.0
Col %	100.0	100.0	100.0

$\chi^2 = 0.02$; p=0.86; NS-Not Significant

Chi-square test showed that there was no significant association between place of residence and outcome of the patients (p=0.086).

No risk of death was found for the patients from rural area as compared to the patients from urban area [OR-0.92(0.39, 2.17); p= 0.86].



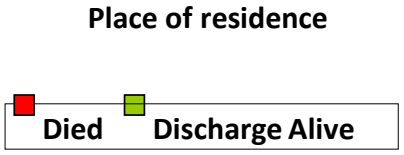


Table-30: Type of burn and outcome of the patients

Type of burn	Outcome		TOTAL
	Died	Discharge Alive	
Flame	43	70	113
Row %	38.1	61.9	100.0
Col %	82.7	66.7	72.0
Scald	8	26	34
Row %	23.5	76.5	100.0
Col %	15.4	24.8	21.7
Chemical	1	3	4
Row %	25.0	75.0	100.0
Col %	1.9	2.9	2.5
Electrical	0	6	6
Row %	0.0	100.0	100.0
Col %	0.0	5.7	3.8
TOTAL	52	105	157
Row %	33.1	66.9	100.0
Col %	100.0	100.0	100.0

$\chi^2 = 5.74$; p=0.12; NS-Not Significant

Chi-square test showed that there was no significant association between type of burn and outcome of the patients (p=0.12). Occurrence of death was more or less equally distributed for all cause of burn.

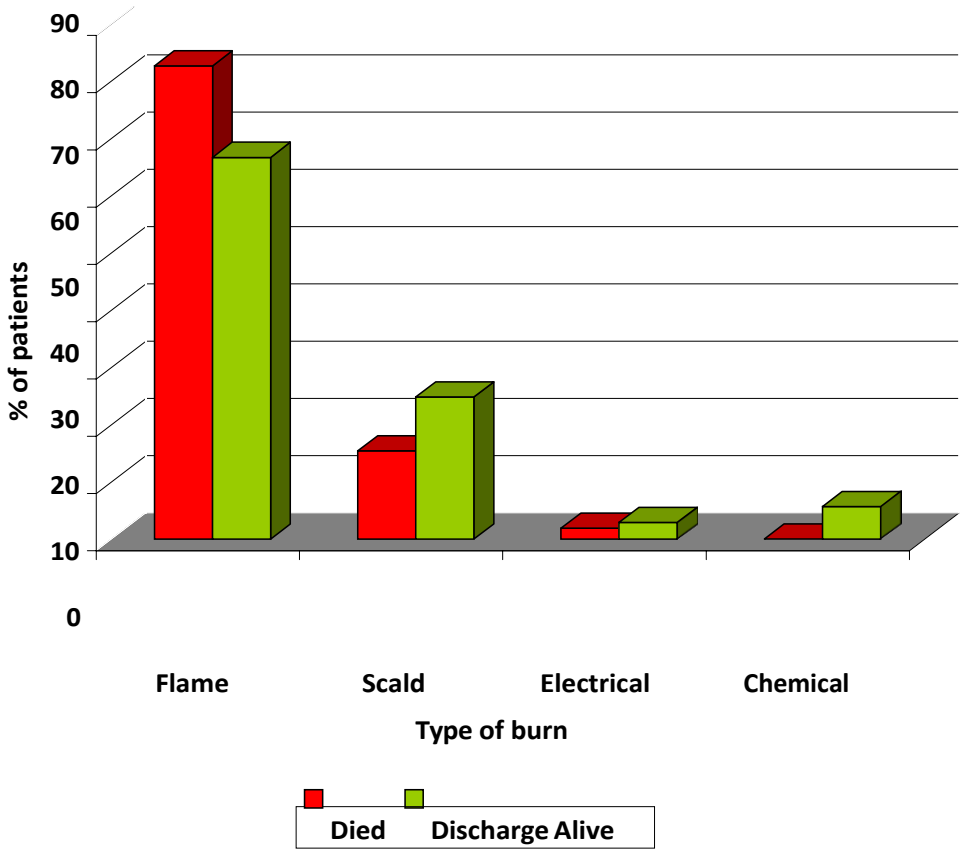


Table-31: Place of burn and outcome of the patients

Place of burn	Outcome		TOTAL
	Died	Discharge Alive	
Kitchen	31	57	88
Row %	35.2	64.8	100.0
Col %	59.6	54.3	56.1
Outside Kitchen	15	36	51
Row %	29.4	70.6	100.0
Col %	28.8	34.3	32.5
Outside Home	6	12	18
Row %	33.3	66.7	100.0
Col %	11.5	11.4	11.5
TOTAL	52	105	157
Row %	33.1	66.9	100.0
Col %	100.0	100.0	100.0

$\chi^2 = 0.49$; p=0.78; NS-Not Significant

Chi-square test showed that there was no significant association between place of burn and outcome of the patients (p=0.78). Occurrence of death was more or less equally distributed for all cause of burn.

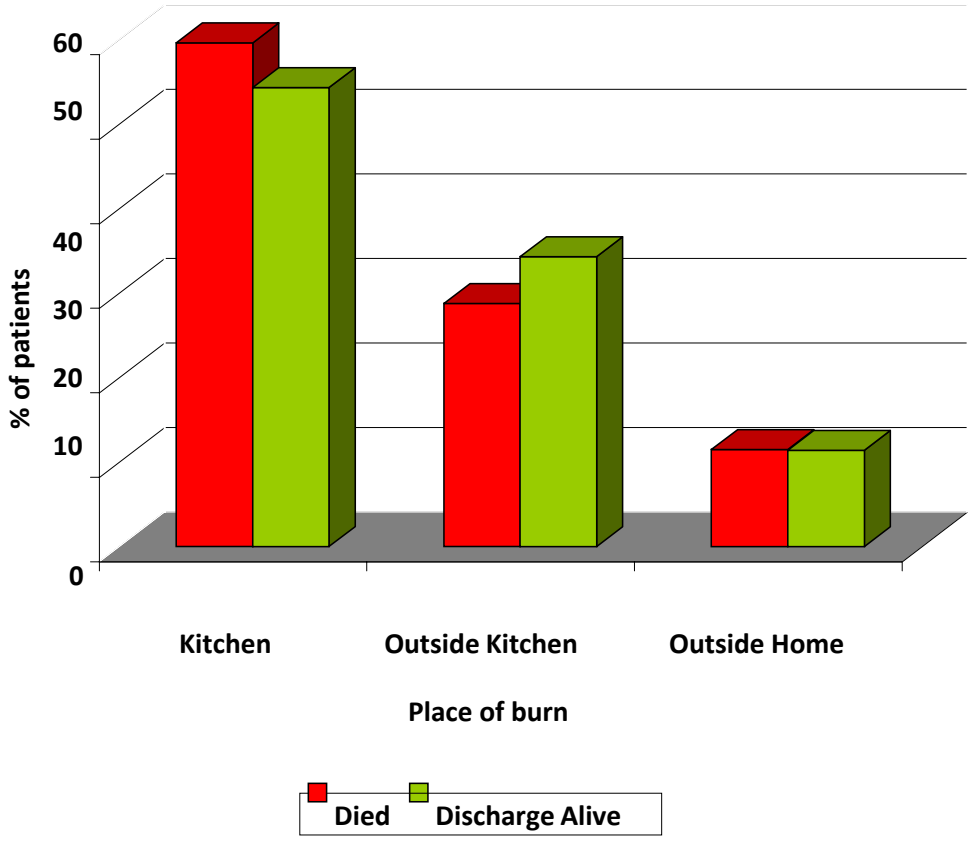


Table-32: Percentage of burn and outcome of the patients

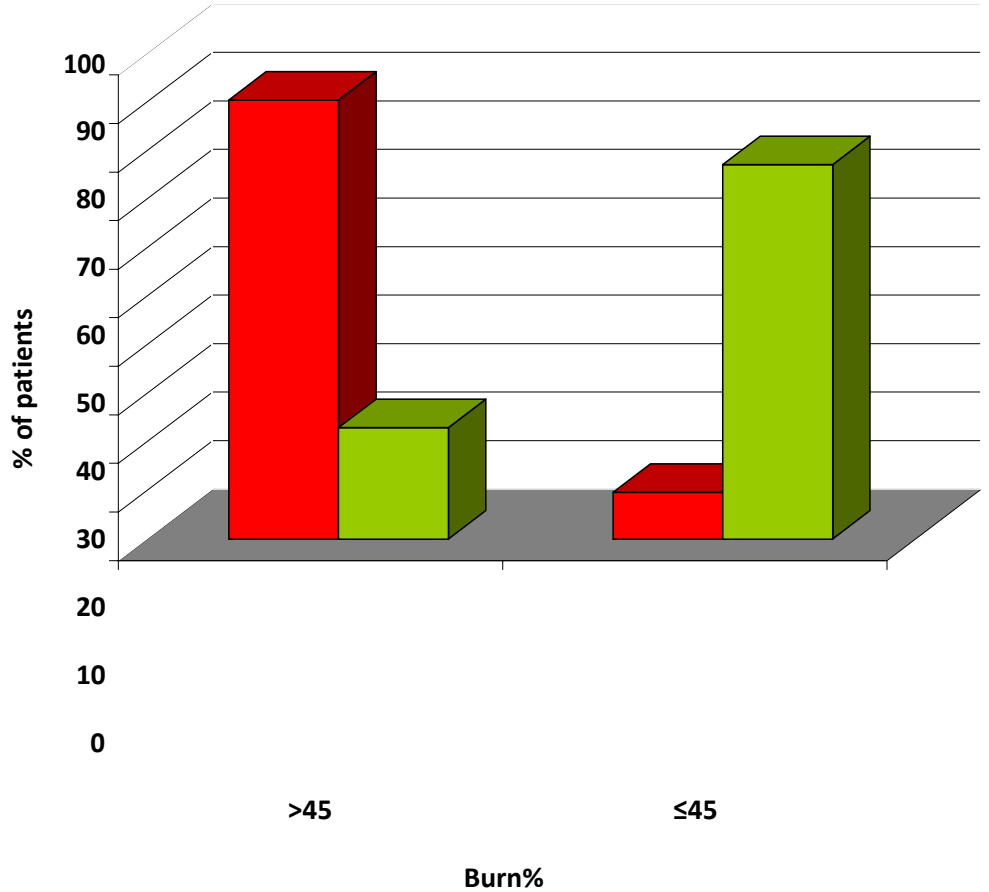
Percentage of burn (in %)	Outcome		TOTAL
	Died	Discharge Alive	
>45*	47	24	71
Row %	66.2	33.8	100.0
Col %	90.4	22.9	45.2
≤45	5	81	86
Row %	5.8	94.2	100.0
Col %	9.6	77.1	54.8
TOTAL	52	105	157
Row %	33.1	66.9	100.0
Col %	100.0	100.0	100.0

* Mean percentage of burn = 45.08 % ≈ 45 %

χ^2 = 64.01; p=0.00001; S-Significant

Chi-square test showed that there was significant association between age and outcome of the patients (p=0.001).

However, the risk of death was 31.72 times more among patients with percentage of burn>45% as compared to the patients with percentage of burn ≤45% [OR-31.72(11.34, 88.71); p= 0.00001] and the risk was significant.



Died Discharge Alive

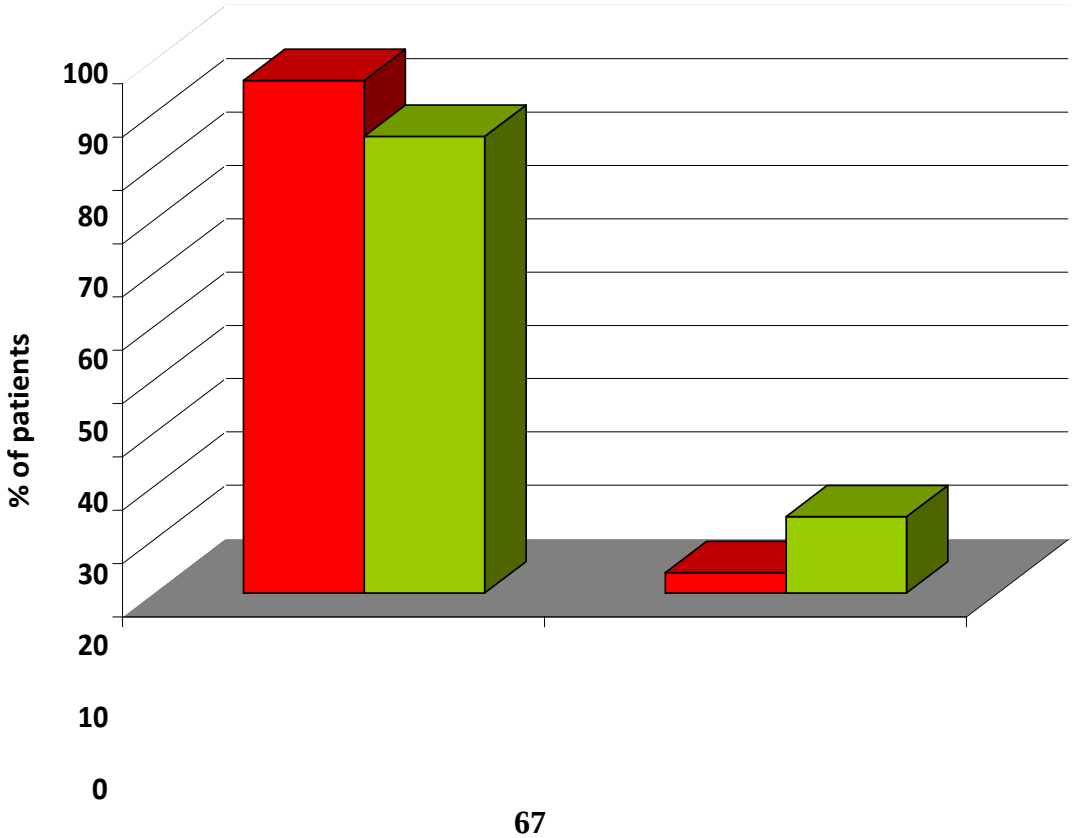
Table-33: Status of first aid and outcome of the patients

Status of first aid	Outcome		TOTAL
	Died	Discharge Alive	
No or inadequate first aid	50	90	140
Row %	35.7	64.3	100.0
Col %	96.2	85.7	89.2
Adequate first aid	2	15	17
Row %	11.8	88.2	100.0
Col %	3.8	14.3	10.8
TOTAL	52	105	157
Row %	33.1	66.9	100.0
Col %	100.0	100.0	100.0

χ^2 = 3.92; p=0.04; S-Significant

Chi-square test showed that there was significant association between status of first aid and outcome of the patients (p=0.04).

The risk of death was 4.16 times more among patients with no or inadequate first aid as compared to the patients with adequate first aid [OR-4.16(1.01, 18.96); p= 0.04] and the risk was significant.



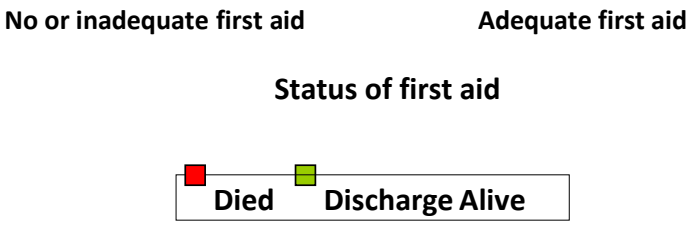


Table-34: Duration of burn and outcome of the patients

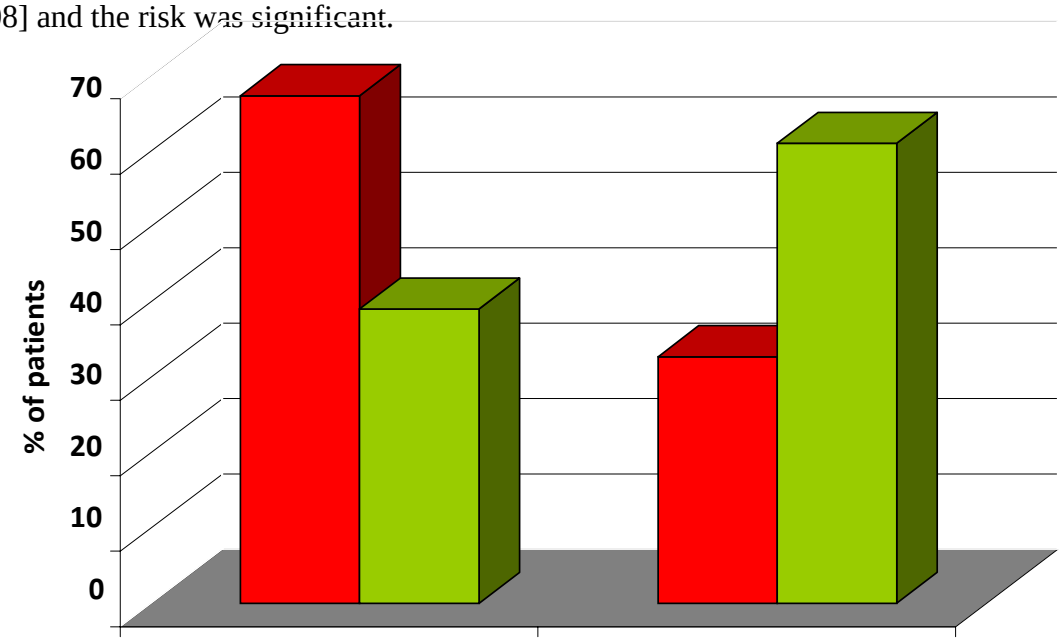
Duration of burn (in hour)	Outcome		TOTAL
	Died	Discharge Alive	
>13*	35	41	76
Row %	46.1	53.9	100.0
Col %	67.3	39.0	48.4
≤13	17	64	81
Row %	21.0	79.0	100.0
Col %	32.7	61.0	51.6
TOTAL	52	105	157
Row %	33.1	66.9	100.0
Col %	100.0	100.0	100.0

* Mean duration of burn = 13.47 hour≈ 13 hour

χ^2 = 11.12; p=0.0008; S-Significant

Chi-square test showed that there was significant association between duration of burn and outcome of the patients (p=0.0008).

However, the risk of death was 3.21 times more among patients with duration of burn>13 hours as compared to the patients with percentage of burn ≤13 hour [OR-3.21(1.59, 6.46); p= 0.0008] and the risk was significant.



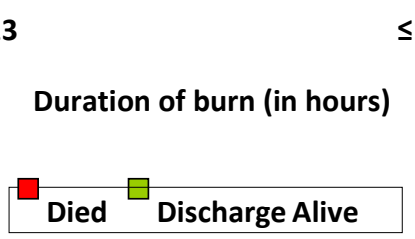


Table-35: Urine output at 1st hour and outcome of the patients

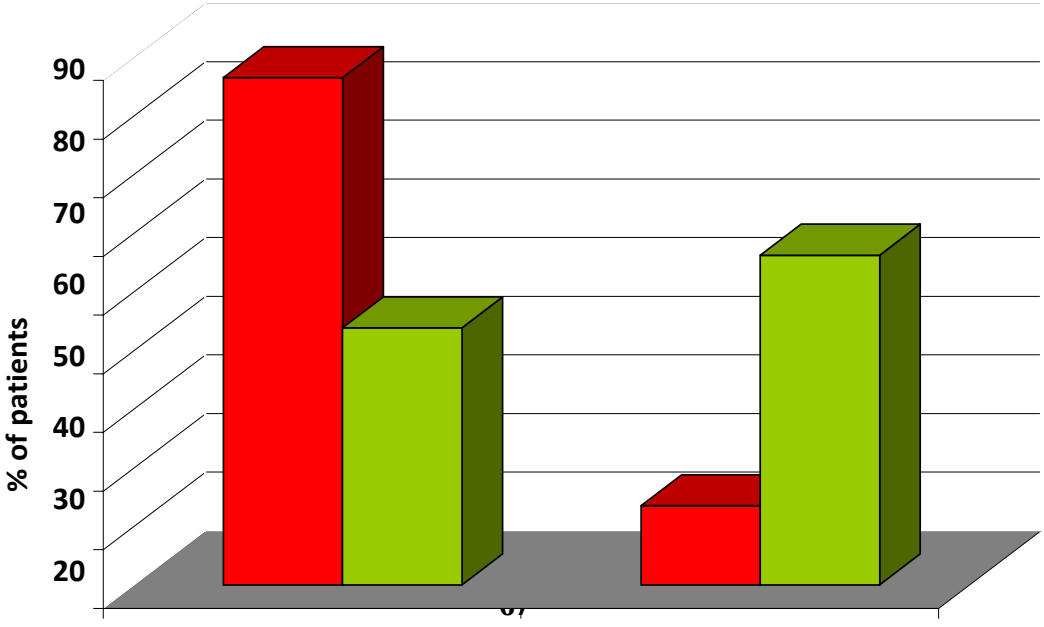
Urine output at 1st hour	Outcome		TOTAL
	Died	Discharge Alive	
Abnormal*	45	46	91
Row %	49.5	50.5	100.0
Col %	86.5	43.8	58.0
Normal	7	59	66
Row %	10.6	89.4	100.0
Col %	13.5	56.2	42.0
TOTAL	52	105	157
Row %	33.1	66.9	100.0
Col %	100.0	100.0	100.0

* Oliguira and anuria

χ^2 = 26.05; p=0.00001; S-Significant

Chi-square test showed that there was significant association between urine output at 1st hour and outcome of the patients (p=0.00001).

However, the risk of death was 8.24 times more among patients with abnormal urine output at 1st hour as compared to the patients with normal urine output at 1st hour [OR-8.24(3.40, 19.97); p= 0.00001] and the risk was significant.



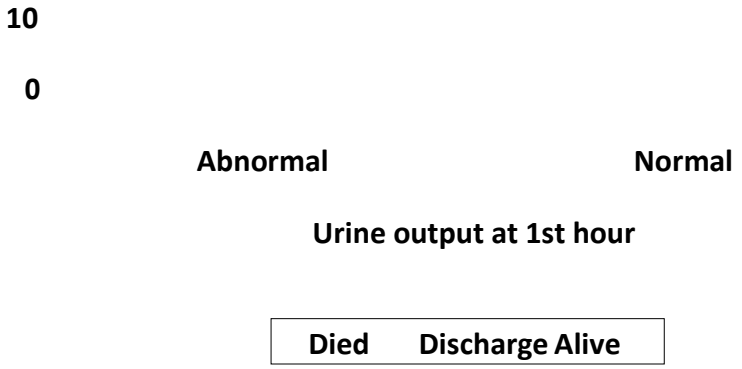


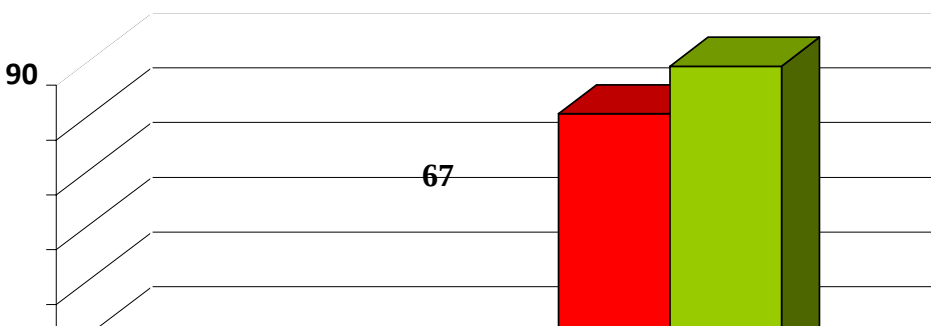
Table-36: Level of Hb at admission and outcome of the patients

Level of Hb at admission (in gm%)	Outcome		TOTAL
	Died	Discharge Alive	
≤10	10	11	21
Row %	47.6	52.4	100.0
Col %	19.2	10.5	13.4
>10	42	94	136
Row %	30.9	69.1	100.0
Col %	80.8	89.5	86.6
TOTAL	52	105	157
Row %	33.1	66.9	100.0
Col %	100.0	100.0	100.0

χ^2 = 2.30; p=0.12; NS-Not Significant

Chi-square test showed that there was no significant association between level of Hb at admission and outcome of the patients (p=0.12).

However, the risk of death was 2.03 times more among patients with level of Hb at admission≤10gm% as compared to the patients with level of Hb at admission>10gm% [OR-2.03(0.80, 5.15); p= 0.12] but the risk was not significant.



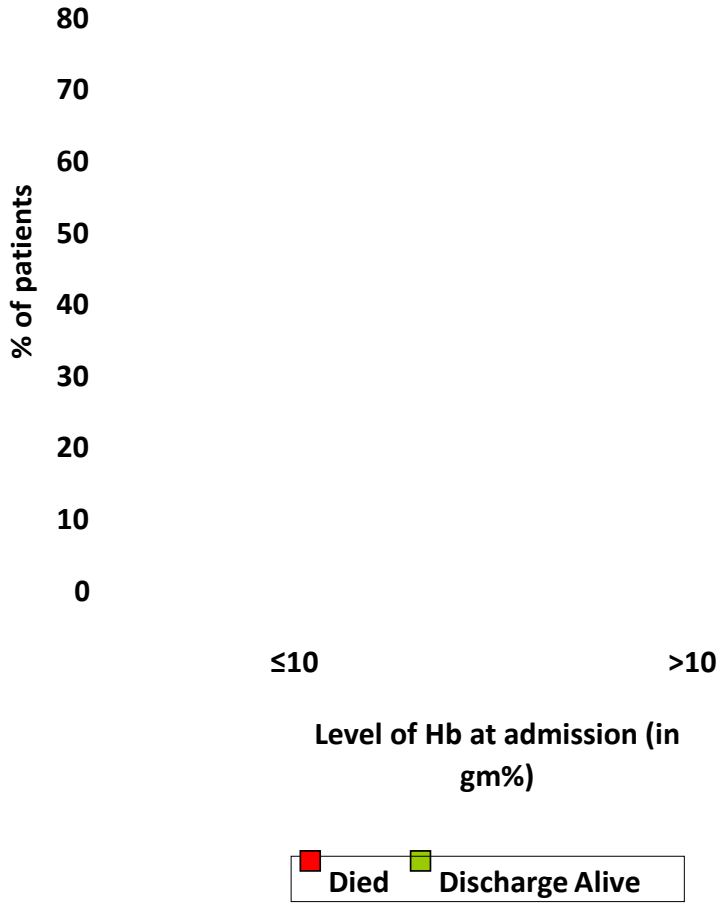

80
70
60
50
40
30
20
10
0
% of patients
≤10
>10
Level of Hb at admission (in gm%)
Died
Discharge Alive

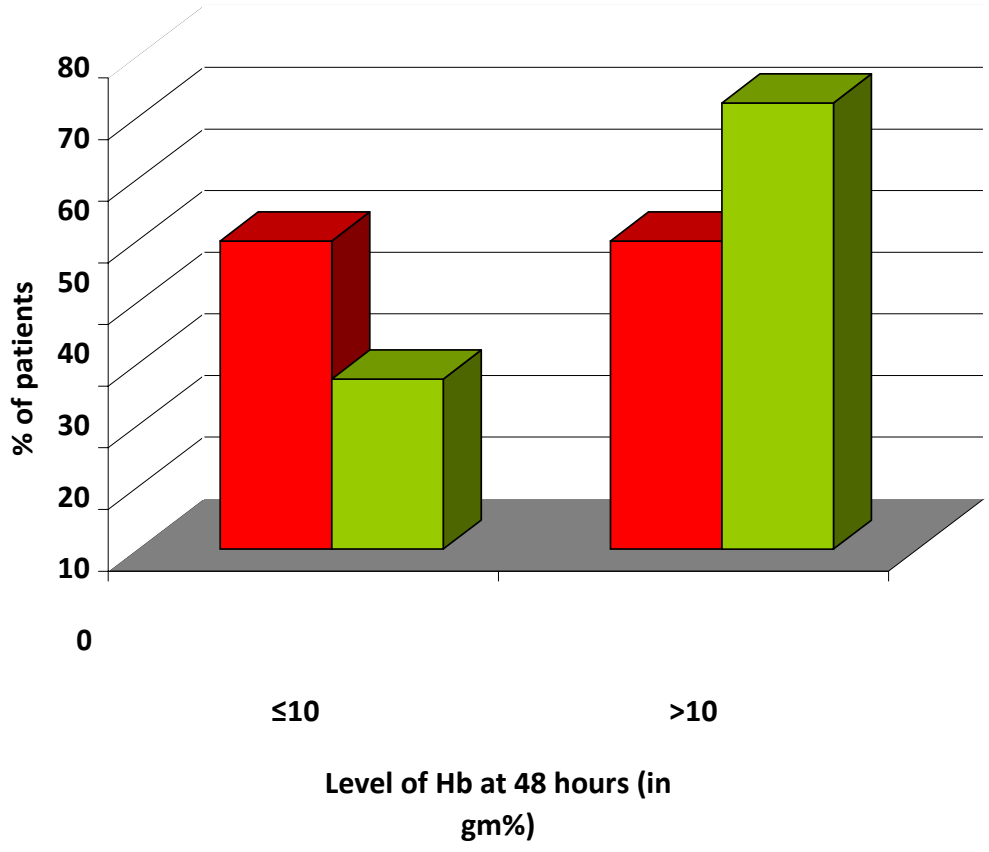
Table-37: Level of Hb at 48 hours and outcome of the patients

Level of Hb at 48 hours (in gm%)	Outcome		TOTAL
	Died	Discharge Alive	
≤10*	15	29	44
Row %	34.1	65.9	100.0
Col %	50.0	27.6	32.6
>10	15	76	91
Row %	16.5	83.5	100.0
Col %	50.0	72.4	67.4
TOTAL	30	105	135
Row %	22.2	77.8	100.0
Col %	100.0	100.0	100.0

$\chi^2 = 5.31$; p=0.02; S-Significant

Chi-square test showed that there was significant association between level of Hb at 48 hours and outcome of the patients (p=0.02).

However, the risk of death was 2.62 times more among patients with level of Hb at 48 hours≤10gm% as compared to the patients with level of Hb at 48 hours>10gm% [OR-2.62(1.13, 6.03); p= 0.02] and the risk was significant.



Died Discharge Alive

Table-38: Level of Na at admission and outcome of the patients

Level of Na at admission (in meq/L)	Outcome		TOTAL
	Died	Discharge Alive	
Abnormal*	50	80	130
Row %	38.5	61.5	100.0
Col %	96.2	76.2	82.8
Normal	2	25	27
Row %	7.4	92.6	100.0
Col %	3.8	23.8	17.2
TOTAL	52	105	157
Row %	33.1	66.9	100.0
Col %	100.0	100.0	100.0

* Level of Na<135 meq/L and Na>145 meq/L

$\chi^2 = 9.73$; p=0.0018; S-Significant

Chi-square test showed that there was significant association between level of Na at admission and outcome of the patients (p=0.0018).

However, the risk of death was 7.81 times more among patients with abnormal level of Na at admission as compared to the patients with normal level of Na at admission [OR-7.81(1.77, 34.42); p= 0.0018] and the risk was significant.

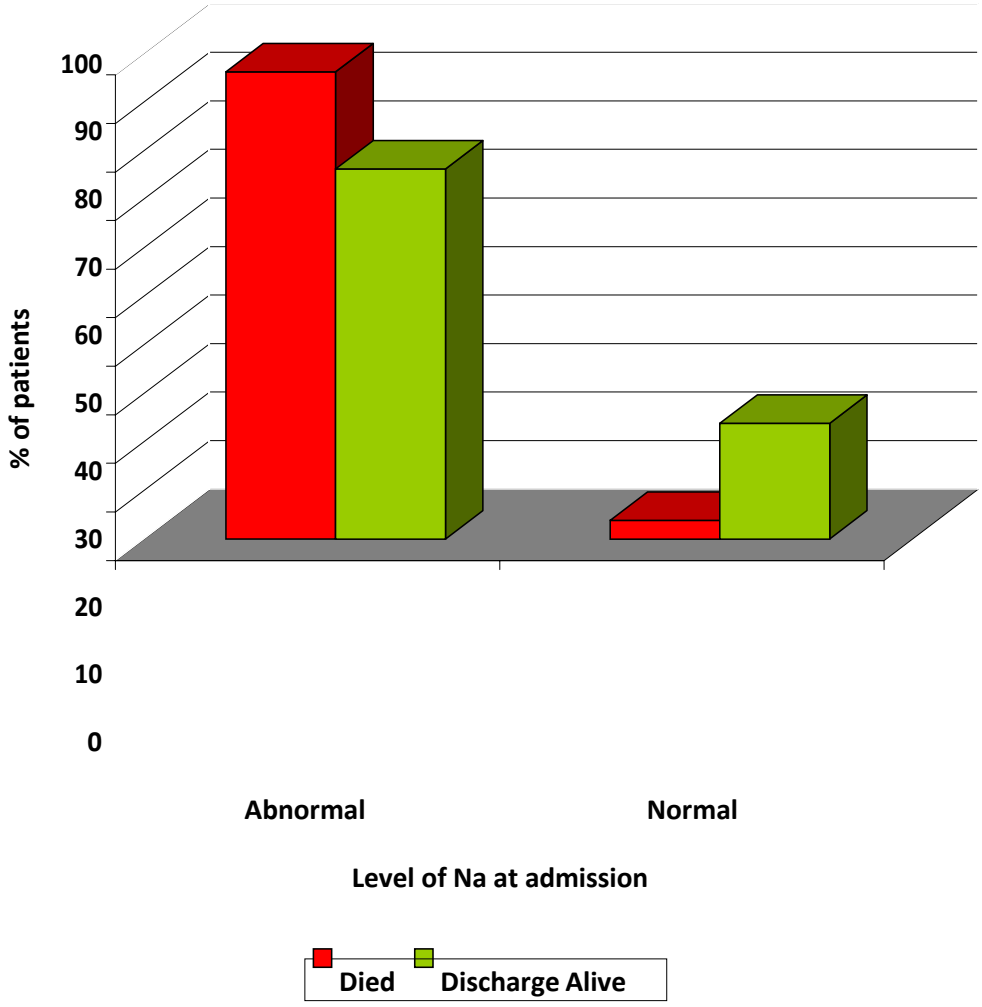

100
90
80
70
60
50
40
30
20
10
0
% of patients
Abnormal
Normal
Level of Na at admission
Died
Discharge Alive

Table-39: Level of K at admission and outcome of the patients

Level of K at admission (in meq/L)	Outcome		TOTAL
	Died	Discharge Alive	
Abnormal*	52	68	120
Row %	43.3	56.7	100.0
Col %	100.0	64.8	76.4
Normal	0	37	37
Row %	0.0	100.0	100.0
Col %	0.0	35.2	23.6
TOTAL	52	105	157
Row %	33.1	66.9	100.0
Col %	100.0	100.0	100.0

* Level of K<3.5 meq/L and K>5.0 meq/L

As one of the cell frequency was zero the risk could not be assessed. However, Fisher exact test showed that proportion of patients who died due to abnormal level of K was significantly higher than that of the patients with normal level of K [p= 0.00001] .

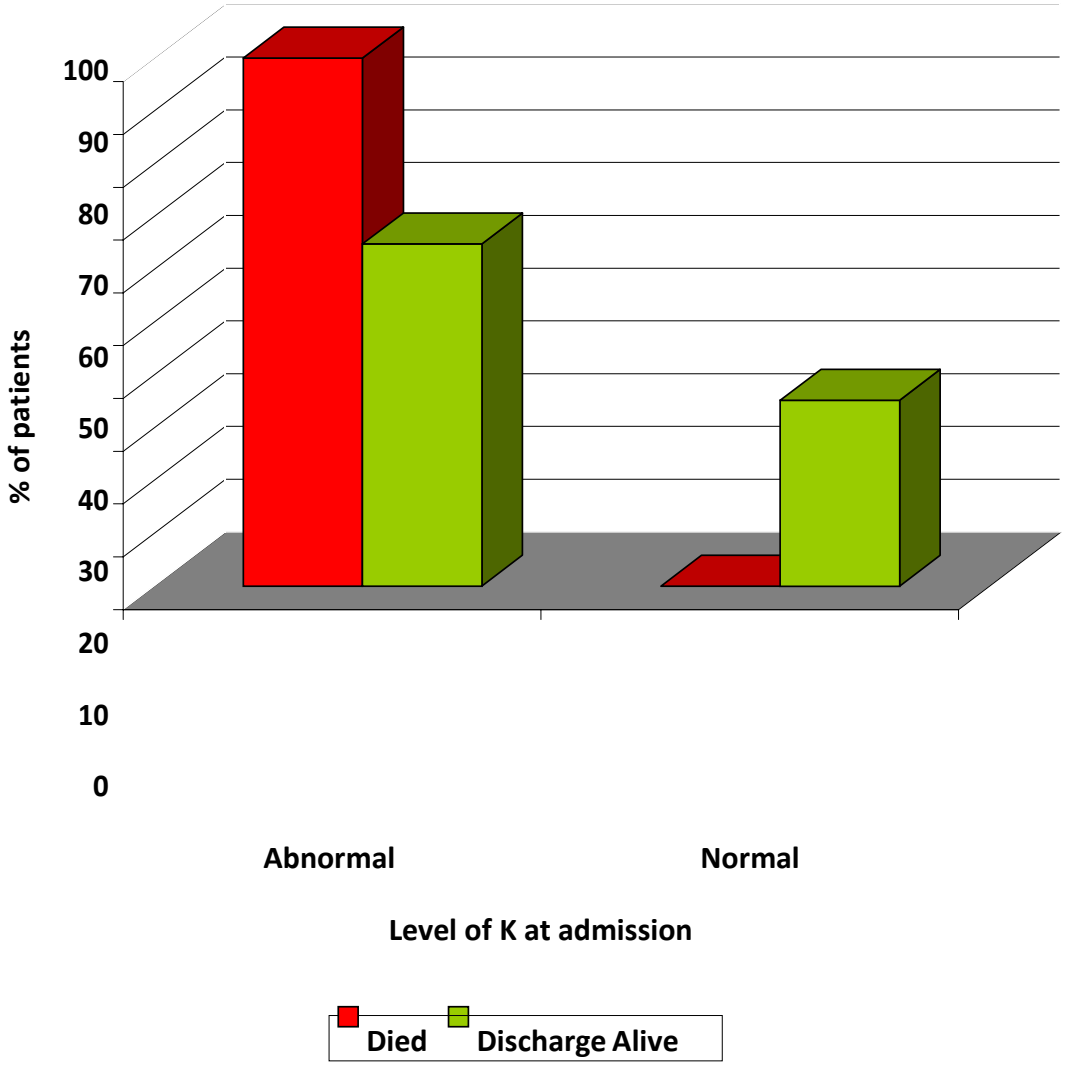

100
90
80
70
60
50
40
30
20
10
0
% of patients
Abnormal
Normal
Level of K at admission
Died
Discharge Alive

Table-40: Head & neck involvement and outcome of the patients

Head & neck involvement	Outcome		TOTAL
	Died	Discharge Alive	
Yes	31	30	61
Row %	50.8	49.2	100.0
Col %	59.6	28.6	38.9
No	21	75	96
Row %	21.9	78.1	100.0
Col %	40.4	71.4	61.1
TOTAL	52	105	157
Row %	33.1	66.9	100.0
Col %	100.0	100.0	100.0

$\chi^2 = 14.10$; p=0.0001; S-Significant

Chi-square test showed that there was significant association between head & neck involvement and outcome of the patients (p=0.0001).

The risk of death was 3.69 times more among patients with head & neck involvement as compared to the patients without head & neck involvement [OR-3.69(1.83, 7.41); p= 0.0001] and the risk was significant.

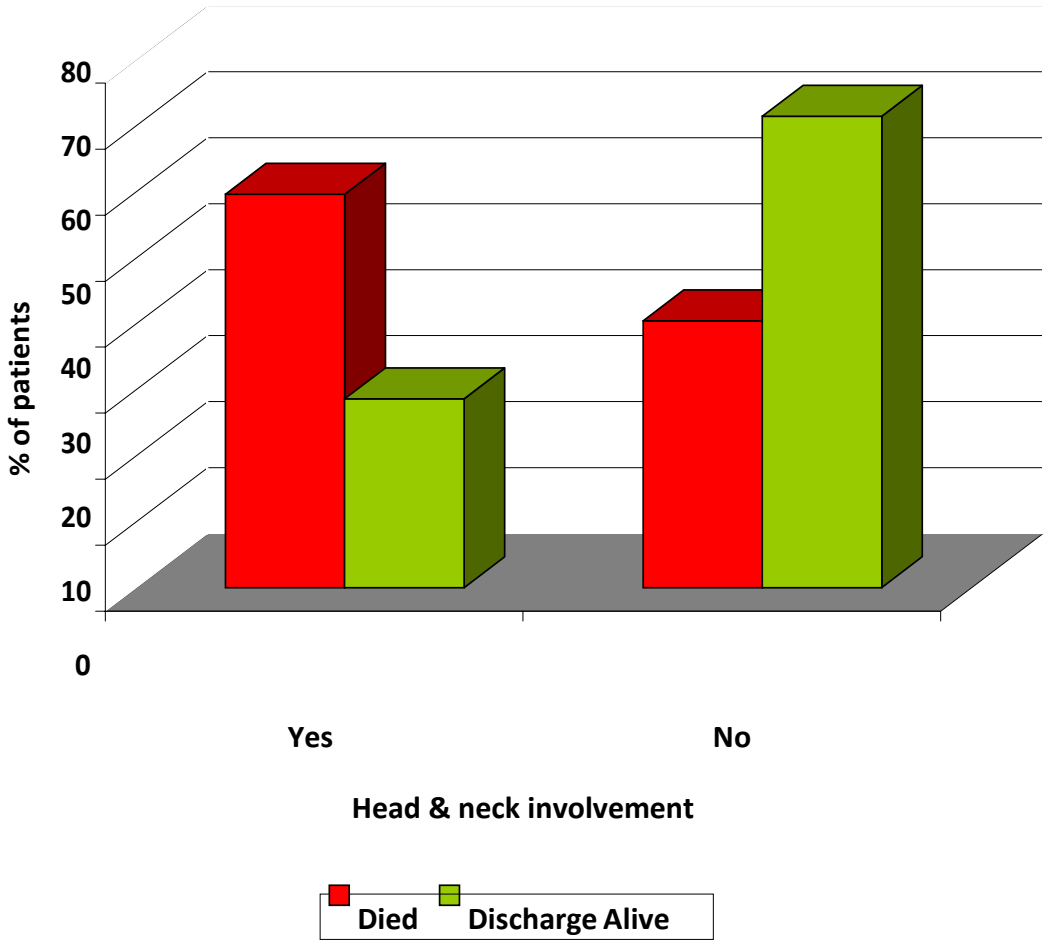

80
70
60
50
40
30
20
10
0
% of patients
Yes
No
Head & neck involvement
Died
Discharge Alive

Table-41: Anterior trunk involvement and outcome of the patients

Anterior trunk involvement	Outcome		TOTAL
	Died	Discharge Alive	
Yes	48	56	104
Row %	46.2	53.8	100.0
Col %	92.3	53.3	66.2
No	4	49	53
Row %	7.5	92.5	100.0
Col %	7.7	46.7	33.8
TOTAL	52	105	157
Row %	33.1	66.9	100.0
Col %	100.0	100.0	100.0

$\chi^2 = 23.62$; p=0.00001; S-Significant

Chi-square test showed that there was significant association between anterior trunk involvement and outcome of the patients (p=0.00001).

The risk of death was 10.50 times more among patients with anterior trunk involvement as compared to the patients without anterior trunk involvement [OR-10.50(3.53, 31.22); p= 0.00001] and the risk was significant

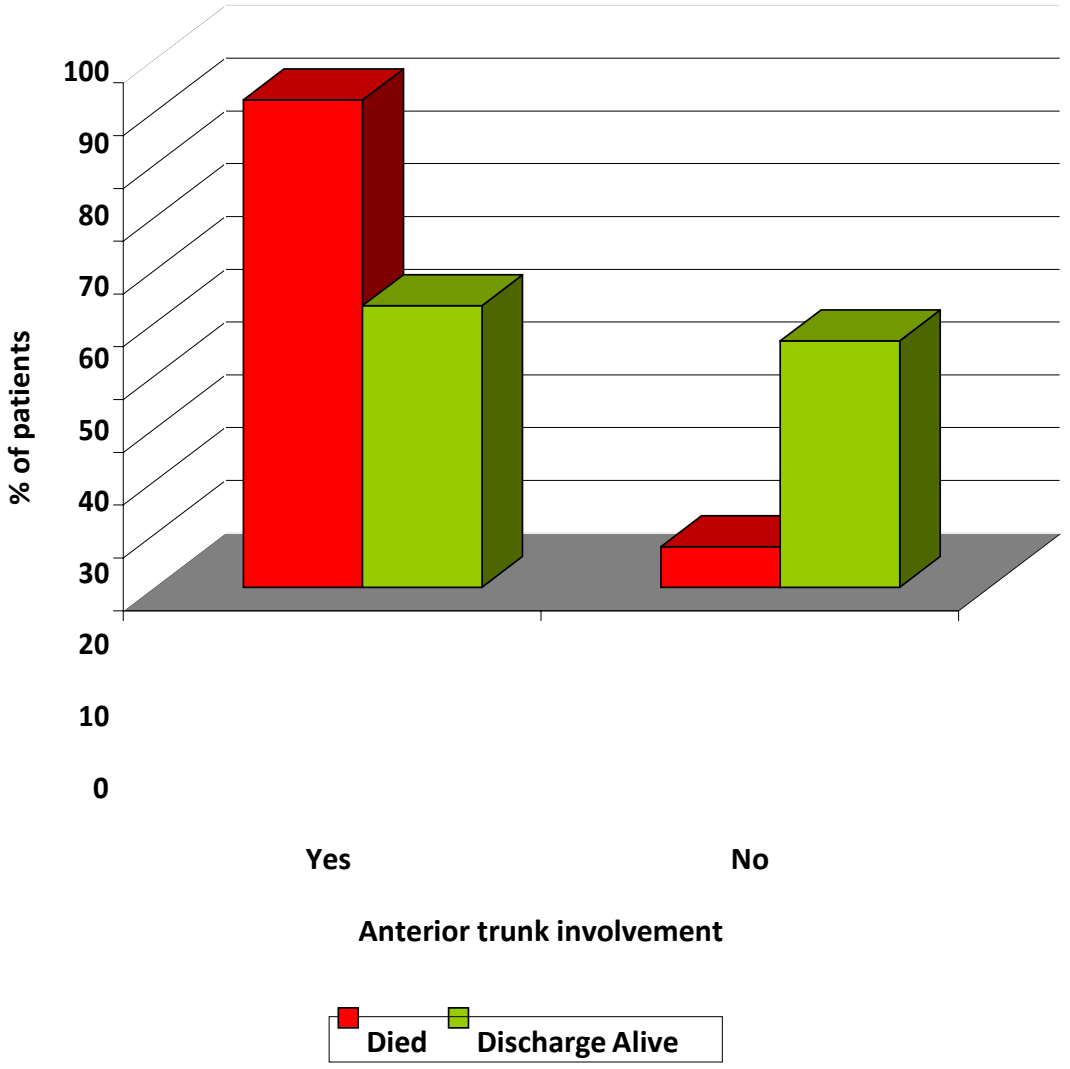

100
90
80
70
60
50
40
30
20
10
0
% of patients
Yes
No
Anterior trunk involvement
Died
Discharge Alive

Table-42: Bacteriology at 1st day and outcome of the patients

Bacteriology at 1st day	Outcome		TOTAL
	Died	Discharge Alive	
Positive	16	4	20
Row %	80.0	20.0	100.0
Col %	30.8	3.8	12.7
Normal	36	101	137
Row %	26.3	73.7	100.0
Col %	69.2	96.2	87.3
TOTAL	52	105	157
Row %	33.1	66.9	100.0
Col %	100.0	100.0	100.0

$\chi^2 = 22.73$; p=0.00001; S-Significant

Chi-square test showed that there was significant association between bacteriology at 1st day and outcome of the patients (p=0.00001).

The risk of death was 11.22 times more among patients with positive bacteriology at 1st day as compared to the patients with normal bacteriology at 1st day [OR-11.22(3.51, 35.79); p= 0.00001] and the risk was significant.

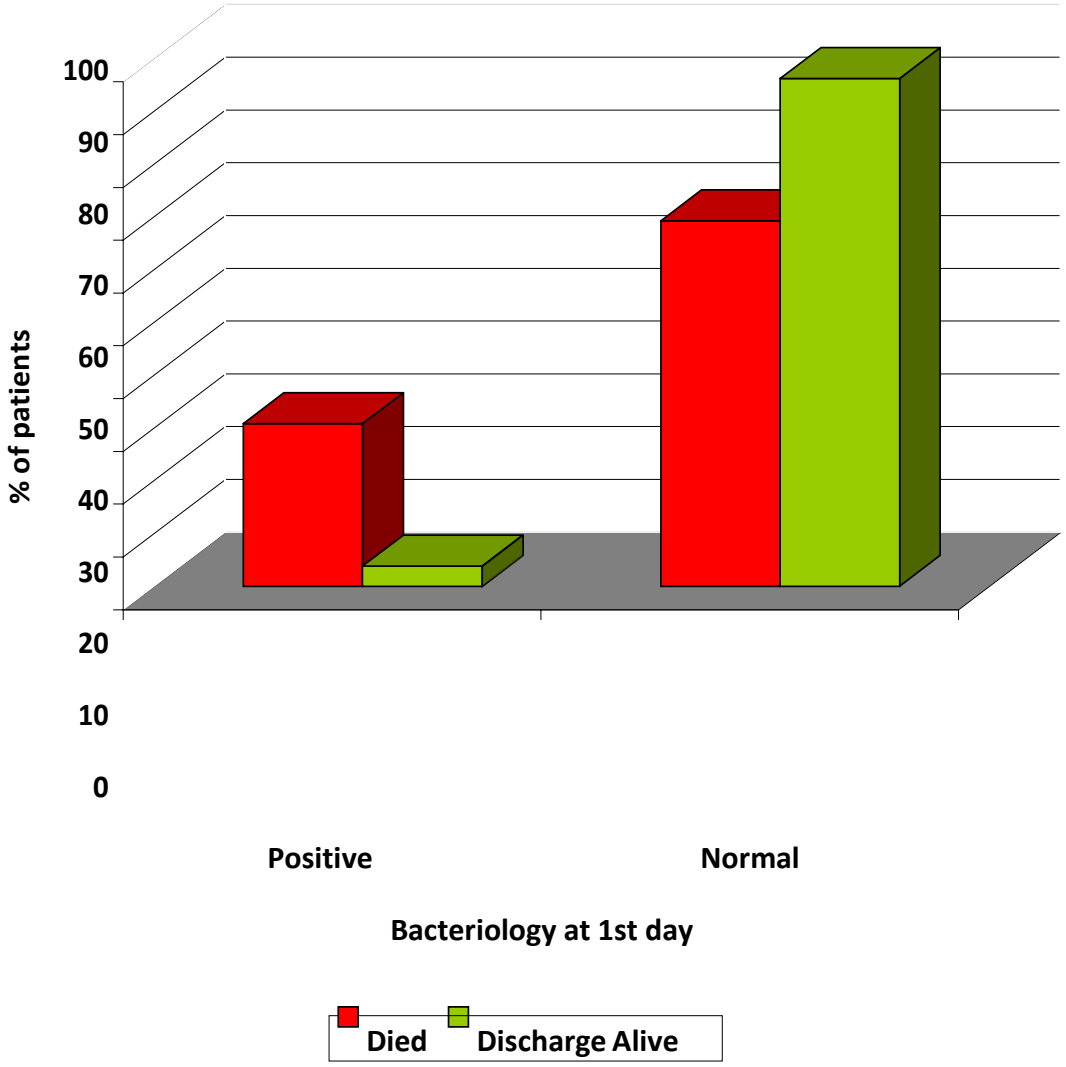
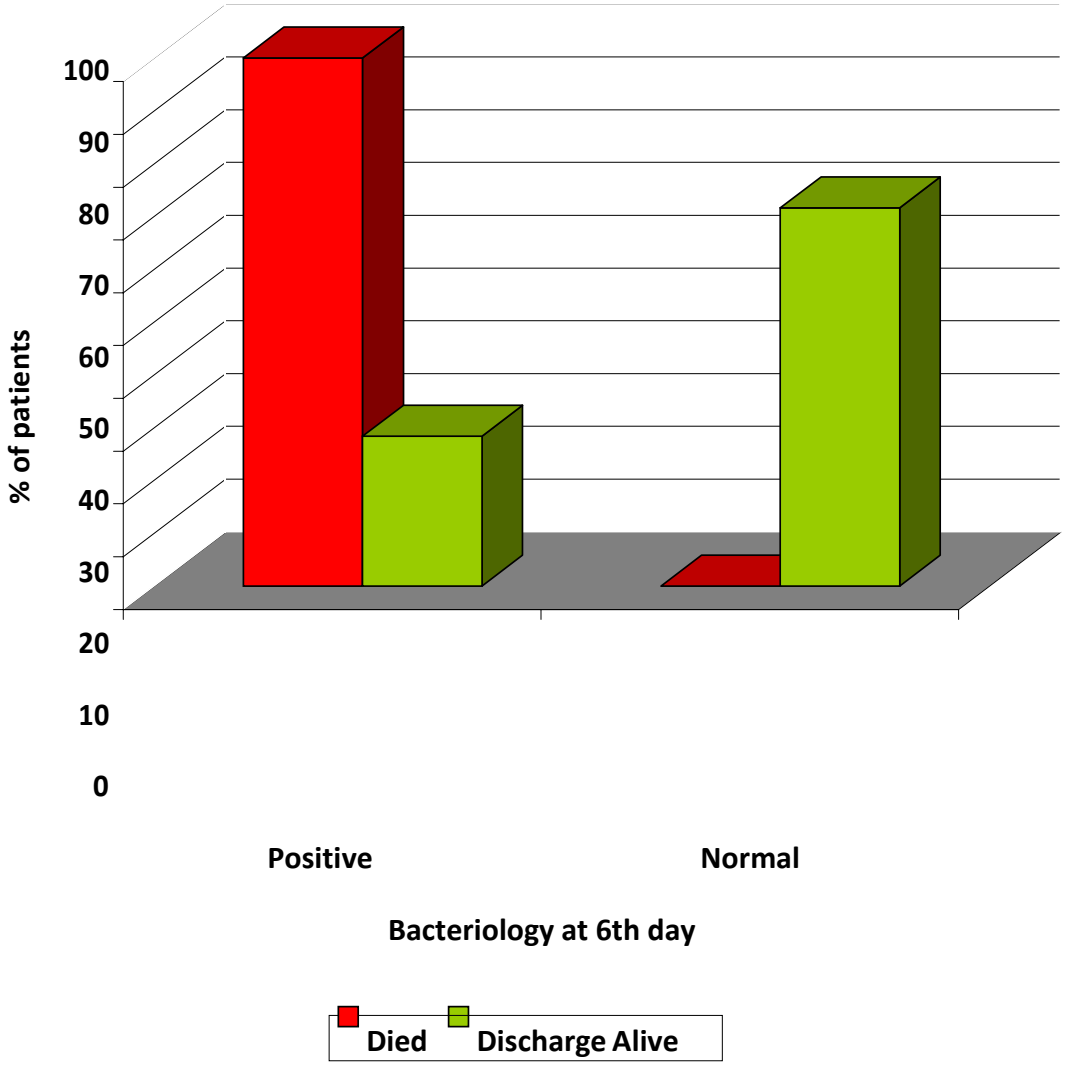

100
90
80
70
60
50
40
30
20
10
0
% of patients
Positive
Normal
Bacteriology at 1st day
Died
Discharge Alive

Table-43: Bacteriology at 6th day and outcome of the patients

Bacteriology at 6th day	Outcome		TOTAL
	Died	Discharge Alive	
Positive	17	29	46
Row %	37.0	63.0	100.0
Col %	100.0	28.4	38.7
Normal	0	73	73
Row %	0.0	100.0	100.0
Col %	0.0	71.6	61.3
TOTAL	17	102	119
Row %	14.3	85.7	100.0
Col %	100.0	100.0	100.0

As one of the cell frequency was zero the risk could not be assessed. However, Fisher exact test showed that proportion of patients who died due to positive bacteriology at 6th day was significantly higher than that of the patients with normal bacteriology at 6th day [p= 0.00001]



DISCUSSION

Age & Sex distribution (Tables 1, 2, 3, 26 & 27): -

In my study of 157 patients, 52 cases (33.1%) are males and 105 patients (66.9%) are females. The Male:Female ratio was 1 : 2.01 showing higher incidence among the females. Out of 52(33.1%) deaths,41(78.8%) are females and 11(21.2%) are males showing risk of death was 2.38 times more among females as compared to males. Regarding age distribution, between age groups 19-29 years, 44(28%) cases are their which is highest among any age group and also maximum males 15(28.8%) and maximum females 29(27.6) from the same age group 19-29 yrs. The mean age of patients is 43years. Among the patients of age group >43years, 33(63.5%) died and patients of age

<43years 19(36.5%) died. The risk of death was 2.93 times more among the patients of age group >43 years.

Shankar G et. al[53] studied in district hospital of north Karnataka on 240 burn patients and found that out of 240 burn patients admitted during the study period, 134 (55.83%) were females. Majority (54.58%) were between 21 and 40 years of age. .

Burton KR et. al[54] in their study from1994-2005 observed that mean patient age was 45.2 years (range 18-97) and 658 (70.9%) were male.

Panday SK et. al[55] in their retrospective study has been conducted for the period of 5 years i.e. 2009 to 2013 based on autopsy of the unnatural death cases resulting from burn. During study period out of total 10215 unnatural Death cases death due to burn injuries was 1911. These cases brought to the Department of Forensic Medicine, IMS, BHU, Varanasi. Thermal burn injuries were averaging 18.65%. Female burn deaths dominated over male in the ratio of 3.52:1. Predominant age group found to be 21-30 years(48.72%)followed

by age group 11-20 (23.11%).

Tejas C et. al[89] in their retrospective study was carried out in the Department of Forensic Medicine & Toxicology, Government Medical College, & Sir T. General Hospital Bhavnagar during the period from 1st January 2013 to 31st December 2013 and includes a total of 243 cases of death due to burns 0bservedthatmostoftheburncaseswerefromruralarea.Predominantage groupfoundtobe21-30years (33.75%) followed by age group 31-40 years (24.28%) and 11-20 years (16.46%) reflecting that young adults were more involved in such type of deaths.

The findings in this series of study are closely similar to most of the above workers. The high incidence of burn in females in the adult age group (15-59 years is due to the fact that most of the burns occur in Kitchen.

Religion (Table 4): -

In the present study on 157 patients, 135(86%) were Hindu, 20 Muslims and 2 Christian. In regard to mortality, Hindu constitutes 32.6% in comparison to Muslims 40% showing a little bit lower incidence on the part of the former.

Panday SK et. al[55] in their retrospective study has been conducted for the period of 5 years i.e. 2009 to 2013 based on autopsy of the unnatural death cases resulting from burn. During study period out of total 10215 unnatural Death cases death due to burn injuries was 1911. These cases brought to the Department of Forensic Medicine, IMS, BHU, Varanasi. Religion wise Hindu (96.70%) predominated over other religions.

The findings in this series are almost similar to the finding of Panday SK et. al[55]. The majority of cases were Hindus which may be due to large population of Hindus in local areas and also due to the fact that Hindu females who wore loose garments (Sari) and Dhotis by males making them more prone

to catch fire. Samiz and Shalwar wore by Muslim females are less vulnerable to catch fire. The low incidence of bum in Christian is in relation to their poor population in this part of country.

Influence of locality, Occupation, Place and cause of burn (Tables 5, 6, 7, 8, 28, 29, 30 & 31):-

In the present series of study 0f 52 cases of burn who died were studied as regards to their locality either rural or urban and the data indicated that 42 cases (80.8%) came from rural areas and only 10 (19.2%) from urban areas. This shows that there is higher mortality of burn in rural areas which is due to the fact that most of the patients admitted here were from rural areas and also the incidence of burn was much higher in rural population as they live in Kuchcha houses of hay and bamboo, are illiterate and unaware of fire safety. Majority of patients are from rural areas 128(81.5%) among total 157 burn patients studied.

Out of the 157 cases of burns Housewives dominates the list with 85(54.1%) followed by farmers 22(14%). Among 52 cases of burn died in the present series of study housewives formed 33(63.5%) of cases, being the highest. Other included employees, students, farmers, howkers with more or less equal number of fatalities.

As most of the housewives in this part of country cook their food themselves and work in kitchen where they use unprotected fire and wear loose clothings (sari) the high incidence in them in natural. Most of them are illiterate and are unaware of fire safety.

In the present series of study of 157 burn patients, 139(88.6%) cases occurs in home out of which 88(56.1%) occurs in kitchen. Out of 52 burn cases who died 46 (88.4%) were domestic, out of which 31 (56.9%) occurred in

kitchen and only 6(11.5%) occurred outside home. Flame was the cause of death in 43 (82.7%) among total 113(72%) cases, 8(15.4%) deaths were from hot liquid(boiling water, dal, oil or other liquids) out of total 34(21.7%)and only1(1.9%)deathfromchemicalagentintotal4(2.5%)cases.Therewasno death from electric or contact burns.

Aynur Atilla et.al[50] have conducted study on 465 burn patients at a tertiary hospital in turkey during year 2009 t0 2011 and found following results. Mean age of the patients was 18.6±22.0 years (median=6.1-87)and twohundredandeighty-two(62.2%)patientswereyoungerthan18yearsof age. Of the patients, two hundred and ninety-two (62.8%) were female and one hundred and seventy-three (37.2%) were male. Mean TBSA was 18.0%±14.0 (range 0-95%). Cause of injury was recorded in four hundred and thirty-two patients. Of the patients, one hundred and eighty-eight (43.5%) had scald injury, one hundred and sixteen (26.9%) had flame injury, forty (9.3%) had electrical injury, twenty-seven (6.4%) had contact injury, and sixty (13.9%) had liquid injury (hot fluids, boiling jam).

An observational study on burn patients regarding its various etiologies was conducted by Khan TS et.al[49]in Kashmir in India during 2010-2011 and they concluded that Patient's ages ranged from 1 to 65 years with a mean age of 24.2 ± 7.6 years. The most common class of the population burnt were school going children (32.70%) followed by housewives (19.10%). Eighty percentage of patients belonged to rural areas and 20% to urban areas. Flame burns were more common in females (52.1%), electric burns were more common in males (93.3%) and scalds were more common in children (64.3%). The predominance of scald injury in the study of other workers id due to the fact that scald is common in schoolgoingchildrenwhich is excluded from my study.

Ferraro A (1998) found that most frequent etiological agent was fire (44.2%) and hot liquid (39%).

De Souza DA et al (1998)[29] observed that occupational and/or domestic accidents were responsible for 78.6% of the burns which were mainly caused by a direct flame (71.2%). Thus, the findings in the present series of study are similar to most of the other workers. The low mortality with electrical bums is not a true data. Most of the patients with severe electric burns do not survive to reach the hospital so that low mortality associated with electrical burns in present series is probably not of great significance. In this part of the country', the use of unprotected fire in kitchen is very dangerous with modernization in cooking system the incidence of bum will go down.

Severity and extent of burn (Tables 9 & 32): -

A look at the above mentioned tables shows that out of 157 burn cases 98(62.4%) cases received less than 50% body surface area burnt. In cases between 0-30% body surface area only 1 died out of 51(32.5%) burn patients. All Patients of more than 70% total body surface area burn died. Mean % of burn is 45%. Out of total 71 patients of burn more than 45%, 47(66.2%) died which is 90.4% of the total death. From 86 patients of less than 45% total body surface area burn, only 5(5.8%) died which is 9.6% of total death. However risk of death was 31.72 times higher among patients with % of burn more than 45% as compared to patients of burn less than equal to 45% burns. This shows that mortality increases with increase in % of burn and extremes of burn.

These findings are similar to those mentioned by Munster AM et al[57] (1991); Lewandowski R et al[38] (1993); Smith DL et al[40] (1994) and De-Souza DA et al[29] (1995). They observed that mortality rate increases with the increase in body surface are burn. They also showed that no matter how severely burned

the patient may be, some probability of their survival remains. The statement is of great clinical importance and is preferable to the old idea that a bum of a certain proportion of the body surface was necessarily fatal. If each burned patient is regarded as having a chance of recovery, every effort will be made to help by means of treatment.

Donati L et al[26](1998) in their study observed that burn mortality was directly proportional to the percentage of burnt body surface area and a 50% mortality was associated with a 72.5% total body surface are burn.

Thus, the percentage of total body surface area burnt appears to be the major factor in determination of mortality.

Status of First Aid (Tables 10 & 33): -

In the present series of study 140(89.2%) patients received no or inadequate first aid out of which 50(35.7%) died which is 96.2% of total death. Only 17(10.8%) patients received analgesics, iv fluids, injection Tetvac, antibiotics and respiratory support in which only 2(11.8%) died which is 3.8% of total death. A few of them used toothpaste as local application before reaching hospital. Some of them used burn clothings over the wound making it further dirty. These instances show that need of health education to the masses regarding first aid is very essential. If the rural health centers are provided by some arrangements regarding first aid, there is every hope of marked improvement in the prognosis of burn patients. As for any trauma, first aid measures at the scene of accident may prove life saving or atleast restrict the morbidity. Damage due to thermal trauma can be minimized by removing the victim from the scene of fire, by pouring large amounts of tap water and by removing smouldering clothes. When inhalation injury is suspected, airway potency must be assured and oxygen is administered on way to the hospital.

Injury due to chemicals can be limited by prolonged washing under running tap water. In electrical bums the current source is switched off. In case of cardiac arrest the victim is given cardiopulmonary resuscitation.

No household remedy or topical agent should be applied at the burned site otherwise the evaluation of depth of burn become difficult. The patient should be covered with a clean sheet and taken to the hospital.

Duration of burn (Tables 11 & 34): -

In the present study 53(33.8%) of patients reach the hospital within 10 hours and 68(43.3%) reach the hospital within 10-19 hours. The mean duration of burn is 13hrs. Among 81(51.6%) patients who reach the hospital before 13hours only 17(21%) died which is 32.7% of total death. Out of 76 cases who reach the hospital after 13 hours, 35(46.1%) died. The risk of death was 3.21 times more among patients with duration of burn>13hours as compared to the patients with percentage of burn ≤13 hour.

An observational study on burn patients regarding its various aetiologies was conducted by Khan TS et[49] in Kashmir in India during 2010-2011 and they concluded that 64.5% of patients reported within 24hrs to hospital. The lack of knowledge, ignorance and inadequate arrangement regarding transport along with the bad condition of the road may be responsible for delay in reaching the hospital. Interval of time that lapse between the accident and hospitalization is of paramount importance in burn victims. The finding in this series of study is similar to the other authors.

Urine output in 1st 24 hours (Tables 12 & 35): -

In the present series of study urinary output was measured by introducing an indwelling Foley's catheter in all cases and output chart was

maintained upto 24 hours. Urinary output less than 300 ml in 24 hours was termed oliguria. In total 66(42%) of normal urine output 7(10.6%) died whereas out of 91(58%) cases with abnormal urine output 45(49.5%) died. Thus, the risk of death was 8.24 times more among patients with abnormal urine output at 1st 24hours as compared to the patients with normal urine output at 1st 24 hours.

Zogovi CJ et al[47] (1996) in their study on acute renal insufficiency caused by bum injury observed that 75% of bum cases picture of early renal failure developed with oliguria immediately after infliction of the bums with rapid increase of serum urea and creatinine levels. In 25% of the patients, acute renal failure developed on 8lh day following infliction of bum. They observed that anuria was present in 34% of the patients and oliguria in 25% of cases. The factors influencing the renal function in bum patients are decreased cardiac output,respiratoryfailurewithhypoxiaandacidosis,toxaemiaandsepsis.

Head, neck and anterior trunk involvement (Tables 17, 18, 39 & 40): -

In the present study of 157 cases, 61(38.9%) has head and neck involvement, out of 31(50.8%) died. The risk of death was 3.69 times more among patients with head & neck involvement as compared to the patients without head & neck involvement. Among the total 157 cases, 104(66.2%) has anterior trunk involvement and 48(92.3%) died among total 52 deaths. The risk of death was 10.50 times more among patients with anterior trunk involvement as compared to the patients without anterior trunkinvolvement.

Burton KR et.al[54] in their study from 1994-2005 observed that the majority of patients were admitted with second-degree burns (48.7%) and burns of the head and neck were the most prevalent (22.2%).Head&neckand anteriorchestinvolvementleadstoinhalationalinjuryandrestrictioninnormal

respiration which has a high impact on mortality of the patients.

Hb% at the time of admission and after 48 hours (Tables 13, 14, 36 & 37): -

In the present study, at the time of admission 136(86.6%) has Hb% more than 10g%, out of which 42(30.9%) died. The risk of death was 2.03 times more among patients with level of Hb at admission ≤ 10gm% as compared to the patients with level of Hb at admission >10gm% but the risk was not significant. 81(51.6%) has Hb level more than 11g% is due to haemoconcentration following shock. After 48 hours among 135 cases, 91(67.4%) have Hb more than 10g%, out of which 15(16.5%) died. Only 41(30.4%) has Hb% more than 11g% after 48 hours of admission. The mean level of Hb at 48 hours after admission (mean±s.d.) of the patients was 10.49±2.00gm% with range 5.0– 15.0 gm%. It is mainly due to correction of hypovolemia. A few days after burn secondary anaemia occur and the patients shows less haemoglobin level.

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Cournand A et.al[58](1943) recorded less than 9.4 gm/dl haemoglobin level after 48 hours in their study in burn patients. Infection, toxaemia, haemorrhages from curling ulcer produced secondary anaemia. The importance of high protein diet, iron supplementation and late blood transfusion is definitely there.

Zogovi CJ et.al[47] (1996) observed that the genesis of burn disease associated anaemia is multifactorial and includes haemorrhage, haemolysis and decreased erythropoietin level.

Distribution of Sodium and Potassium level at the time of admission (Tables 15, 16, 38 & 39): -

In my study, out of 157 cases, 113(72%) presents with hypokalemia and 124(79%) presents with hyponatremia. Out of 52 deaths, 50(96.2%) has

abnormal serum sodium level and all 52(100%) has abnormal potassium levels.

, the risk of death was 7.81 times more among patients with abnormal level of Na at admission as compared to the patients with normal level of Na at admission. The proportion of patients who died due to abnormal level of K was significantly higher than those of the patients with normal level of K. Normal range of sodium in serum is between 137-147 mEq./litre and in the present series of study the serum sodium level in most of the cases is below the normal range. Normal serum potassium level varies from 3.5-5 mEq./litre and normal serum chloride level 95-105 mEq./litre. In the present series serum potassium and chloride level in most of the patients is nearly within normal limit. This is common for the patient to pass through a state of low serum sodium level in the initial phase of burn so initial resuscitation should be with a sodium containing solution like Ringer's lactate or normal saline but additional potassium is never required in first 24-48 hours because injured and burnt cells release potassium leading to normal to increased potassium level in most of the cases. Potassium may be occasionally required subsequently in diuretic phase (Demling, RH 1987[59]). The electrolyte estimation was done in very few numbers of cases in the present series and as such it is not of much significance.

Bacteriology at the time of admission and on day 6 (Tables 19, 20, 42 & 43): -

In this present study, 20 cases (12.7%) had positive bacteriology on day

1. Staphylococcus aureus topped the list with 18(11.5%) cases. In the bacteriology on day 6, 46(38.7%) was positive in total 119 cases. 35 patients died before day 6. Staphylococcus aureus again topped the list with 31(26.1%) followed by Pseudomonas pyocyaneus 8(6.7%). Escherichia coli and Proteus were found in 2(1.7%) and 5 (4.2%) cases respectively.

David J. Coleman[45] (2000) found that most commonly recovered organisms were various types of Staphylococcus.

In the present series of study the findings are similar to the above worker. Staphylococcus aureus is the permanent inhabitant in skin and is a natural contaminant of wound. Most of the burn wounds are infected before they reach the hospital or any antibiotics is started. But the rate of hospital acquired infection in the present series study is also significant. Every case of burn, whether clean or dirty has to be taken as contaminated in the strict sense. The development of infection is inherent in the very nature of burn injury as the main bacterial contamination comes from within the burnt skin and not so much from extraneous sources. These show the great need for the establishment of a separate burn unit because in general wards the cross infection, air borne contamination, droplet infection from attendants, doctors and nursing staff cannot be ruled out.

Surgical interventions (Tables 22 & 44): -

In the study of 157 cases, 94(59.9%) got surgical interventions like split thickness skin graft and debridement out of which 17(32.7%) died and 77(73.3%) discharged alive. The risk of death was 5.66 times more among patients without surgical intervention as compared to the patients with surgical intervention. Early debridement leads to removal of the infective foci and split thickness skin graft coverage of burnt area makes it less permeable to the bacterial invasion and early healing of the burn wound.

Distribution of duration of stay in hospital (Tables 23 & 24): -

In the present study among 105 patients discharged alive, Most of the patients (63.8%) were discharged within 6 weeks (≤42 days). Only 4.8% of the

patients were discharged within one week (<7 days). Among 52 deaths, 35(67.3%) died within 1 week. Majority of cases died within 72 hours with more than 60% total body surface area burn and received no or inadequate first aid.

Burton KR et.al[54] in their study from 1994-2005 observed that the mean length of hospital stay for burn patients was 20.4 days (range 1-312). Cases with extensive burn died early and cases survived from extensiveburnshasa longdurationofstayinthehospitalof>6weeksbecausehealingtakestime.

Distribution of outcome and cause of death (Tables 21 & 25): -

In the present study, 52(33.1%) died during treatment among total 157 cases. Most of the patients 35(67.3%) died due to hypovolemic shock followed by septicaemia 15(28.8%). Only 3.9% of the patients died due to anaemia and hypoproteinaemia. Most of the patients who died of hypovolemic shock had extensive burn usually more than 60% of body surface area and mostly died within 72hours. The elderly persons (60 years and above) died from shock even with comparatively less extensive burn. Delay in immediate transport of the patient to hospital and inadequate or no first aid immediately after burn seem to play an important role.

Tejerina C et al[34] (1992) in their study on mortality among burn patients over age 60 years found that the most common cause of death during first 24 hours was hypovolemic shock.

Batra AK[60] in their study from a total of 4042 medicolegal deaths reported at an Apex medical centre of a rural health district, over a period of 5 years 1997-2001, 942 deaths (23.3%) were due to burns; with mortality rate of

per year per 100,000 populations.

Shankar G et. al[53] studied in district hospital of north Karnataka on 240

burn patients and found that out of 240 burn patients admitted during the study period the overall mortality rate was 37.50%.

All burns are contaminated from external sources as well as from residents in the skin itself and its deeper layers i.e. hair follicles, sweat and sebaceous glands. They play major parts in ultimate production of sepsis. Burn wound provides a large, warm, moist and protein rich medium for growth of micro-organisms from the endogenous and exogenous sources. The patient is also more susceptible to infection due to depressed immune system. Septicemia in burns can also result by invasion of bacteria from the respiratory tract indwelling cannula, urinary tract and sometimes by transmigration of bacteria from gastrointestinal tract. The blisters should not be removed as removal of blisters usually lead to the formation of a fibrin film over the burnt area which is much better culture media than blister fluid rich in cholesterol and other tissuelipoids.

Still JM et al[44](1998) observed that incidence of sepsis increased with increasing number of central line days and increasing number of central line changes.

Yowler CJ et al[30] (1998) observed that earlier identification of nonsalvageable limbs and their amputation may decrease infectious complications and improve the chances of patient survival. The findingsinthe presentseriesaresimilartomostoftheaboveworkers.Theinfectionherealso seemstobedue to the same factors brought by contact with attending persons and cross infection. Thus, the need of a separateburnunitandisolationwardis greatly felt.

The findings in this series of study are not similar to those of other workers. The low mortality from chest infection in the present series may be due to tropical atmosphere in this part of country. In the presentseriesnocase

of death from suffocation was recorded.

The low figure of mortality in present series of study from anaemia and hypoprateinemia is due to the fact that we lose most patients with extensive burns due to shock and infection and very few patients are left to reach this stage.

The above mentioned complications are responsible for most of the deaths which occur in cases of burn. A significant decrease in the mortality of burn is only possible by a proper understanding and better management of these complications.

Up to the turn of the century the inevitable outcome of extensive burns was death within a matter of few hours or days. It was not until the beginning of Second World War that the need for fluid, plasma and electrolyte replacement was realized and once the principle was applied, a dramatic improvement in the results of treatment of the shock phase was obtained. A fall in mortality is one of the expected results of advancement in the treatment of severe illness. In the case of the burn, most of the reports suggest that mortality fall progressively until the mid-nineteen forties since then it has fallen little if at all but the survival time of patients who die from burns has increased significantly. Many patients with extensive burns who would formerly have died in the first 48 hours from shock today survive this phase of illness because of better understanding in the management of shock with blood transfusion, proper fluid and electrolyte balance, corticosteroids and other supportive treatments.

CONCLUSION

Burn injuries have been a major cause of concern since prehistoric days to the present era of modern medicine. However, the general belief that the burns usually occur at the two extremes of age, indicating the accidental nature of infliction does not hold true in the present Indian setup where the majorityofreportedcasesbelongstosecondorthirddecadeoflife.Moreover, aclearevidenceoffemale preponderance from a specific age group, locality, marital status etc., is enough to compel any reasonable person to think of bringingtheburnsoutofthepurviewofthe'householdaccidents'.Increase in age and percentage of burn is directly proportional to increase in mortality. If proper first aid given and patients should be transferred to hospital early with adequate fluid resuscitation and early surgical interventions like debridement andsplitthicknessskingraftingcanreducethehospitalstayandmortality.

SUMMARY

- This is a cross - sectional, prospective, observational study conducted at M. R. BANGUR HOSPITAL, TOLLYGUNGE, KOLKATA- 33 over 157 patients to study factors affecting mortality in burn patients from January 2014 to December 2015.
- Most of the burns are domestic 88.6% and 56.1%% of these occur in kitchen. Flame catching fire is the chief cause of burn (72%) in this part of country.
- Females (house-wives 54.1%) are the most common victims of burn, the male: female ratio being 1:2.01. The risk of death was 2.38 times more among females as compared to males.
- Most of the patients are Hindu 86% and comes from rural areas 81.5%.
- 47.1% patients come from the age group 19-39 years and female predominates in each group.
- Mortality increases with the increase in total body surface area burn, increase in age, degree of shock, type of first aid received, presence of infection, previous health of patient and degree of anaemia and hypoproteinaemia. Other factors remaining constant, mortality increased proportionately with the advancement of age and extent of burn.
- About 66.2% of cases reached this hospital after 10 hours of burn injury but 77.1% of cases reached within 20 hours of burn injury.
- 50.3% of cases developed oliguria and 7.6% cases anuria in 1st 48 hours due to burn shock.
- There is marked haemoconcentration in the 1st 48 hours followed by low haemoglobin contents and hypoproteinemia later on.

- Majority of cases brought here for admission received either no first aid or inadequate first aid and only 10.8% of cases got proper first aid which greatly influenced mortality.
- About 38.7% of patients got infection of the wound. Staphylococcus aureus is the most common contaminant (26.1%) followed by Pseudomonas pyocyaneus (6.7%). Other organisms isolated are E. coli and Proteus.
- Involvement of anterior trunk and head & neck has poor prognostic value regarding mortality in burn patients.
- Surgical interventions like early debridement and split thickness skin grafting has in reduction of hospital stay and mortality.
- Majority of patients have dyselectrolytemia at the time of admission.

- Shock and renal failure (67.3%) are the most common causes of death in burn cases in this hospital followed by septicaemia (28.8%). Chest infection, anaemia and hypoproteinemia are the next important causes of death.

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ANNEXURE

Fig 1: Blister formation in a second degree partial thickness burn

Fig 2: First & Second degree burn involving large surface area

Fig3: Third degree burn after debridement in a female patient

Fig 4: Fourth degree burn with involving muscles of dorsum of hand

Fig 5: First degree burn (scald)

Fig 6: Extensive superficial burn

Fig 7: Split thickness skin grafting in a patient with 2nd degree extensive burn

Fig 8: Electric burn with entry wound

Fig 9: Chemical burn due to accidental spillage of sulphuric acid

INFORMED CONSENTFORM

Subjectidentificationnumberforthistrial.....

Titleofthis Project:.....-

Name ofPrincipal Investigator..... Tel. No.....

I have received the information sheet on the above study and have read and / or understood the writteninformation.

I have been given the change to discuss the study and ask questions.

Iconsenttotakepartinthestudyand Iamawarethatmyparticipationisvoluntary. I

understandthat Imaywithdrawatanytimewithoutthisaffectingmyfuturecare.

Iunderstandthattheinformationcollectedaboutmefrommyparticipationinthisresearchand sectionsof anyofmymedicalnotesmaybelookedatbyresponsiblepersons(ethiccommittee members/regulatory authorities).I give access to these individuals to have access to my records.

I understand I will receive a copy of the patient information sheet and the informed consent form.

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Signature /Thumb impression of Subject Date ofSignature

Printed name of the subject in capitals

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Signature/Thumb impression of legally accepted representatives Date ofSignature

(The legally accepted representatives signature should be added if the subject is a minor or is unable to sign for themselves. The relationship between the subject and the legally accepted representatives should be

stated. The impartial witness signature should be added if the subject/ legally accepted representatives is unable to read or write and consent should be obtained in his presence.)

Printed name of legally accepted representatives in capitals

Relationship of legally accepted representatives to subject in capitals

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Signature of the person conducting the informed consent discussion Date of signature

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Printed name of the person conducting the informed consent discussion in capitals

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Signature of the impartial witness Date of signature

Printed name of the impartial witness in capitals

PATIENT INFORMATIONSHEET

TITLE OF STUDY—*Study of factors affecting mortality in burn patients above 18 years of age.*

- We have taken up this study to find the different factors affecting mortality in burn patients. The knowledge would help to diagnose the cause & complications of burn and introduction of appropriate management to reduce the mortality in burn patients.
- Your taking part in the study is purely voluntary. You have the right to withdraw your consent anytime in future without assigning there and this is not going to change the type of treatment you have been advised by your surgeon.
- The result of the study may not directly benefit you but it might lead to some knowledge which may be of some benefit to the future generation.
- The study is not going to contribute any financial or other benefits to the doctors and researchers involved with the study
- Their is no any monitory cost involved in participation.
- You can take comfort from the fact that all the information will be kept strictly confidential. In fact, even when they are published in medical literature the person concerned can never be identified.
- The information gained from the study will never be used as evidence or proof of anything now or in future in any legal other framework.
- I will be highly grateful if you kindly participate in the study.