



Assessment of burn patients complications and outcomes from Bihar region

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Abstract

Fire is boon for mankind when under control, becomes catastrophic when uncontrolled; the root of mightiest disasters mankind would have ever witnessed claiming innumerable lives. In cases of severe burns the mortality has rapidly decreased in last few decades. Still even today sepsis remains major cause of mortality in burn patients. All patients who are admitted in the burn ICU have reserved prognosis and are subjected to various complications. The survival rate is significantly impaired in elderly as compared to younger patients due to age associated immune dysfunction. Hence based on the above findings the current study was planned to evaluate the prognostic factors for prediction of complications and outcomes in burn patients.

The present study was planned in the Department of Plastic Surgery in Patna Medical College and Hospital, Patna, Bihar. Total 10 cases of the burns patients admitted to the hospital were enrolled in the present study. The patients with First and second degree burns, Total burns surface area of 40% - 90%, Admissions within 24 hours of incidence were evaluated for the present findings. Diet consisted of high protein with balanced carbohydrate and fat diet to provide high calorie diet. In the first 48 h no antibiotic was given for small area burns (<10% TBSA) For large area burns with inhalation burns-on admission intravenous antibiotics were given are Cefotaxim/amoxicillin-clavulanic acid Amikacin.

The data generated from the present study suggest that Poor outcome in burn patients was seen to be related to persistently low serum cholesterol, high serum triglyceride and presence of echinocytes, toxic granules, toxic vacuoles. Simple and easy to analyse prognostic factors will be greatly helpful for doctors, as well as valuable for experienced clinicians. In many parts of world where most of the burn victims belong to low socio economic status, these early mortality indicators based on routine investigations will prove to be cost effective as they can help the clinician to explain the course of disease within few days, and help relatives to take decisions regarding continuation or termination of treatment as per the prognosis and their financial circumstances.

Keywords: Burn, complication, outcome, cholesterol, etc

Introduction

Burns are a serious public health problem. A burn is defined as an injury to the skin or other organic tissue primarily caused by heat or due to radiation, radioactivity, electricity, friction or contact with chemicals. Heat burns occur when some or all of the different layers of cells in the skin are destroyed by a hot liquid (scald), a hot solid (contact burn) or a flame (flame burn). Skin injuries due to ultraviolet radiation, radioactivity, electricity or chemicals, as well as respiratory damage resulting from smoke inhalation, are also considered as burns. According to WHO estimates about 265 000 deaths occur each year from fires alone globally, with more deaths from scalds, electrical burns, and other forms of burns for which data are not available. The majority of these deaths occur in low- and middle-income countries, with almost half occur in the WHO South-East Asia Region^[1].

In India around 7 million people suffer from burn injuries each year with 1.4 lakh deaths and 2.4 lakh people suffer with disability. Burn death rates have been decreasing in high income countries. Females and males show similar rates for burns in contrast to other injury patterns where rates of injury are higher in males than females. The higher risk for females is associated with open fire cooking, or unsafe cook stoves, loose clothing. Self-directed or interpersonal violence is also a factor for burn injuries. Along with adult females, children are also vulnerable to

burns. Out of 5 burn victims 4 are women and children. Burns are the fifth most common cause of non-fatal childhood injuries and 11th leading cause of death of children aged 1-9 years. Among all people globally, infants have the highest death rates from burns.

Burns are also a leading cause of morbidity; millions who survive suffer from lifelong disability and disfigurements with resulting emotional trauma and stigma. Burns are preventable. Increased efforts in prevention and care would lead to significant reduction in burn-related morbidity, mortality and disability. The National Programme for Prevention, Management and Rehabilitation of Burn Injuries (NPPMRBI) is an initiative by the Directorate General of Health Services, Ministry of Health and Family Welfare, Government of India to strengthen the preventive, curative and rehabilitative services for burn victims.

Symptoms of burn depend on the depth of the burn. Burns can be divided into three types.

First degree or superficial burns involves the upper skin layer. They produce redness (erythema) and pain (tenderness). Blisters are absent. They are typically caused by exposure of the unprotected skin to solar radiation (sun burn) or to brief contact with hot substances, liquids or flash flames (scalds). First-degree burns heal within a week with no permanent changes in skin colour, texture, or thickness.

Second degree or partial thickness burns affect deeper skin layers. Symptoms are more severe and usually include blisters.

- Superficial second-degree burns take less than three weeks to heal.
- Deep second-degree burns take more than three weeks to close and are likely to form hypertrophic scars.

Third degree or full thickness burns involve all skin layers. Skin is white (appears cooked), and there may be no pain in the initial stages. Due to extensive destruction of the skin layers third-degree burn wounds cannot regenerate themselves without grafting [2].

A number of complications may occur, with infections being the most common. In order of frequency, potential complications include: pneumonia, cellulitis, urinary tract infections and respiratory failure. Risk factors for infection include: burns of more than 30% TBSA, full-thickness burns, extremes of age (young or old), or burns involving the legs or perineum. Pneumonia occurs particularly commonly in those with inhalation injuries [3].

Anemia secondary to full thickness burns of greater than 10% TBSA is common. Electrical burns may lead to compartment syndrome or rhabdomyolysis due to muscle breakdown. Blood clotting in the veins of the legs is estimated to occur in 6 to 25% of people. The hypermetabolic state that may persist for years after a major burn can result in a decrease in bone density and a loss of muscle mass. Keloids may form subsequent to a burn, particularly in those who are young and dark skinned. Following a burn, children may have significant psychological trauma and experience post-traumatic stress disorder. Scarring may also result in a disturbance in body image. In the developing world, significant burns may result in social isolation, extreme poverty and child abandonment [4].

Burns are a major cause of injury worldwide. The World Health Organization estimates that the lifetime incidence of severe burns is 1% [5], and that more than 300,000 people die annually from fire-related burns worldwide [6]. In addition, the prevalence of burns is significantly higher in developing countries than in developed ones. Due to damage to the skin and other organs, burns can lead to open wounds, disability, death, major economic consequences, severe emotional and psychological complications, and economic burden. Therefore, burn patients require not only acute primary treatment but also subsequent rehabilitation, reconstruction and long-term anti-scar therapy. Although more than 90% of all burns are preventable, burns remain common and are a major public health problem [7]. To further improve the effects of preventive measures, studies are needed to investigate the epidemiology, etiology and outcomes of burn patient populations.

Research in the field of burns has been translated to improved survival rates, decreased hospital length of stay, reduced morbidity and mortality rates due to the development of resuscitation protocol, infection control, early wound debridement, early enteral nutrition, respiratory support, and support of hypermetabolic responses.

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remains major cause of mortality in burn patients. All patients who are admitted in the burn ICU have reserved prognosis and are subjected to various complications. The survival rate is significantly impaired in elderly as compared to younger patients due to age associated immune dysfunction.

Hence based on the above findings the current study was planned to evaluate the prognostic factors for prediction of complications and outcomes in burn patients.

Methodology

The present study was planned in the Department of Plastic Surgery in Patna Medical College and Hospital, Patna, Bihar. Total 10 cases of the burns patients admitted to the hospital were enrolled in the present study. The patients with First and second degree burns, Total burns surface area of 40% - 90%, Admissions within 24 hours of incidence were evaluated for the present findings. Diet consisted of high protein with balanced carbohydrate and fat diet to provide high calorie diet. In the first 48 h no antibiotic was given for small area burns (<10% TBSA) for large area burns with inhalation burns-on admission intravenous antibiotics were given are Cefotaxim/amoxicillin-clavulanic acid Amikacin.

A detailed Proforma was prepared to collect data of all patients, case files were retrieved and entry was done into master chart. All the patients were informed consents. The aim and the objective of the present study were conveyed to them. Approval of the institutional ethical committee was taken prior to conduct of this study.

Following was the inclusion and exclusion criteria for the present study.

Inclusion Criteria: First and second degree burns, Total burns surface area of 40% - 90%, Admissions within 24 hours of incidence.

Exclusion Criteria: Patients referred >24 h post-burn injury, burns <40% or >90%, electrical and chemical burn injury patients and patients with pre-existing co-morbid conditions.

Results & Discussion

All the patients are admitted and treated as per above discussed protocols and daily blood Investigations are taken for the first seven days. The above parameters are selected on the Basis that they are simple standard investigations and obtaining samples are simple. Sample Size this study is 50 patients. Usually patients in a burn unit are monitored by simple basic Investigations.

It is observed from the present investigation that TLC was significantly higher in non-survivors than in survivors at the time of admission but not subsequently. No significant difference in values was noted for triglycerides (TG), echinocytes, toxic granules and toxic vacuoles. Infection or sepsis in patients correlated with presence of toxic granules, toxic vacuoles on peripheral smear, raised TLC and low values of cholesterol. Echinocytes (spiculated RBC) were seen in all patients. In four patients they persisted from post-burn day 4 until death. Progressive decrease in echinocytes which correlated with rising cholesterol values was seen in survivors.

Early surgical excision, wound debridement, and skin grafting have been recommended for patients with burns to decrease complications, infections, and hospital stay, although survival has not always been improved for these patients. The current database literature examining the risk

factors for morbidity and mortality after burns typically focuses on specific variables, such as age, gender, or socioeconomic status.

Bedri *et al.* demonstrated higher mortality rates after burn injuries associated with lower socioeconomic status, female gender, and African-American race [8]. Osler *et al.* used the database to create a logistic regression model that showed how age, burned surface area, and inhalation injury contributed to mortality. Based on this analysis, they proposed a revised Baux score to improve predictions of mortality after burn injuries [9].

In France, Vidal-Trecan *et al.* identified higher severity of burns from rural areas: there are usually produced outdoor, due to flames, explosions or open fire; in these report rural burns were more extensive, involving a larger TBSA, deeper and determined more deaths than urban burns [10]. In a Turkish study performed by Tarim MA., burns produced in rural areas were also deeper, larger, and causing more deaths than those from urban areas, probably due to the particularities of the rural population, including the delay of transportation to the burn units [11]. Mian *et al.* published a study on urban-rural dichotomy of burn patients from United States (data from Georgia and South Carolina) and highlight the socioeconomic disparities between the urban and rural population, with young urban population groups that live in poor socioeconomic status communities being at the higher risk. For the rural areas the access to medical facilities is more difficult and also the burn unit referral is delayed [12].

Morbidity and mortality risk depends on TBSA, in-creasing in a linear manner: the more extensive is the burn, the higher is the risk. Jeschke *et al.* established a critical threshold for morbidity and mortality after burn injuries at 40% TBSA burned for adult patients and 60% TBSA burned in paediatric patients, showing that patients with burns at or exceeding these cut-off values are at high risk for severe complications and death, even if they are treated in highly specialized burn centers. The same study has also taken into account the age of the patients and set a lower survival cut off at around 30% TBSA for elderly patients [13].

The standard of care is represented by the early excision and grafting of the full thickness burn wounds: early excision decrease infections risk, length of hospital stay and mortality (mortality is decrease when burns are not associated with inhalation injury); burn eschar excision is associated with increased need of blood transfusion [14].

Table 1: Demographic Data

Variable	No. of Cases
Age	28 – 58 years
Gender	
Male	4
Female	6
Alcohol	2
Smoker	3
Comorbidities:	
CHF	2
Diabetes	4
Hypertension	3
Psychiatric illness	2
Obesity	4
Respiratory disease	3

Table 2: Clinical Data

Variable	No. of Cases
Burn type,	
Fire/flame	3
Scald	1
Contact with hot object	2
Electrical	3
Chemical	1
Inhalation injury	4
Intubation,	6

Table 3: Multi-organ system failure

Multi-organ system failure	No. of Cases
Burn shock	4
Cardiovascular failure	3

Table 4: Cholesterol Sampling Timing

Cholesterol Sampling Timing	mg/dL
Cholesterol on admission	142 ± 39
Cholesterol after 24 hrs	121 ± 28
Cholesterol after 48 hrs	106 ± 31
Cholesterol after 5 days	81 ± 24
Cholesterol after 7 days	68 ± 11

The degree of metabolic changes experienced by burn patients is directly related to the extent of injury. In large burn injuries, cortisol, glucagon and catecholamines are markedly elevated [15]. Cortisol is strongly catabolic and is associated with negative nitrogen and calcium balance, loss of tissue protein and bone mineral. It also stimulates gluconeogenesis, increases proteolysis and sensitizes adipocytes to the action of lipolytic hormones. Catecholamines increase the rate of glycogenolysis, hepatic gluconeogenesis, promote lipolysis and peripheral insulin resistance [16]. These changes lead to release of amino acids from muscles and lipolysis of adipose TG leading to the release of fatty acids into the plasma. The free fatty acids can be used directly by most peripheral tissues for their energy requirements [17]. In burn patients, fat oxidation is increased to obtain endogenous energy substrates. In addition to that, there is increased recycling of fatty acids that leads to increase in triglyceride plasma level.

Cholesterol is an inevitable component of almost all phospholipid membranes in the human organism. It occurs in both the free and ester form of cholesterol and fatty acids. Dunham *et al.* in their study demonstrated that patients with severe trauma had a sudden reduction in total serum cholesterol concentration [18]. Hypocholesterolemia has been found in patients undergoing surgical interventions [19]. and in those with multiple organ dysfunction syndrome [20]. and burns [21]. Fraunberger *et al.* demonstrated a relationship between hypocholesterolemia and several disease states, as well as organ dysfunction. In patients with multiple organ dysfunction syndromes plasma cholesterol below 100 mg/dl was associated with increased mortality (P < 0.05). A decrease in plasma cholesterol was also associated with increased circulating levels of tumor necrosis factor [22].

Because human longevity has been enhanced in recent years, patients should be given every opportunity to recover from a thermal injury with as few disabilities as possible. The health care, legal, and social aspects of the following

paradigms should be studied further. Optimal and safe living environments for a growing older population are necessary for injury prevention.

Conclusion

The data generated from the present study suggest that Poor outcome in burn patients was seen to be related to persistently low serum cholesterol, high serum triglyceride and presence of echinocytes, toxic granules, toxic vacuoles. Simple and easy to analyse prognostic factors will be greatly helpful for doctors, as well as valuable for experienced clinicians. In many parts of world where most of the burn victims belong to low socio economic status, these early mortality indicators based on routine investigations will prove to be cost effective as they can help the clinician to explain the course of disease within few days, and help relatives to take decisions regarding continuation or termination of treatment as per the prognosis and their financial circumstances.

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