

To Compare the Rate of Mortality among Fire Burn Inhalational and Non Inhalational injuries in admitted Patients at Burns Centre Civil Hospital Karachi

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ABSTRACT

Objective: To compare the rate of mortality in fire burn inhalational and non inhalational injuries.

Study Design: Retrospective, comparative study.

Place and Duration of Study: The study was conducted at Burns centre, Civil Hospital, Karachi from January 2009 to December 2010.

Materials and Methods: The study was conducted on admitted patients at Burns centre, Civil Hospital, Karachi. All male young male patients aged 20 to 40 years admitted in Burns ward (Civil Hospital, Karachi) suffering with fire burn inhalation or fire burn non inhalation injuries with burnt surface area between 20% - 50% were included in this study. Patients were followed until discharged or death.

Results: Out of total 300 male, 150 in each group having age between 20 and 40 years with 20% to 50% of burnt surface area and had sustained severe burn injuries admitted to Burn centre were included in the study. Of these, patients with fire burns inhalational injuries were at high incidence of mortality rate i.e. 66/150(44%) as compared to non inhalational injuries i.e. 42/150(28%)($P < 0.05$).

Conclusion: We conclude that patients with fire burn inhalation injuries are at increased risk of death, because in addition to severe cutaneous burns it also causes acute inflammation and damage of the respiratory system.

Key Words: Inhalational injury, smoke inhalation, fire burn.

INTRODUCTION

Fire burn inhalation injury is defined as an acute damage of the respiratory tract caused by inhalation of smoke, hot gases and steam in a closed space. The diagnosis of inhalation injury is confirmed by the presence of mucosal erythema, edema, or ulceration and submucosal hemorrhage found on bronchoscopy normally performed within first 24 hours after burns¹. Inhalation injury represents the major cause of death from burns and has a much greater influence on mortality than age or the extent of burned body surface. In burn centers, in fact most cause of death is respiratory failure. Acute upper airway obstruction occurs in 20–30% of hospitalized burn victims with inhalation injury². Previous studies have reported that in comparison to cutaneous injuries, inhalation injuries cause cardiopulmonary distress and are associated with high mortality rate^{3,4,5}.

In another study, it was reported that patients suffered with thermal burn association with severe inhalation injury have damage tracheobronchial mucosa and urgent intubation also places them on high incidence of bacterial bronchial contamination. Intubation into this damaged mucosa provides an entry portal for bacterial⁶. In smoke inhalation injury, respiratory dysfunction is caused by number of factors, among which acute

respiratory distress syndrome (ARDS) and inhalation injury are most important⁷.

Therefore this retrospective study was done to determine and compare the mortality rate in fire burn inhalation injuries and non inhalation injuries in our set up so that proper management system for it could be developed.

MATERIALS AND METHODS

According to our objective of the study, we have selected files of 300 patients out of which 150 of those patients suffering with inhalational injury and 150 with non inhalational injuries. All these patients were adult male, aged 20-40 years, had sustained severe burn injuries with 20 to 50 % of burnt surface area and treated in BURNS CENTRE, KARACHI from January 2009 - December 2010. Only male patients' record was selected because only they were in domain of the Principle Investigator. Data were collected on a proforma for each patient from records. The proforma have the variables like name, age, percentage of burn, etc. All inhalational injuries were diagnosed by immediate laryngoscopic examination as it is the most rapid and least complicated diagnostic too. It reveals airway abnormalities including a large amount of soot in the respiratory tract.

Treatment of inhalation injury begins with initial assessment of airway. If patient presents with stridor, respiratory distress, deep burns of face and neck then the patient was intubated with adequate sized of endotracheal tube, and humidified oxygen was administered. His head was elevated and he was shifted to the intensive care unit of the hospital. If stridor, respiratory distress or deep burns was absent then laryngoscopy was done to look for airway injury and presence of edema. If the edema is present, then the patient was intubated early and shifted to the ICU of the hospital. However, if modest erythema was present but upper airway edema was absent, the patient was followed closely and laryngoscopy was done after every four hours.

RESULTS

Out of 300 young males patients, fulfilling the inclusion criteria, 150 were suffering with inhalational injury where as equivalent number of patients (150) was suffering with non inhalational injuries. Mean age of the patients was 27.3 ± 3.2 . Gold standard treatment

was provided to both the groups. All the patients of both groups were followed till their discharge or death. Out of 150 patients suffering with inhalational injury 84 (56%) were discharge on full recovery from their injuries whereas 66 i.e., 44 % were died. However in other group of non inhalational injury 108 (72%) were survived and discharge from the hospital on full recovery. In this group only 42 patients i.e., 28% were died. For further convenience we divide the patients in two age groups 20 to 30 years and 31 to 40 years. The mortality was much higher in patients with fire burn inhalation with age group 31-40 (49%) as compared to non inhalation (22%). The mortality was found statistically significant in patients with fire burn inhalation injury as compared to non inhalational injuries in both the age groups (chi square test $P < 0.05$). (Table I)

The data was further break up in year wise. In both the years, the patients suffered with inhalation injury were more deaths as compared to non-inhalation injuries. (Graph I).

Table No.1: Comparison of mortality in inhalational and non-inhalational injury

Age of Patients (years)	Inhalational Injury			Non Inhalational Injury		
	Total patients	Expired	Discharged	Total patients	Expired	Discharged
20-30	97	40(41.0%)	57(59%)	105	32(30.0%)	73(70%)
31-40	53	26(49.0%)	27(51%)	45	10(22.0%)	35(78%)
Total no .of patients	150	66(44.0%)	84(56%)	150	42(28.0%)	108(72%)

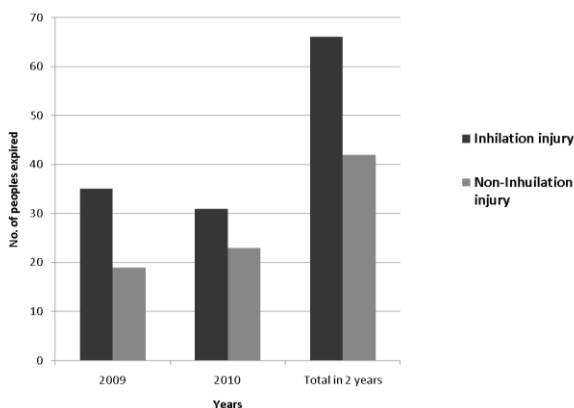


Figure: Mortality rate among inhalation vs non-inhalation fire burns

DISCUSSION

According to our study, we have determined how inhalation injury influences the outcome after burn injury. Additionally, the current study estimates, in a quantitative manner, the increase in patient mortality in inhalation injury. Our data indicate that the effects of inhalation injury are detrimental to patient survival, thus confirming the findings of previous studies.

In laboratory models of inhalation injury, Zawacki⁸ and others⁹ found that severity of inhalation injury was a

function of both the size of burn and the amount of smoke inhaled, and within limits carboxyhaemoglobin levels were proportional to severity of injury.

Klosova¹⁰ analyze data of 67 fire burn elderly patients out of which only 6% of patients had inhalation injuries; and found a high mortality rate of 75% in patients with inhalation injuries¹⁰. This is similar to our study results which showed that patients with inhalation injuries have a mortality rate “two” times that of patients without inhalation injury and emphasizes its contribution to mortality. On the other hand, as reported, the depth of severe burns, did not affect mortality significantly, although it was previously believed in patients with large burns¹¹.

According to Stollery, few clinical indices exist as yet that allow quantitative analysis of the magnitude of pulmonary injury after smoke inhalation. Early identification and quantification of the magnitude of injury in their inhalation injured patients would allow identification of those patients who develop increased dead space ventilation, prolonged requirements for mechanical ventilation, and were at risk of developing chronic pulmonary insufficiency, physiologic abnormalities that were documented in a sub segment of their inhalation-injured burn patients

In another study conducted by Lumenta concluded about 16% of all admissions with burns were ≥ 65 years of age, with a mortality rate of 30.6% (81/265). Only

gender and premorbid conditions did not influence mortality. Among survivors (184/265), the median duration of hospital stay was 26 days. Factors contributing to a significantly increased length of stay were, in decreasing order, total body surface area burned, high levels of burn scores, inhalation trauma, flame injury and certain premorbid conditions (cardiovascular disease, alcoholism)¹³. In our study the major cause of mortality among burn patients of age 20 to 40 years with burnt surface area between 20-50%, is due to inhalational injury (44%); whereas in the same age group and with the same burnt surface area with non-inhalation injury mortality rate was just (28%).

Inhalation injury, in addition to inflicting structural damage on the respiratory tract epithelium, impairs surfactant production and mucociliary transport and produces atelectasis¹⁴. Inhalation injury also impairs pulmonary macrophage function. The net result of these pulmonary changes, combine with global immune-suppression of burns¹⁵, is the development of respiratory tract infection. In patients with inhalation injury, early pneumonia was more common than in those patients without inhalation injury; in patients with inhalation injury, 69% of pneumonias occurred within the first post burn week, whereas 38% occurred in patients without inhalation injury¹⁶.

A prospective study in year 2009, evaluated that out of 31 patients with inhalational injury, the mortality rate is 45.2% (14 died) and in 27 patients without inhalational injury, mortality rate is 16.7% (4 died)¹⁷. These results are in accordance with our study results.

CONCLUSION

We conclude that inhalational injuries increase the mortality rate significantly; patients with inhalation injuries are also likely to sustain severe complications, which can also cause death. In the patients in the midrange of severity of injury due to burn, the complications of inhalational trauma may make a sublethal injury lethal, and it is in these patients that better management may improve survival.

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