

# Frequency of Chemical Burn and Mortality Rate in Admitted Patients at a Tertiary Care Hospital of Karachi

1. Ehmer-al-Ibran 2. Masood Hussain Rao 3. Maria Khan 4. Iqra Yasin

1. Asstt. Prof: In charge Burns Centre, CH&DUHS, Karachi 2. Principal Research Officer, PMRC Research Centre, DMC, Karachi 3. House Officer, Civil Hospital, Karachi 4. Student, DMC, DUHS, Karachi.

## ABSTRACT

**Background:** Developing countries have a high incidence of burn injuries creating a fear or respect public health problem. Acid assault is one of the most savagely violent of crime which aims to punish the victim or to destroy the victim's social life. This violent usually occurs in third world countries like Pakistan, Bangladesh, and Iran etc. In Pakistan 7 to 17 burn admissions annually recorded during the study period.

**Objectives:** To assess the epidemiological factors in terms of incidence morbidity and mortality and the effect of social and cultural issues associated with the chemical burns.

**Study Design:** A cross sectional retrospective

**Place and Duration of Study:** This study was conducted in burns ward of Civil Hospital Karachi from May 2004 to Oct 2010.

**Materials and Methods:** All the patients were identified the etiology and the extent of damage that was produced as a result of throwing corrosive chemicals.

**Results:** Overall 127 patients record were included in study. It was more commonly found in younger age group i.e. 21 -30 years. The incidence was much more in males (74.0 %) as well as stratified by age. Majority of the patients (90.6%) were burn with Accidental. Moreover, the patients who had 3RD degree burn (41.9%) that leads to more mortality in our circumstances. Septicemia was the leading cause of death. The burn injury was significantly associated with degree of burn, depth, extent and mode of injury. The most common incidence found was accidental followed by assault.

**Conclusion:** Lack of information about the catastrophic outcome of this action plus the wide spread availability of strong destructive chemicals are the main reasons for the rising incidence of this crime. The majority of deep burns were on homicidal. So measure should be taken to generate awareness for protective measures, immediate first aid, proper professional treatment, restriction in availability of acid, implementation in the existing law regarding the bail of accused etc to prevent these accidents and ensure safety.

**Key Words:** Acid violence, Chemical burn, Epidemiology of burn.

## INTRODUCTION

Burn damages skin and underlying tissues, caused by heat, chemical or electricity. However thermal burn is generally the most common type of burn and result from exposures to or contact with steam, flames and hot surface or hot liquid with a temperature above boiling point. A chemical burns occurs when living tissues is exposed to a corrosive chemical substance. Many house hold goods contain chemicals which are useful when handled in a proper way, but can cause serious damage when accidents happen; different types of chemicals are available in the market. Sulphuric acid is commonly used at home for cleanliness, automobile battery fluid and fertilizer etc. Other forms of acids are hydrochloric acid, phosphoric acid, mono chloratic acid, tri-chloratic acid, di-chloratic acid, carbolic acid etc. These substances are very irritating to the skin and if remain in contact for prolonged period can be absorbed through skin to produce systemic toxicity<sup>1</sup>.

Chemical burns results from contact of the skin or by ingestion of chemical. Worldwide corrosive substances

are frequently used for chemical assault. The most common substances used are lye and sulphuric acid. According to a study, conducted in 2008 in USA<sup>2</sup>, exposure to acids and acid containing products and chemicals resulted in ten (10) deaths, eighty three (83) cases of major toxicity and 1788 cases of moderate toxicity. Exposure to alkali products and chemical resulted in nine (9) deaths, one hundred and sixty eight (168) cases of major toxicity and 2684 cases of moderate toxicity. Exposure to per oxide resulted in no death, nine (9) cases of major toxicity and one hundred and fifty four (154) cases of moderate toxicity. Exposure to bleaches and hypochlorite containing products resulted in two (2) deaths, forty three (43) cases of major toxicity and 2016 cases of moderate toxicity. Exposure to phenol containing product usually results in no death; two (2) cases of major toxicity and seventy (70) cases of moderate toxicity were reported. In Asian countries, especially in India and Pakistan, the motive of this act is usually marital affairs including marriage problems, extra marital affairs and divorce.

Poverty in low socioeconomic class is a common reason for which acid assaults are committed<sup>3-7</sup>. The rational of this study is to perform statistical analysis and to identify the etiology of this crime and determine ways of preventing such very severe and serious acts.

## MATERIALS AND METHODS

**Study design:** Cross sectional retrospective study.

**Study duration:** Oct 2011 to Dec 2012.

**Study setting:** Records of all admitted patients with chemical burn in Burns Centre of Civil Hospital, Karachi.

**Data collection and data analysis procedure:** All the records of admitted chemical burn patients of burn centre of civil hospital Karachi from May 2004 to Oct 2010 was reviewed to assess the incidence of acid burns related to chemical assaults. A performa was used to collect the information having socioeconomic data (like name, age, sex, marital status) characteristics of the illegal action, cause of burn and percentage of body surface areas. The data thus collected was entered in computer and analysis in the SPS version 16 .0. Frequency and percentages were determined for qualitative variables whereas mean and S.D was calculated from quantitative variables.

## RESULTS

Overall 127 patients were included in the study, out of which 94 (74%) were males and 33 (26%) were females. Majority of the patients (70.9%) were single (bachelor). Out of 94 males, 47 i.e. 50% were single as compared to 7/33 i.e. 21% females. It was statistically significant at  $P < 0.05$ . The mean age was  $20 \pm 7.3$  (Ranges 50 i.e. 1-50). Half of the female patients were attacked by their husbands or relative whereas rest by their lovers refusing from marriage. In male cases 22% were attacked by their wives, 14% by strangers and 14% dimp a quarrel (Table 1).

The mean hospitalization period was  $37.0 \pm 9.2$  days. Out of 127 cases 82(64.6%) patients had 10-20% body surface area burned. (Table 2).

Facial involvement was common and it was observed in 76.8% of the cases .The upper limbs, the trunk and the lower limbs were involved 82.4%, 61.7% and 32.2% of the cases respectfully. The patients who underwent surgery for debridement or reconstruction were 82.8%for four surgical procedures and 76.0 for five surgical procedures. In 90.6% cases, the cause of burn was accidental, and rest assault 9.4%. (Table 3).

The common victim is at the age range between 21-30 years (48.4%) followed by 11-20 years (22.6%). Most of cases falls in 3rd degree burn (41.9%) followed by 30.6 % in 2nd degree and 27.50 % in 1st degree (Table 4).

The highest frequency of cases was recorded in 2007 followed by in 2010 whereas the lowest was recorded in 2006 and 2008. The highest frequency of burn was recorded in superficial burn (53 cases i.e. 41.9%), followed by partial thickness (39 cases i.e. 30.6%) and full thickness (35 cases i.e. 27.5%). The mortality was record in 2 cases due to severe injuries (3.3%).

**Table No.1: Socio demographic data of the patients**

|                                             |    |       |
|---------------------------------------------|----|-------|
| SEX                                         |    |       |
| (a)Male                                     | 94 | 74.0% |
| (b)Female                                   | 33 | 26.0% |
| MARITAL STATUS                              |    |       |
| (a)Single                                   | 90 | 70.9% |
| (b)Married                                  | 37 | 29.1% |
| CHARACTERISTICS OF ILLEGAL ACTION CAUSED BY |    |       |
| (a)Unknown or lover                         | 38 | 29.9% |
| (b)Accidental                               | 60 | 47.2% |
| (c)Spouse                                   | 10 | 7.9%  |
| (d)Family maybe                             | 12 | 9.5%  |
| (e)quarrel                                  | 7  | 5.5%  |

**Table No.2: Sex v/s percentage of body surface area burned**

| Sex    | Up to 10% | 11-20% | 21-30%<br>31-40% | 40+    | Total |      |
|--------|-----------|--------|------------------|--------|-------|------|
| Male   | 28        | 32     | 12               | 12     | 10    | 94   |
| Female | 10        | 12     | 4                | 3      | 4     | 33   |
| Total  | 38        | 44     | 16               | 15     | 14    | 127  |
| %      | 30.90%    | 34.60% | 12.60%           | 11.80% | 11%   | 100% |

**Table No.3: Year wise cause of burn**

| Year    | Accidental | Assault | Total |
|---------|------------|---------|-------|
| 2005    | 6          | 2       | 8     |
| 2006    | 13         | 4       | 17    |
| 2007    | 16         | 0       | 16    |
| 2008    | 24         | 1       | 25    |
| 2009    | 17         | 3       | 20    |
| 2010    | 39         | 2       | 41    |
| Total   | 115        | 12      | 127   |
| Percent | 90.60%     | 9.40%   | 100%  |

**Table No.4: Types of burn**

|            |        |
|------------|--------|
| 1st degree | 27.50% |
| 2nd degree | 30.60% |
| 3rd degree | 41.90% |
| Total      | 100%   |

## DISCUSSION

Compared to the industrial world, Pakistan and neighboring third-world countries like Iran, Bangladesh, and India have a high incidence of acid burn violence. The actual incidence in Karachi, Pakistan is likely to be much higher than that registered at the Burn Centre Civil Hospital Karachi, Sindh, Pakistan. This is due to a minor trauma that may not be referred to a major burn Centre or referral may be to other specialist, such as ophthalmology in cases of eye injury. As acid assaults generally occur in the depressed socioeconomic areas of smaller cities, victims may receive medical care at their local clinics.

In a worldwide glance, Mannan<sup>8</sup> reported the largest study of acid violence (771 cases). After reviewing the worldwide literature, they found that, over the last 40 years, Jamaica, Bangladesh and Taiwan were among the areas with the highest incidence of acid assault in the world. Male victims were more common in Jamaica, while in Bangladesh and Taiwan females were the predominant victims. The youngest victims were found in Bangladesh. In other study from china<sup>9</sup> reported 337 cases, of which 40 (10.5%) were due to criminal assault, the rest being related to industrial accidents. In Azerbaijan<sup>10</sup> a province in northern Iran 121 cases of chemical injury with multiple etiologies were reported in 2008. In this study 111 cases (91.7%) were accidental, 10 cases (8.3%) were classed as criminal assault. In our study, out of 127 cases 115(90.6%) were accidental while 12(9.4%) cases were assault. The frequency of this act is increasing in developing countries such as Iran, and in some industrial cities e.g. Hong Kong<sup>11,12</sup>. The usual scenario of acid violence in most third world countries and surprisingly in some developed ones is one in which the victims spouse uses concentrated sulfuric acid to gain revenge for an unsuccessful marriage or relationship provoked by social or economic reasons<sup>13</sup>. The victims will suffer severe facial disfiguration and isolate themselves from social activities for the rest of their lives. Chemicals such as sulphuric acid from batteries or sodium hydroxide obtained from cleaning supplies are an affordable means of assault among lower socioeconomic groups<sup>14</sup>.

The high increasing incidence of acid attacks, which are frequently reported in the daily newspaper in Pakistan, is a call for medical and social authorities to search for solutions to prevent such violence acts and to identify strategies for keeping strong caustic agents out of the reach of ordinary people. Two easy ways would be to stop the crime through manufacturing wet car batteries and to make plumbing agents available only to professionals.

## CONCLUSION

The cases of chemical burn are on increasing side. To prevent it, limiting the use of acid in vehicle battery or identifying the gold by the general population by reducing their availability might help to reduce the incidence of the catastrophic crime of acid burn violence. Investigation of the cultural and social reasons behind this crime should be the main strategy for its elimination or reduction. Discussing this crime and its terrible outcomes publically may have prevention

effects and may even give ideas to people who are seeking a way to exact revenge.

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### Address for Corresponding Author:

#### Dr. Ehmer al Ibran

Assistant Professor, Incharge Burns centre  
Civil Hospital, Karachi.  
Email: dr.ehmer@yahoo.com  
Cell no: 03332262820.