

BURNS FROM A STOVE BURST: ANALYSIS OF 34 CASES

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SUMMARY. Burns continue to be a major environmental factor responsible for significant morbidity and mortality in developing countries and, in particular, burns due to stove bursts are a major problem. Two types of stoves are available in Pakistan: gas stoves and kerosene stoves. The state is considered of patients burned by stove bursts in general, and also with specific reference to 34 adult patients admitted with stove burns to our hospital in Pakistan. Various treatment options were used, and the patients' treatment and outcome are reported. The continued commercialization of such stoves, and especially of the gas stove, is a cause of serious and permanent consequences that represent a danger for the population. Proper care should be observed when handling them because, as always, prevention is better than cure.

Introduction

Burns are among the most devastating of all injuries, with outcomes spanning the spectrum from physical impairments and disabilities to emotional and mental consequences.¹ Most burns are caused by thermal energy, including scalding and fires, the majority being due to exposure to chemicals, electricity, ultraviolet radiation, and ionizing radiation. Globally, fire-related burns are responsible for about 265,000 deaths annually.² Over 90% of fatal fire-related burns occur in developing countries, with south-east Asia alone accounting for over half of these fire-related deaths.² Hospitals which treat burn patients have reported a great number of burns in people using kerosene stoves.^{3,4}

The principle aim of this study was to describe the state of patients burned by stove burst.

Materials and methods

This study was carried out in the Department of Plastic Surgery, Pakistan Institute of Medical Sciences, Islamabad, Pakistan, from January 2002 to December 2003. Adult patients of either sex above the age of 12 years were included. Patients below the age of 12 years were excluded as they were managed at the Children's Hospital, Pakistan Institute of Medical Sciences. Patients were included in the study only if they had a clear history of burns from stove bursts and were admitted to hospital. Patients with burns from all other causes were excluded.

Management started with the standard protocol for airways, breathing, and circulation. All the patients were resuscitated. They were daily washed and dressed, using 2%

silver sulphadiazine cream. The patients underwent various surgical treatments including fasciotomy, split-thickness skin grafting (STSG), full-thickness skin grafting (FTSG), flap coverage, etc. Patients with superficial burns were managed conservatively.

Results

A total of 34 patients (3 males, 31 females) were admitted with stove burns. The average age of the females was 25.9 yrs and of the males 29 years (range, 14-40 yr). The majority of the patients (58.8%) belonged to the younger age group (21-30 yr). Most of the patients were housewives (73.5%) (*Table I*); 61.8% of the patients were unmarried, against 38.2% married. The patients had an average of 36.0% total burn surface area. The abdomen and lower limb were the most affected areas (29.4%), followed by the upper limb (26.5%) and chest (23.5%). Inhalation injury was observed in 14.7% of the patients. The average hospital stay was 21.8 days (range, 18-43 days). Various treatment options were used, including fasciotomy (20.6%), STSG (76.5%), FTSG (5.9%), flap coverage

Table I - Occupation of patients

Occupation	Number
Housewives	25
Labourers	2
Dependants	4
Farmers	2
Carpenters	1
Total	34

Table II - Treatment options

Treatment	Number of patients	
	Male	Female
Fasciotomy	1	6
Split-thickness skin graft	1	25
Full-thickness skin graft	-	2
Flap coverage	1	1
Tracheostomy	-	3
Conservative treatment	1	4

(5.9%), and tracheostomy (8.8%) (Table II). Conservative treatment alone was opted for in 14.7% patients. Wound infection was observed in 5.9% of cases and partial loss of skin graft in 8.8%. Three patients died (8.8%), all females (Fig. 1).

Discussion

Burns continue to be a major environmental factor responsible for significant morbidity and mortality in developing countries. Burns due to stove bursts were a major finding reported in other studies.³⁻⁷

Two types of stoves are available in Pakistan: gas stoves

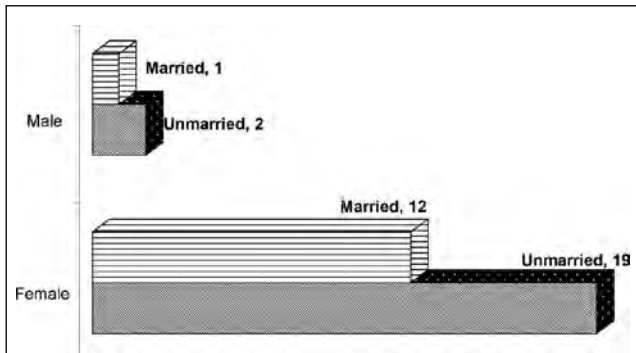


Fig. 1 - Patients' marital status.

and kerosene stoves. Gas stoves mostly contain liquid petroleum gas (LPG) (Fig. 2). Two types of kerosene stoves are available: domestic and commercial (Figs. 3, 4). Commercial kerosene stoves are rapidly being replaced with gas stoves as they are more economical and also because of the increase in outdoor activities linked to the development of leisure and free time. In our study kerosene was the flammable liquid used in the stoves.

Stoves used for domestic purposes consist of a base which contains kerosene. Multiple cotton thread wicks extend from the base to the upper chamber. An outside second chamber is used to protect the flames from the air. The exact mechanism of stove burst is not known, but it is thought that some of the kerosene in the lower chamber is converted into gaseous form, which suddenly escapes and catches fire, resulting in stove burst. The stove used for commercial purposes consists of a chamber in which air is pumped into kerosene in order to make the gaseous form.

When such stoves burst, it is mostly the front parts of body that are involved (face, neck, front of chest, legs, arms, and hands). The lower abdomen and upper thighs are spared initial injury, but when the person stands up the hot flammable liquid may flow down and involve the lower abdomen and upper thighs (Fig. 5). The back is usually spared.

The background history of the burn is of utmost importance in such cases and may help in medico-legal aspects. If only the front parts of the body are involved, it may be a case of accidental stove burst. But if the back parts or the whole body are affected, it may be a case of attempted homicide.

Careful handling of the stoves is of utmost importance and is key to preventing an injury. Nearly all the burn patients in this study belonged to a low socio-economic category and they did not observe the necessary precautions when handling or using the stoves.

In a study conducted in a burns unit in Pakistan,⁶ 41% of the patients had flame burns. Similarly, in another study



Fig. 2 - Gas stove.



Fig. 3 - Domestic kerosene stove.



Fig. 4 - Commercial kerosene stove.



Fig. 5 - Initial injury by stove burst.

by Mabrouk et al.,³ 40% of 759 patients had burns due to stove burst. The percentage of stove bursts was even higher (52%) in a study conducted in Karachi, Pakistan.⁴

Surprisingly, 91% of the patients in our study were female, and the mean age was 36.0 yr - 73.5% of the patients were housewives. These findings are much higher than those of studies conducted in Pakistan.^{4,6}

The mortality in our study was 8.8%, which is much less than the 29.7% found by Khan et al.⁶ The average total burned surface area in our study was 35.6% - it was much less (11-20%) in Khan's study.⁶

RÉSUMÉ. Les brûlures continuent à être un facteur environnemental important responsable d'une morbidité et d'une mortalité significative dans les pays en voie de développement et, en particulier, les brûlures causées par l'explosion d'un poêle constituent un grave problème. Au Pakistan deux types de poêle sont disponibles : les poêles à gaz et les poêles à kérosène. Les Auteurs considèrent la condition des patients brûlés à cause des explosions de poêle en général et, en particulier, ils présentent les données de 34 patients adultes hospitalisés dans leur hôpital au Pakistan. Ils ont fait recours à diverses options thérapeutiques, que les Auteurs décrivent avec les résultats finaux. La continuation de la commercialisation de ces types de poêle, et en particulier du poêle à gaz, provoque des conséquences graves et permanentes qui constituent un danger pour la population. Il faut exercer la correcte attention dans leur maniement parce que, comme toujours, mieux vaut prévenir que guérir.

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This type of burn has already been described in the literature. In 1985, Saxby et al. published a series of 31 patients burned in similar conditions, with one death.⁸ Similarly, Richards et al. expressed concern about the persistence and frequency of this type of burn.⁹

These stoves are dangerous products. However, accidents are usually due to the fact that the victims do not follow the instructions and do not observe the necessary precautions. In some cases, the stoves were refilled while still burning, a strictly forbidden practice. Also, the companies that make these stoves do not always observe the due precautions and safety check-ups. These stoves provide a very cheap alternative to electric stoves, especially in low socio-economic groups.

The continued commercialization of this kind of stove, and especially the gas stove, is causing serious and permanent consequences that represent a danger for the population. All burns centres confronted with this type of burn should pass the information on to the public authorities so that the government in each country can take the appropriate measures.

Conclusion

Proper care should be observed in handling gas and kerosene stoves. Prevention is always better than cure. Injuries due to stove burst are long-lasting and, more often than not, preventable.

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