This is the 11th in a series of 12 articles

ABC of burns

Burns in the developing world and burn disasters

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Burns in the developing world

Developing countries have a high incidence of burn injuries, creating a formidable public health problem. High population density, illiteracy, and poverty are the main demographic factors associated with a high risk of burn injury. The exact number of burns is difficult to determine: judicious extrapolation suggests that India, with a population of over 1 billion, has 700 000 to 800 000 burn admissions annually. The high incidence makes burns an endemic health hazard. Social, economic, and cultural factors interact to complicate the management, reporting, and prevention of burns.

Epidemiology

The epidemiology of burn injuries is different from that in the developed world. Most burn injuries are sustained by women aged 16-35 years. Women of this age group tend to be engaged in cooking, and most work at floor level in relatively unsafe kitchens and wear loose fitting clothes such as saris, dupatta, etc. Children and elderly people are at relatively less risk because many households still exist as joint families, and the system safeguards these age groups to some extent.

The commonest mode of burn injury is a flame burn. Most such incidents are related to malfunctioning kerosene pressure stoves. These are cheap contraptions without safety features, and burns occur when carbon deposits block the kerosene vapour outlets. Unsupervised and careless handling of firecrackers during the festival of Diwali lead to an increased incidence of injuries during the festival period. Fire is also used in homicide and suicide.

Problems in management

Burn management in developing countries is riddled with difficulties. Lack of government initiative and low literacy rates preclude effective prevention programmes. Many uneducated households are fraught with superstition, taboos, weird religious rituals, and faith in alternative systems of "medicine," which complicates management.

Most burn centres are situated in large cities and are inadequate for the high incidence of injuries. Resuscitation is often delayed as patients have to travel long distances and transport facilities are poor. Many burn centres are also plagued with lack of resources, lack of operating time, and shortage of blood. Often there are no dedicated burn surgeons, and general surgeons without formal training are involved in burn care. Burn nursing is also not a recognised concept. These conditions make excisional surgery impossible for a large percentage of patients. There is generally no coordination between district hospitals and tertiary burn centres.

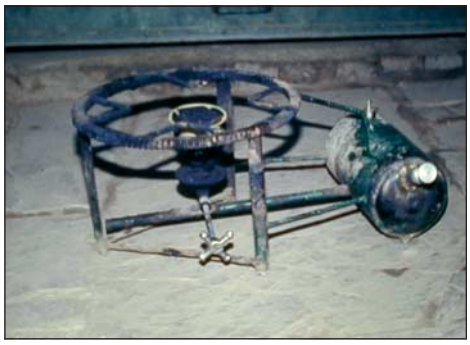
Strategies for effective burn care in developing countries

The approach to burn management has to be radically different from that in Western countries.

Prevention programmes

Prevention programmes should be directed at behavioural and environmental changes which can be easily adopted into lifestyle. The programmes need to be executed with patience, persistence, and precision, targeting high risk groups.

Cooking at floor level in loose fitting clothes such as "dupatta" places women at increased risk of burn injury



Cheap kerosene cooking stoves, which are prone to malfunction, are a common cause of burns

Unsupervised use of fireworks by children during festivals such as Diwali increases the incidence of burns during the festival period

Burn management problems in developing countries

- High incidence of burns
- Lack of prevention programmes
- Inadequate burn care facilities
- Lack of resources
- Lack of trained staff
- Poor infrastructure and coordination
- Social problems

Depending on the population of the country, burns prevention could be a national programme. This can ensure sufficient funds are available and lead to proper coordination of district, regional, and tertiary care centres. It could also provide for compulsory reporting of all burn admissions to a central registry, and these data could be used to evaluate strategies and prevention programmes. There should be adequate provision by law to set manufacturing standards for heating and electrical equipment, fire safety standards for high rise buildings, and procedures for storage and transportation of hazardous materials, explosive chemicals, and firecrackers. A national body of burn professionals should be constituted to educate all healthcare staff involved in burn care.

Providing treatment

To provide optimal burn care to a large population with limited resources, it is imperative to strengthen the existing infrastructure. A few regional burn centres should be developed to provide tertiary management and training to burn care staff. General surgeons working in district hospitals should form the nucleus of the burn care service and decide on referral procedures.

If it is not possible to keep referred patients at burn centres for six to eight weeks of treatment, they can be discharged after two or three weeks of stabilisation. Such patients can then be treated at district hospitals or at home with the help of primary health centres. Thus, primary health centres can act as liaison between burn patients and district hospitals. The incidence of burn wound septicaemia with domiciliary treatment is remarkably low. These patients can be readmitted as necessary for blood transfusions, treating septicaemia, and skin grafting.

Certain well tested and cost effective treatment procedures need to be adopted to conserve resources: these include using Parkland formula for resuscitation, pursuing conservative burn wound management, and using amnion as a biological dressing.

Strategies for burn management in developing countries

- Effective prevention programmes
- Burns as national health agenda
- Central registry of burns
- Create a professional burn group
- Adequate safety legislation
- Induct district hospitals and primary health centres
- Encourage patient management at home
- Cost effective treatment procedures
- Develop regional centres of excellence

Cost effective burn treatments to conserve scare resources

Parkland formula for fluid resuscitation
This is cost effective and ensures proper compliance

Conservative burn wound management
This involves using closed dressings, eschar separation, and skin grafting. This takes the pressure off operating facilities and provides comparable results to surgery

Amnion as a biological dressing
This is easily available, is free of cost, and can be comfortably preserved for a week

Burn disasters

A disaster is a situation that is unpredictable, massive, and poses an immediate threat to public health. A burn disaster is "an event resulting in mass burn casualties and severe loss of human lives and material from a known thermal agent." Disasters normally exceed the resources of local healthcare facilities.

Disaster management involves coordinating the activities of various health disciplines to prevent disasters, provide an immediate response to a disaster, and help in rehabilitation of victims.

Disaster plan

An organised disaster plan can reduce loss of property, social disruption, and suffering. A disaster plan should be specifically tailored for a particular region and nature of fire disaster. Ultimately, a coordinated system must be developed that includes medical and public safety organisations, law and order agencies, and transport agencies.

The communication lines from the central command should be fast and multilingual. It should be able to advise workers at the disaster site, direct transport agencies, and simultaneously relay the information to surrounding hospitals. All the regional and distant hospitals must be incorporated in a multi-tier system as the number of cases may overwhelm local facilities.

Hospitals play a pivotal role in providing trained staff. All doctors and nurses, irrespective of their specialties and whether they are included in the plan, should be educated about the basics of burn care. With a burn specialist at the core, the

Characteristics of a burn disaster

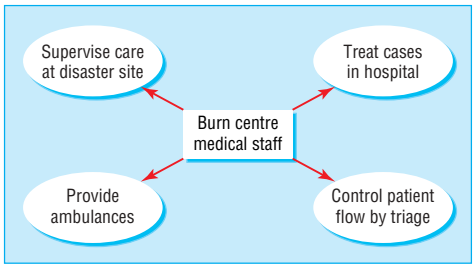
- Large number of patients with extensive burn injuries
- A high incidence of serious associated injuries
- Site of the disaster is not always accessible
- Immediate care and assistance may not be adequate
- Response time may be prolonged
- Local infrastructure may be affected by fire

Principles of disaster management

- Prevention
- Disaster profiles
- Disease patterns
- Risk assessment
- Post-emergency phase
- Effective multidisciplinary response
- Mobilisation of workforce resources
- Local community or national involvement
- Reconstructive phase

Factors to be considered while developing a disaster plan

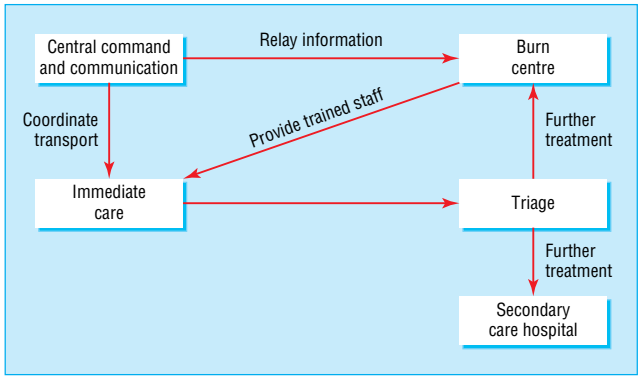
- Unpredictability
- Characteristics (explosion, building fire, toxic fumes, etc)
- Type of building (dwelling, hotel, office, etc)
- Type of trauma (burn, associated injury, inhalational injury)
- Time (day, night, during festivities, etc)
- Area (city, non-urban, accessibility, etc)
- Number of people injured
- Degree of preparedness to manage a disaster



Role of hospital in disaster management

hospital disaster management team also includes a respiratory physician and an anaesthetist. There should be prompt and judicious deployment of staff. Teams of psychologists should manage panic among disaster victims and their relatives both at the disaster site and at hospitals. Accurate triage by clinicians experienced in burns must guide the flow of patients from the site to the inner circle of healthcare facilities (primary and secondary care hospitals) and then to the outer circle (tertiary care hospitals and burn centres).

Transportation needs are guided by the number of victims, their condition, the nature of the fire disaster, and geographical considerations. Possible modes of transport include ambulances, local transport vehicles, military vehicles, helicopters, fixed wing aircraft, and rescue boats.



Major arms of a disaster plan

Managing a disaster

Immediate care is provided by people present at the scene of the disaster, who may be survivors or passers by. These first responders are later guided by trained healthcare workers who arrive at the site. On site management includes first aid, patient triage, and ambulance staging with a basic aim of maximal use of resources.

Triage

Triage is the cornerstone of effective burn disaster management and is done at the disaster site by staff with knowledge of burn treatment. Triage takes into consideration the total number of patients, bed availability, and transportation capacity.

Triage should be prognostic, and patients should be categorised on the basis of age, extent of burns, site of burns and presence of inhalational injury:

- *Group I*—Minor burns (< 10% of total surface area in children, < 20% in adults) to non-critical areas
  Assigned to—Outpatient care, dressing, tetanus prophylaxis
- *Group II*—Minor burns to critical sites (face, hands, genitalia)
  Assigned to—Short hospital stay, special wound care or operation
- *Group III*—Major burns (20-60%)
  Assigned to—Admission to burn unit, intravenous resuscitation
- *Group IV*—Extensive burns (> 60%)
  Assigned to—Lower priority for transfer
- *Group V*—Minor burns with inhalational injury or associated injury
  Assigned to—Oxygen, intubation, transfer to intensive care unit.

The patients in groups III and V are evacuated first, followed by group IV. Group II cases are evacuated at the end. Group I cases are either discharged after first aid or asked to make their own way to the nearest primary care centre.

Further treatment

Initial care is in the line of ABC of resuscitation. An adequate airway and respiration must be ensured. All patients except those with minor burns must receive fluid resuscitation based on a simple formula. Wounds should be covered with a sterile sheet until they are dressed. Dressings should be simple, with only antimicrobial pads and Gamgee Tissue. Effort should be made to detect and treat associated injuries.

Secondary triage may also be done at this time. If necessary, seriously injured patients can be sent to centres of higher level while less serious patients who reach the tertiary centres are referred back to primary care centres. The success of such a plan lies in accurate triage at every level, so that all centres are used optimally and best possible treatment is delivered to all according to the severity of injury, with minimum delay.

First aid at the site of a burn disaster

- Quantitative assessment of burns
- Qualitative assessment of burns
- Commence intravenous resuscitation
- Catheterisation
- Analgesia
- Hospital transfer

Further reading

Burns in the developing world

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Competing interests: See first article for series editors' details.

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