

Burn Care in Low- and Middle-Income Countries

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KEYWORDS

• Burn care • Low- and middle-income countries • Societal impact • Global burden of disease

KEY POINTS

- Burn injury is a disease of poverty.
- Increased burn incidence and mortality in low- and middle-income countries.
- Deficient health care system and early resuscitation leads to increased mortality.
- Local wound care and improved nutrition is critical to survival.
- Early excision and grafting be used if health system permits.

BURDEN OF DISEASE

Burn injuries are one of the most devastating injuries and a major global public health issue particularly in low- and middle-income countries (LMIC), where 95% of fire-related burn deaths occur.¹ Annually, more than 300,000 people die from fire-related burn injuries worldwide, and millions more suffer from burn-related disabilities and disfigurements. Fire-related burns account for a loss of 10 million disability-adjusted life-years (DALY) annually.²

The burden of burn injury falls predominantly on the world's poor. The high incidence of burn among the global poor is driven by several factors, including migration to urban areas, disorganized urban development, inadequate electrification of homes, the use of paraffin as a primary energy source, and failure of preventative programs. The incidence of burn injury in LMICs is 1.3 per 100,000 population compared with an incidence of 0.14 per 100,000 population in high-income countries (HIC).³ The rate of burn injury is even more severe in some developing countries such as Bangladesh, where the incidence of nonfatal burn injury is 166.3 per 100,000 per year.⁴ The

epidemiology of burn injuries in LMICs is different than in HIC, predominantly affecting children and women, with children aged less than 5 years suffering the highest risk of any group among burn victims.^{5,6}

In LMICs, the vast majority of childhood burns are reported to occur in the home in comparison to adult burns, which occur equally at home, outdoors, and at workplaces.⁷ Women aged 16 to 35 years sustain most domestic burns, due to the traditional practice of floor-level cooking or the use of an open fire.^{8,9}

HEALTH CARE SYSTEMS AND PERSONNEL

Countries with a high gross national product per capita often have a relatively healthier population due to higher health care expenditures.¹⁰ Poor health care infrastructure is a common denominator in most LMICs. Most existing burn centers are situated in large cities and have insufficient capacity for the high-burn injury incidence. Although management in these centers is based primarily on standard principles, hospitals are ill equipped with staff and support facilities. In addition to inadequate physical structures, these centers are

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invariably plagued with a lack of resources, inadequate operating room availability, and a shortage of blood products for transfusion. Resuscitation is often delayed, because patients have to travel long distances, and ambulances and prehospital services are nonexistent.^{6,11} There is also limited coordination between district hospitals and tertiary burn centers. Furthermore, in many developing countries, a lack of human resources remains the greatest challenge to providing surgical care. Often there are no dedicated burn surgeons, leaving the management of burn patients primarily to general surgeons without formal burn training. Burn nursing is also not a recognized field.

EFFECTIVE BURN CARE RESUSCITATION

Prehospital care of burn victims with simple measures such as irrigation with clean, cool water and clean dressings is of particular importance where access to hospital care is commonly delayed. Initial appropriate burn treatment aimed at conserving scarce resources includes emphasis on early fluid resuscitation and ensuring proper compliance to established resuscitation protocols such as the Parkland formula.¹² Patients with burns less than 10% total body surface area (TBSA) can be hydrated orally, unless there is trauma or burns to the mouth or airway. Burns greater than 10% TBSA requires 1 to 2 large-bore intravenous lines (or intraosseous lines) for fluid resuscitation. The Parkland formula (4 mL isotonic crystalloid solution \times kilogram of body weight \times [% TBSA] = total milliliter in the first 24 hours) may be used to initiate fluids for ongoing resuscitation and fluid losses.¹³ Half of this total is given during the first 8 hours after injury, and the remaining given during the next 16 hours. Patients have highly variable systemic responses to burn injury so formulaic calculations of fluid deficits are merely guides to resuscitation.

MEDICATIONS

Provision of pain relief in the face of limited resources is very challenging. In those without substantial risk of renal injury, mild pain can be treated with nonsteroidal anti-inflammatory agents or acetaminophen. Moderate to severe pain will likely require opioids.¹⁴ In a study of the patterns of pediatric analgesic use in Africa, acetaminophen and ibuprofen were widely used, constituting approximately 60% of all analgesics, whereas opioids were only used in 0.2%, falling well short of the World Health Organization standards.¹⁵

Because of a paucity of published studies, the role of prophylactic systemic antibiotics in

preventing infectious complications is unclear. However, available evidence does not support their use.¹⁶ The appropriate administration of a tetanus immunization is mandatory.

EARLY BURN EXCISION AND GRAFTING

Surgical debridement may be required for deep partial-thickness and full-thickness wounds. In the acute phase, these wounds need simple coverage. Saline bandages or cling wrap is often sufficient to cover wounds and keep patients warm and dry. In HICs, increasingly aggressive surgical approaches with early tangential excision and wound closure are standard practice in burn units. This approach represents the most significant change in recent years, leading to improvement in mortalities of burn victims at a substantially lower cost. However, in the absence of proper health care infrastructure, insufficient blood banking and supplies such as dressings, and inadequately trained health care personnel, such aggressive therapy in burn victims, can induce further trauma and result in a poor outcome.¹⁷ In fact, evidence from sub-Saharan Africa suggests that early excision may have a much higher mortality compared with late excision in a resource-poor environment.¹⁸ Consequently, smaller burns over critical areas such as joints are better suited for this technique.¹⁹ For many burn patients in most LMICs, early excisional surgery, although feasible, is rarely wise.

Given the realities of inadequate operating room access, closed burn wound dressing, eschar separation, and delayed skin grafting will help separate patients with small- and medium-sized burn wounds (<40% TBSA) with the potential for survival from those with extensive wounds (>50%) that should be triaged to palliative care in a resource-poor environment.¹² A delayed operative strategy is especially important considering that the mortality for burns of greater than 40% TBSA in most LMICs approaches 100%.² The inability to practice early tangential excision and skin grafting may explain the high incidence of burn-related sequelae, such as disfiguring hypertrophic or keloid scarring, and disabling contractures.^{20,21}

LOCAL WOUND CARE

Local wound care in the developing countries is one of the greatest barriers to effective burn wound management because wound care products and dressing supplies are not easily obtainable or far too expensive. Cool running water at a temperature between 10°C and 15°C for 20 to

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