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Original research

Burn management capacity in low and middle-income countries: A systematic review of 458 hospitals across 14 countries

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HIGHLIGHTS

- Disproportionately burns are greater in low and middle-income countries (LMICs).
- Given lack of data on burns, our review assesses burn management capacity in LMICs.
- Fourteen studies were reviewed, data from 458 hospitals in fourteen countries.
- Our review suggests that LMICs do not appear to be equipped for burn management.
- Efforts are needed to document resources to inform policy & guide burn management.

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ABSTRACT

Importance: More than 90% of thermal injury-related deaths occur in low-resource settings. While baseline assessment of burn management capabilities is necessary to guide capacity building strategies, limited data exist from low and middle-income countries (LMICs). **Objective**: The objective of our review is to assess burn management capacity in LMICs. **Evidence review**: A PubMed literature review was performed based on studies assessing baseline surgical capacity in individual LMICs. Seven criteria were used to assess burn management capabilities: presence of surgeon, presence of anesthesiologist, basic resuscitation capabilities, acute burn management, management of burn complications, endotracheal intubation and skin grafts. **Findings**: Fourteen studies were reviewed using data from 458 hospitals in fourteen countries. Of these, 82.3% (284/345) of hospitals had the capacity to provide basic resuscitation and 84.9% (275/324) were capable of providing acute burn management. Endotracheal intubation was only available at 38.3% (51/133) of hospitals. Moreover, only 35.6% (111/312) and 37.9% (120/317) of hospitals were able to provide skin grafts and treat burn complications, respectively. **Conclusion**: Many hospitals in LMICs are capable of initial burn management and basic resuscitation. However, deficiencies still exist in the capacity to systematically provide advanced burn care. Efforts should be made to better document resources in order to guide burn management resource allocation.

1. Background

There is a disproportionate increased burden and prevalence of burn injury and its associated morbidity and mortality in low and middle-income countries (LMICs), particularly in sub-Saharan Africa. The incidence of burns in LMICs is 1.3 per 100,000 population compared with an incidence of 0.14 per 100,000 population in

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high-income countries, ranking itself in the top 15 leading causes of burden of disease globally [1,2]. Furthermore, the incidence of burn injuries requiring medical care is approximately 20 times higher in the Western Pacific as compared to the Americas [3]. Despite this, there is a paucity of literature dedicated to burn injury in LMICs.

Existing studies focus largely on epidemiology with an emphasis on prevention, with limited investigation on surgical capacity and available burn care resources. Assuming timely and appropriate recognition of burn injury, the initial barrier to treatment is often the long distance and poor transport system for patients to reach a burn or advanced treatment center, as most are situated in large cities [4]. Inadequate access to health care facilities often leads to dependence on traditional medicine and a delay in presentation to the hospital, lending patients to a higher risk of infection and greater complications [5]. Within burn centers of LMICs, the lack of resources, inadequate operating rooms, and shortage of intravenous fluid, medications, and blood has been well documented [4–7].

Hodges et al. demonstrated in their study of Ugandan anesthetists that only 23% had the facilities to deliver safe anesthesia to an adult, and 13% to deliver safe anesthesia to a child. Items most frequently unavailable included a pulse oximeter (74% of anesthetists), a tilting operating table (23%), an oxygen source (22%) and appropriately sized tracheal tubes (21%). Furthermore, fundamental items noted to be inconsistently available included running water for 44% of respondents, electricity for 80%, and intravenous fluids for 30% [8]. Additionally, the dearth of qualified health care workers, particularly general surgeons and indeed dedicated burn or plastic surgeons within LMICs, inevitably results in burn care management being delivered by personnel without formal burn training [8].

In order to allocate burn management resources for advanced care centers in LMICs, an evaluation of their existing capabilities, surgical capacity and resources (both equipment and personnel), must be specifically identified. We therefore sought to review and summarize available data on burn management capacity in LMICs.

2. Methods

Available literature assessing baseline surgical capacity in individual LMICs utilizing the World Health Organization's (WHO) Tool for Situational Analysis to Assess Emergency and Essential Surgical Care (TSAAEESC) and the Personnel, Infrastructure, Procedures, Equipment and Supplies (PIPES) survey, was accessed using MEDLINE [9,10]. The classification of LMICs in this review is defined according to the World Bank for the World Development Report; this classification is based on the level of socio-economic development, epidemiological homogeneity and geographic location [11]. Combined controlled vocabulary and related key words such as “survey tool” and “surgical capacity” were used (see Fig. 1). Additional resources were identified through expert sources and the bibliographies of included articles. If there were multiple studies from a single country, the study with the most facilities was used. A study was excluded if it did not have at least two of the seven criteria for burn management capacity enumerated below. Two reviewers (SG, EGW) screened all the studies; a third party reviewer (ALK) evaluated the study if any discrepancies existed. Two reviewers (SG, EGW) independently extracted the data.

Seven criteria for burn management capacity were used: presence of surgeon (consultant), presence of anesthesiologist (consultant), basic resuscitation, endotracheal intubation, acute burn management, skin graft and burn complications (contracture release). Endotracheal intubation was used in the criteria as a proxy for access to critical care treatment. Availability of each item was scored using a binary system for each hospital. An item was given a point if cited as always available; other responses received no points. Efforts were made to record items at all facilities, however, when data were not reported, the denominator only included the facilities for which data were available. When only percentages of facilities were available, the absolute number of facilities was calculated. For the studies in which the data were reported as a range, the mean was calculated and used. All data were then analyzed into a single file and analyzed with descriptive statistics.

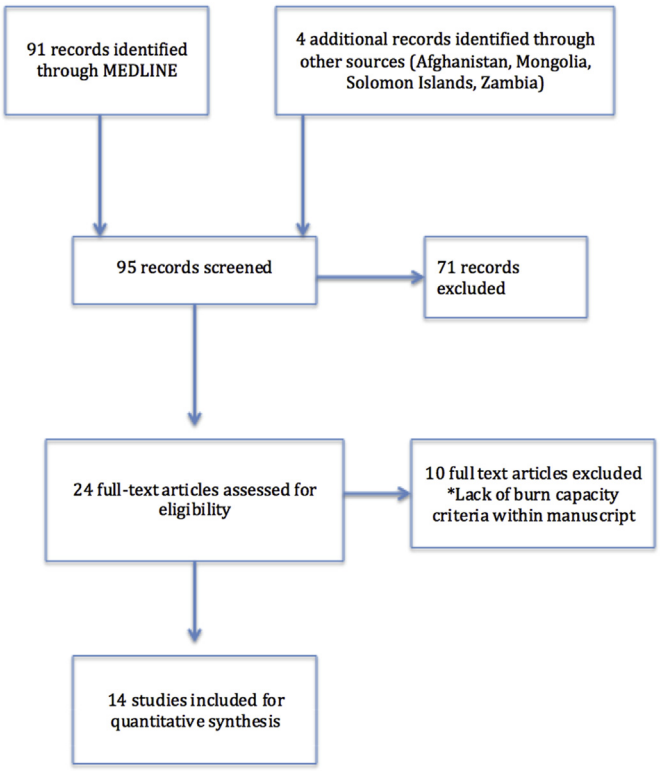

Fig. 1. Study selection methodology.

3. Results

Fourteen individual country studies with relevant data were identified documenting our burn management capacity criteria from 458 hospitals (Table 1). Overall, of the 458 hospitals identified, most hospitals had the capability to perform basic resuscitation at 82.3% (284/345), but only 35.6% (111/312) of the hospitals had the capability to perform a skin graft. Endotracheal tubes and treatment of burn complications (contracture release) were both deficient, present in only 38.3% (51/133) and 37.9% (120/317) of hospitals identified, respectively.

The proportion of hospitals able to perform skin grafts ranged widely from 0% (noted in Sri Lanka, 0/47) to as much as 70% in Sierra Leone (7/10). The ability to treat burn complications varied by country from 23% in Bolivia (7/31) to 59% in Afghanistan (10/17). Not one country identified was able to provide 100% of any of the criteria of burn management capacity. The only countries documenting each criterion were Nigeria and Mongolia.

The number of surgeons and anesthesiologists was calculated as number of respective consultants per hospital. The Afghan study reported number of facilities with surgeons and number of facilities with anesthesiologists, thus this study was not included in the total calculation. Data available revealed that 0.71 surgeons per hospital were present over 379 hospitals and only 0.18 anesthesiologists