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Rehabilitation practices for burn survivors in low and middle income countries: a literature review

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ABSTRACT

Objective: To systematically review the delivery and effectiveness of rehabilitation for burn survivors in low and middle income countries (LMIC).

Methods: We systematically searched the literature through 11 electronic databases and the reference lists of relevant studies. Studies were suitable for inclusion if they were primary research with a focus on burns rehabilitation in LMIC settings describing either service delivery or treatment effectiveness. No time, design or other limitations were applied, except English language.

Results: Of 226 studies identified, 17 were included in the final review, including 7 from India. The results were summarised in a narrative synthesis as the studies had substantial heterogeneity and small sample sizes, with many relying on retrospective data from non-representative samples with no control groups. Most studies (12) described service delivery and 5 examined the effectiveness of different types of rehabilitation. Multiple studies stressed the need for rehabilitation and multidisciplinary teams for burns management.

Conclusions: The published research on burns rehabilitation is very limited and little is known about current practices in LMIC settings. In order to inform policy and service delivery, the effectiveness, feasibility and sustainability of current services needs to be investigated.

INTRODUCTION

Burns contribute significantly to the global burden of death and disability: in 2015, injuries caused through exposure to fire, heat or hot substances led to the loss of over 12 million disability-adjusted life-years (DALYs) worldwide, and were attributed to over 180,000 deaths [1]. The World Health Organisation (WHO) describes burns as the 'forgotten global public health crisis' [2]. Burns have not received sufficient attention in global or national policy initiatives - they did not fit under any of the Millennium Development Goals, and are not directly mentioned in the subsequent Sustainable Developmental Goals [3, 4].

The largest burden of burns are in low- and middle-income countries (LMICs), where prevention programs are inadequate or absent and healthcare resources are stretched, with limited acute care or rehabilitation services available for burns victims [5]. Over half of all burns-related deaths in the world occur in the South East Asia region, where India bears the largest burden with over a million people moderately or severely burnt every year [6]. Further, 60% of these deaths occur in women, mostly aged between 15 and 34 years [7]. Young females have been consistently reported across multiple hospital-based studies as a high risk group with the average male:female ratio of fire-related deaths of 1:3, the only injury with over-representation of women [7]. Prevention efforts face challenges particularly in the context of intent of the injury amongst women, with family violence and self-immolation common contributors to burn injury [7].

Few burn victims in LMICs receive appropriate first aid or immediate acute care, which can lead to further complications. Lack of co-ordinated management of a burn injury may result in complex psychological problems such as anxiety, depression and post-traumatic stress disorder, often leading to fatalistic attitudes and the belief by patients and carers that little or nothing can be done for pain management and to relieve suffering [8]. As a result, burn survivors become emotionally overwhelmed and typically withdraw [9]. Unfortunately, this lack of activity exacerbates secondary problems, such as contractures, thereby heightening the survivor's disability [10, 11]. The distribution of burn morbidity also varies across settings and the prevalence of moderate and severe disability due to unintentional injuries in people under 60 years of age is 35.4 million in LMIC settings; 12.5 times higher than in high income countries (HIC) [12]. Populations in LMICs have a higher exposure to risks associated with burns, such as cooking fires and fuels [13].

Reported costs for burns treatment in India are comparatively high when compared to other LMICs. A tertiary hospital setting in India reports an average per patient cost of USD885 for burns treatment [14], while comparable work from Vietnam reports an out-of-pocket cost of USD427 per burns case [15]. Rehabilitation is defined as strategies involved in functional recovery and community reintegration from disability [16]. Coordinated rehabilitation with access to a multidisciplinary team minimises adverse effects of burn injury by preventing contracture development and the impact of scarring, and by maximising functional ability, psychological wellbeing and social integration [17]. Burns injury care in LMICs face several challenges, primarily because of limited resources, the absence of adequately trained health personnel, a lack of facilities equipped with essential resources, the lack of guidelines for best practice, the concentration of services in urban areas, as well as an array of access barriers for patients [18, 19]. Ideally, burns rehabilitation should integrate the physical, psychological and social aspects of care as it is common for patients to experience difficulties in one or all of these areas following a burn injury. It is not known what burns rehabilitation services are available, accessible or most effective for low resource settings. Appropriate burns care that follows evidence-based guidelines to ensure the best outcomes for patients is unlikely to be achievable and sustainable within the overworked, under-resourced health care systems of LMICs, unless novel low cost models of care are developed. In order to inform development of such models of care, there is a need to understand the current practices, resources and effectiveness of rehabilitation in hospitals, homes and communities in LMICs. We carried out a systematic review of available literature to appraise the care practices and effectiveness of burn related rehabilitation in LMICs.

METHODS

Search strategy

A systematic search of published literature was completed in 11 electronic databases: MEDLINE, Scopus, CINAHL, Web of Science, Web of Knowledge, SafetyLit, Cochrane Library database, Centre for Reviews in Health Systems and International Development, Global Health Library, International Online Resource Centre on Disability and Inclusion, and India Med. Search terms included the following strings and relevant medical subject headings (MeSH terms): “burn”, “rehabilitation” and “developing countries”, and “injury”, “community/home based” “rehabilitation” and “developing

countries" (Table 1). Individual names of low and middle-income countries were also included. Relevant internet sources including Google Scholar were also searched to identify other potentially relevant articles.

Inclusion criteria, data extraction and quality appraisal

Studies were suitable for inclusion if they were primary research from LMIC settings, describing service delivery or evaluating the effectiveness of burns rehabilitation services. No publication date period or other limitations were applied, except English language. LMICs were defined as those published by the Australian Governments Department of Foreign Affairs in 2015 [20].

Study selection and data abstraction were carried out using a standard data abstraction form by one author (CL). The study selection process is summarised in a flow diagram (Figure 1).

RESULTS

Initial searches identified a total of 333 research papers, from which 59 were identified as potentially relevant based on the screening of titles and abstracts. Excluded articles were either duplicates (105) or did not fulfil inclusion criteria (167). From the 59 articles selected for full review, a further 35 were excluded because they did not fulfil the inclusion criteria. The remaining 17 studies are summarised in Table 1. Characteristics of the study, including limitations, are presented. The process for identifying studies is outlined in Figure 1.

The 17 studies retained for inclusion reported on various aspects of patient rehabilitation following burn injury in LMICs (Table 1). Due to the substantial heterogeneity between studies, results were summarised in a narrative synthesis and no meta-analyses were performed.

Of the 17 studies identified, 12 were descriptive accounts of burn rehabilitation services, including two retrospective reviews of patient records [21, 22], three quantitative surveys [23-25], two case studies [26, 27], one prospective follow-up study [28], two qualitative studies [29, 30], and two descriptive reviews [31, 32]. Only five studies evaluated the effectiveness of rehabilitation services – this included one randomised controlled trial of a massage therapy intervention [33], one clinical trial of a comprehensive rehabilitation program comprised of occupational therapy, physiotherapy and education for patients and carers [34], one comparison study investigating rehabilitation outcomes following intensive physiotherapy consultations provided in addition to standard medical care [35], and two pre-post design studies; one evaluating a scar management program [36] and a second reviewing the effect of psychotherapy sessions on mental health outcomes of burns patients [37]. There were seven studies from India [22, 26, 28, 29, 31, 32, 37], two each from China [23, 34], Korea [33, 36] and Iran [30, 35], and one each from Sri Lanka [21], Pakistan [25] and Brazil [24].

Descriptive studies of burns rehabilitation services

A retrospective review of medical records for 459 children admitted to a specialised burns unit at a paediatric hospital in India [22] reported on patient health outcomes and rehabilitation needs. The

study investigated the relationship between age, aetiology, total body surface area (TBSA) burnt, social and economic status and requirements for rehabilitation however, approaches to analysis were not well documented. The study highlighted important issues around access to treatment and the needs of children of lower socioeconomic status. Financial constraints were reported as a major barrier to accessing comprehensive rehabilitation, with 80% of the study population classified as 'below the poverty line'. It is noted that children with higher education had better access to rehabilitation, including psychosocial rehabilitation. One third (n=151, 33%) of patients were from distant peripheral areas outside the capital city, making rehabilitation services costly to reach.

A second study retrospectively reviewed medical records for 46 patients with burns resulting from acid assaults in Sri Lanka [21]. The study reported less than 40% compliance with attendance at rehabilitation clinics however, reasons for non-compliance were not reported. The authors hypothesized that stigma, scarring, and social barriers, including the potential threat of a recurrent incident, were underlying factors for poor attendance. Rehabilitation compliance for long-term follow-up was better among females than males.

A survey of 39 Burns Centres across China [23] was performed, of which 38 reported to provide at least one type of rehabilitation service. The most common rehabilitation services offered were pressure garment provision (n=38, 100%), splinting (n=32, 84%), physical therapy (n=82%) and occupational therapy (n=21, 55%). The study highlighted several challenges to accessing appropriate burn rehabilitation services. These included a shortage of suitably qualified rehabilitation health professionals, a need for professional development and training, an absence of guidelines, and insufficient government funding.

A case study of two paediatric burns patients who received surgery in Taiwan [27] reports on the feasibility and utility of tele-medicine for rehabilitation in an island setting, where access to rehabilitation services is a limited. The study evaluated range of motion in the limbs of both patients up to 10 months post-surgery, but no other objective measures were taken. Both patients and surgeons reported to be satisfied with videoconferencing as a method of follow-up consultation. A second case study from India [26] provides a detailed description of the burns treatment and

rehabilitation protocol at one urban hospital. Case studies of two women, aged 30 and 35 years, who were treated at the hospital for accidental burn injuries sustained at home, are presented to illustrate hospital procedures. The article reports rehabilitation services to be negligible or non-existent. It states that private burn facilities are scarce and unaffordable for most patients, while government facilities are frequently over-capacity and under-resourced, causing the discharge of patients prior to treatment completion.

A cross-sectional study from Brazil [24] of 63 teenagers and young adults receiving psychological and physical rehabilitation for burn injuries, found low levels or an absence of depression (average Beck's Depression Inventory (BDI) score = 7.6, reflecting slight depression) and/or issues with low self-esteem (average score on the Rosenberg Self-Esteem Scale (RSE) = 8.4, reflecting an adequate degree of self-esteem). The study suggests that multidisciplinary rehabilitation programs may be effective for ensuring better psychosocial outcomes for burns patients. This study was limited due to its small sample size, use of convenience sampling to select the study population, lack of control group, and lack of information on individual burn severity and associated mental health outcomes. Therefore, study outcomes should be interpreted with caution.

Two qualitative studies were included, which explored the rehabilitation care process for burns patients and their carers. A study from Iran [30] used 28 semi-structured interviews to understand perceptions of patients and carers following self-immolation, identifying the need for integrated rehabilitation care. The second study from India [29] used 22 semi-structured interviews to investigate parental involvement in the rehabilitation care process for children with burn injury. Parents were found to identify and mobilise resources for their child's treatment, manage wounds and perform other tasks associated with rehabilitation in the home, and minimise their child's exposure to stigma within the community. The authors identified a lack of support for parents from health care professionals and other extended family members.

One Indian study [31] reviewed different approaches by rehabilitation practitioners to improve the design of axillary splinting devices to increase patient adherence. Structural physical barriers, such as narrow corridors, were reported to create difficulties for patients wearing the devices.

Studies evaluating effectiveness of burns rehabilitation services

Impact of rehabilitation on functional outcomes

One study from Iran [35] compared the outcomes of two burn rehabilitation treatment protocols among 30 burn patients. Patients were allocated into either a control group (n=15) who received standard medical care, or to an intervention group (n=15) who received standard medical care with additional intensive physiotherapy consultations. There was a significant difference ($p<0.01$) in burn contractures between both groups, with one patient (6%) experiencing burn contractures in intervention group and 11 patients (73%) experiencing contractures in the control group.

One clinical trial from China [34] evaluated functional outcomes (self-care and quality of life) of 55 severe burns patients with and without rehabilitation. Patients were allocated into either a control group (n= 25) who received standard medical care, or to an intervention group (n=30) who received comprehensive rehabilitation including occupational therapy, physiotherapy, and patient and family education. Patient allocation was not random but based on convenience to access rehabilitation services. A wide range of outcome measures were collected at 3 months post intervention, including self-care performance (Modified Barthel Index [MBI]), QOL (World Health Organization Quality of Life-BREF), pain and itchiness (Visual Analogue Scale [VAS]) and mental health (Self-Rating Depression Scale [SDS] and Self-Rating Anxiety Scale). When comparing the intervention and control groups, the intervention group achieved significantly better outcomes in MBI ($p<0.001$), VAS ($p=0.009$), physical health ($p=0.002$), psychological health ($p=0.021$), and social relationships dimensions of QOL ($p<0.001$). No confidence intervals were reported for p values.

Burns scar rehabilitation

One study from Korea [36] evaluated a scar management program, reporting measures of skin status, depression, and burn-specific health among 26 burns survivors. Participants were allocated into either a control group (n=13) who received standard medical care, or to an intervention group (n=13) who received the scar management program over a three month period. There were no significant changes in burn scars, subjective skin status, or depression between the control and intervention

groups. Participants within the intervention group observed a reduced burn scar depth over the study period, although this change was not significant. A second randomised controlled trial from Korea [33] evaluated the effect of massage therapy performed by a skilled therapist on hypertrophic burn scars. This study had a large sample size (n=146), with 76 participants allocated to an intervention group who received massage therapy in addition to standard medical care. The study found significant improvements in scar pain (95%CI: 0.69–2.02; p<0.001), scar thickness (95%CI: 0.03–0.09; p=0.02) and scar melanin (95%CI: 12.1–21.3; p=0.02) between the control and intervention groups following massage therapy.

Psychological rehabilitation

One study from India [37] assessed the impact of psychological rehabilitation on 35 burns patients. This study evaluated the effectiveness of supportive psychotherapy for burns patients using a pre-post-test design, examining depression as the outcome. Results showed that multiple (15-20), short, face-to-face and tele-psychotherapy sessions led to a significant decrease in depressive symptoms and improved self-image among both males (95%CI: 0.44-1.16, P<0.001) and females (95%CI: 0.4-1.33, p=0.001).

DISCUSSION

This review identified a lack of accessible and sustainable burns rehabilitation services within LMICs. Scarce resources, competing health priorities and limited access for rural populations to healthcare facilities were identified as barriers to providing appropriate long-term burns rehabilitation. Due to the small number of studies identified for this review, it was not possible to comment on the effectiveness of existing burns rehabilitation interventions in this context.

Multiple studies included in this review identified areas requiring improvement within existing burns rehabilitation services. Burns rehabilitation services offered through private sectors were reported to be costly, while government services were reported to be over-capacity and under resourced. This issue is not unique to burns rehabilitation, with primary public health facilities from a number of LMICs reported to be less responsive to patients and often lacking in supplies [38]. A lack of appropriately qualified staff and limited professional development opportunities for clinicians were identified as

barriers to making appropriate services available. This is particularly concerning as greater numbers of qualified physicians from LMICs migrate to HICs, while training capacity within LMICs remains low[39].

Multiple studies identified the need for a multidisciplinary approach to burns rehabilitation in LMICs, ideally including elements of physiotherapy, occupational therapy, psychological therapy and patient and family education. It was acknowledged that the likelihood of providing access to all services in a resource poor setting is low. Multidisciplinary care has been shown to be an effective approach to improving functional outcomes in the areas of COPD, stroke and palliative care however, its integration into standard medical practice presents many challenges, even in HICs [40].

Successful rehabilitation requires components of health, education, livelihood and social welfare [41]. It is well established that there is an over-representation of psychiatric and psychological disorders in people with burns, with estimates varying between 20% and 75% among adult patients, which may develop during the continuum of care [42]. The focus of most burn rehabilitation research has been on health - primarily physical health. Our search found only two studies [34, 37] specifically describing these components with the addition of empowerment, but individual components were not evaluated.

Long travel distances to health facilities and associated travel costs were both identified as barriers to accessing long-term burns rehabilitation services. Recent years have seen a rise in the utilisation and success of community based rehabilitation services and eHealth applications. The World Health Organisation initiated the Community-Based Rehabilitation (CBR) strategy in 1978 [41], which aimed to achieve a multi-sectoral 'bottom-up' approach to providing long-term care in community settings. Practical aspects of the strategy include enabling communities to develop and implement services to ensure they respond to local needs, and promotes the use of local resources (human, financial, material) where possible to increase the likelihood of service sustainability. Randomised controlled trials evaluating community-based mental health rehabilitation programs in LMICs have shown significant improvement in disability levels [43, 44]. [Whilst isolated vertical programmes for community rehabilitation are not sustainable, developing skills among community health workers in rehabilitation, for all cause disability including traumatic brain injury, spinal injuries, hip fracture, stroke and other](#)

communicable and non-communicable conditions is likely to have far reaching impact. Previous studies have identified numerous benefits of eHealth applications in LMIC settings, such as the use of teleconferencing and videoconferencing for diagnosis and follow-up. Outcomes include improved remote patient monitoring, reduced travel and waiting times for patients, improved diagnostic accuracy and clinical efficiency [45].

Strengths and limitations

This review emphasizes the limited research available on rehabilitation options for burns survivors in LMICs. All studies included in this review emphasised the need for burns rehabilitation services, highlighting some common barriers to their operation. The majority of research work in LMICs on the rehabilitation of burns has occurred in the last decade and therefore, all studies included in this review report on recent data.

Overall, the quality of the studies was poor. Limitations included small sample sizes [21, 24, 35, 36], the use of retrospective data [21, 22], non-representative participation [23], and an absence of control group [24]. Due to the methodological variations between studies, direct comparisons between outcomes were not possible. Definitions of rehabilitation varied across the studies and few studies reported clear, validated outcomes. As many studies recruited participants from specific medical institutes or hospitals, the generalisability of study outcomes is questionable. It is likely that there are many effective services currently being provided in LMICs that are undocumented and have not yet been evaluated for effectiveness.

CONCLUSION

The limited published research on known burns rehabilitation practices in low- and middle-income countries highlights a number of barriers to the provision of high quality, accessible and sustainable rehabilitation services. Although a number of studies reported on various treatment practices trialled with small numbers of patients, many of which were shown to improve patient outcomes, interventions varied and evidence on effectiveness is unclear. Few studies provided suggestions on how to incorporate these treatment options into health service protocols, or into the broader health system. As only a small number of studies were identified through this review, further research is required to

investigate undocumented burn rehabilitation services, evaluating their effectiveness, feasibility, sustainability and potential for upscale.

REFERENCES

1. World Health Organization. *Global Health Estimates (GHE)*. Health statistics and information systems 2016 [cited 2017 1/2]; Available from: http://www.who.int/healthinfo/global_burden_disease/en/.
2. Falder, S., *Burns care overseas—the forgotten health crisis*. 2014, BMJ Blogs.
3. Sachs, J.D. and J.W. McArthur, *The millennium project: a plan for meeting the millennium development goals*. The Lancet, 2005. **365**(9456): p. 347-353.
4. Griggs, D., et al., *Policy: Sustainable development goals for people and planet*. Nature, 2013. **495**(7441): p. 305-307.
5. Atiyeh, B., A. Masellis, and F. Conte, *Optimizing burn treatment in developing low- and middle-income countries with limited health care resources*. Annals of Burns and Fire Disasters, 2010. **23**(1): p. 13-18.
6. World Health Organization., *Fact sheet: Burns*. 2016, WHO: Geneva.
7. Sanghavi, P., K. Bhalla, and V. Das, *Fire-related deaths in India in 2001: a retrospective analysis of data*. The Lancet, 2009. **373**(9671): p. 1282-1288.
8. Peck, M.D., *Epidemiology of burns throughout the world. Part I: Distribution and risk factors*. Burns, 2011. **37**(7): p. 1087-1100.
9. Wallis, H., et al., *Emotional distress and psychosocial resources in patients recovering from severe burn injury*. Journal of Burn Care & Research, 2006. **27**(5): p. 734-741.
10. Van Loey, N.E. and M.J. Van Son, *Psychopathology and psychological problems in patients with burn scars*. American Journal of Clinical Dermatology, 2003. **4**(4): p. 245-272.
11. Herndon, D.N., *Total burn care*. 2007: Elsevier Health Sciences.
12. Mathers, C., D.M. Fat, and J.T. Boerma, *The global burden of disease: 2004 update*. 2008: World Health Organization.
13. Forjuoh, S.N., *Burns in low- and middle-income countries: a review of available literature on descriptive epidemiology, risk factors, treatment, and prevention*. Burns, 2006. **32**(5): p. 529-537.
14. Ahuja, R.B. and P. Goswami, *Cost of providing inpatient burn care in a tertiary, teaching, hospital of North India*. Burns, 2013. **39**(4): p. 558-564.

15. Nguyen, H., et al., *Catastrophic household costs due to injury in Vietnam*. Injury, 2013. **44**(5): p. 684-690.
16. World Health Organization. *Rehabilitation*. 2016 [cited 2017 1/2]; Available from: <http://www.who.int/topics/rehabilitation/en/>.
17. Esselman, P.C., et al., *Burn rehabilitation: state of the science*. American journal of physical medicine & rehabilitation, 2006. **85**(4): p. 383-413.
18. Atiyeh, B., A. Masellis, and F. Conte, *Optimizing burn treatment in developing low- and middle-income countries with limited health care resources (Part 3)*. Ann Burns Fire Disasters, 2010. **23**(1): p. 13-18.
19. Calland, J.F., et al., *Burn management in sub-Saharan Africa: Opportunities for implementation of dedicated training and development of specialty centers*. Burns. **40**(1): p. 157-163.
20. Australian Federal Government., *List of Developing Countries as declared by the Minister for Foreign Affairs*. 2015, Department of Foreign Affairs Canberra.
21. Karunadasa, K.P., et al., *Burns due to acid assaults in Sri Lanka*. Journal of Burn Care & Research, 2010. **31**(5): p. 781-5.
22. Ramakrishnan, K.M., et al., *Paediatric rehabilitation in a developing country - India in relation to aetiology, consequences and outcome in a group of 459 burnt children*. Pediatric Rehabilitation, 2004. **7**(2): p. 145-149.
23. Chen, J., et al., *A survey on the current status of burn rehabilitation services in China*. Burns, 2013. **39**(2): p. 269-78.
24. Teixeira Nicolosi, J., V. Fernandes de Carvalho, and A. Llonch Sabates, *A quantitative, cross-sectional study of depression and self-esteem in teenage and young adult burn victims in rehabilitation*. Ostomy Wound Management, 2013. **59**(9): p. 22-9.
25. Din, S., et al., *Rehabilitation and social adjustment of people with burns in society*. Burns, 2015. **41**(1): p. 106-109.
26. Chamania, S., et al., *Burn rehabilitation: A challenge, our effort*. Indian Journal of Burns, 2013. **21**(1): p. 35.
27. Syed-Abdul, S., et al., *Telemedicine utilization to support the management of the burns treatment involving patient pathways in both developed and developing countries: a case study*. Journal of Burn Care & Research, 2012. **33**(4): p. e207-12.
28. Kumaran, S., et al., *A clinical study of post burn contracture of axilla and its management*. Indian Journal of Burns, 2008. **16**(1).
29. Ravindran, V., G.R. Rempel, and L. Ogilvie, *Embracing survival: A grounded theory study of parenting children who have sustained burns*. Burns, 2013. **39**(4): p. 589-598.
30. Norouzi, K., et al., *What is missed in self-immolated patients' care? A grounded theory study*. Journal of Clinical Nursing, 2012. **21**(23-24): p. 3418-28.

31. Manigandan, C., et al., *Adjustable aesthetic aeroplane splint for axillary burn contractures*. Burns, 2005. **31**(4): p. 502-4.
32. Vandana, V.P., M.T. Friji, and N. Suri, *Speech and swallowing rehabilitation following burns injury: role of speech pathologists in the multidisciplinary team*. Indian Journal of Burns, 2008. **16**(1).
33. Cho, Y.S., et al., *The effect of burn rehabilitation massage therapy on hypertrophic scar after burn: A randomized controlled trial*. Burns, 2014. **40**(8): p. 1513-1520.
34. Tang, D., et al., *Functional Outcomes of Burn Patients With or Without Rehabilitation in Mainland China*. Hong Kong Journal of Occupational Therapy, 2015. **26**: p. 15-23.
35. Okhovatian, F. and N. Zoubine, *A comparison between two burn rehabilitation protocols*. Burns, 2007. **33**(4): p. 429-34.
36. Roh, Y.S., C.H. Seo, and K.U. Jang, *Effect of a skin rehabilitation nursing program on skin status, depression, and burn-specific health in burn survivors*. Rehabilitation Nursing, 2010. **35**(2): p. 65-69 5p.
37. Gouthi, S. and A. Chada, *Impact of supportive psychotherapy on burn patients*. Indian Journal of Burns, 2011. **19**(1).
38. Basu, S., et al., *Comparative performance of private and public healthcare systems in low-and middle-income countries: a systematic review*. PLOS Medicine, 2012. **9**(6): p. e1001244.
39. Hongoro, C. and B. McPake, *How to bridge the gap in human resources for health*. The Lancet, 2004. **364**(9443): p. 1451-1456.
40. Mitchell, G.K., J.J. Tieman, and T.M. Shelby-James, *Multidisciplinary care planning and teamwork in primary care*. Medical Journal of Australia, 2008. **188**(8): p. S61.
41. World Health Organization., *Community-based rehabilitation: CBR guidelines*. 2010, WHO: Geneva.
42. Wisely, J., et al., *Pre-existing psychiatric disorders, psychological reactions to stress and the recovery of burn survivors*. Burns, 2010. **36**(2): p. 183-191.
43. Patel, V., et al., *Efficacy and cost-effectiveness of drug and psychological treatments for common mental disorders in general health care in Goa, India: a randomised, controlled trial*. The Lancet, 2003. **361**(9351): p. 33-39.
44. Araya, R., et al., *Treating depression in primary care in low-income women in Santiago, Chile: a randomised controlled trial*. Lancet, 2003. **361**(9362): p. 995-1000.
45. Fritz, F., M. Kebede, and B. Tilahun. *The need for cost-benefit analyses of eHealth in low and middle-income countries*. in *MedInfo*. 2015.
46. Mathangi Ramakrishnan, K., et al., *Paediatric rehabilitation in a developing country--India in relation to aetiology, consequences and outcome in a group of 459 burnt children*. Pediatric Rehabilitation, 2004. **7**(2): p. 145-9.
47. Norouzi, K., et al., *What is missed in self-immolated patients' care?: a grounded theory study*. Journal of Clinical Nursing, 2012. **21**(23-24): p. 3418-3428.

Table 1: Search terms used to identify relevant studies

	Population
1	Developing countr* or LMIC
2	Communit* or home*
	Exposure
3	Fire* or burn* or flame*
4	Rehab* or treatment
	Outcomes
5	Injur* or damage* or trauma* or wound*
6	Death or mortality or fatal* or die* or decease* or morbidity
	Combining search
	1 and 2 and 3 and 4 and (5 or 6)

Table 2: Standardised data extraction table summarising studies included in the review

Study	Country	Aim/Focus	Study Type	Participants
Burns due to Acid Assaults in Sri Lanka [21].	Sri Lanka	To describe the epidemiology, mechanism, complications, management challenges, and related psychosocial factors associated with acid assaults.	<u>Retrospective, descriptive</u> A retrospective review of patient records from a Burns and Reconstructive Surgical Unit over an 18 month period. Evaluated variables included, amongst other things, compliance with rehabilitation.	n=46
A comparison between two burn rehabilitation protocols [35].	Iran	Compare two burn rehabilitation protocols.	<u>Comparison</u> Burn patients were randomly assigned to 2 different physio treatment groups: Group 1- Conventional physiotherapy Group 2- Burns rehabilitation therapy.	n=30
Effects of a Skin Rehabilitation Nursing Program on Skin Status, Depression, and Burn-Specific Health in Burn Survivors [36].	Korea	Identify the effects of a skin rehabilitation nursing program (SRNP) on skin status, depression, and burn-specific health in Korean burn survivors.	<u>Pre/post design</u> Participants with burn injuries on forearms and/or hands trialled a burn rehabilitation program for a 3 month period.	n=26
Paediatric rehabilitation in a developing country—India in relation to aetiology, consequences and outcome in a group of 459 burnt children[22, 46].	India	Relationship between age, aetiology, percentage body surface area burnt, social and economic status of individual and necessity for rehabilitation.	<u>Retrospective, descriptive</u> A retrospective review of patient records from a Paediatric Burns Facility over a 10 year period.	n=459 Case records of 459 children who were admitted during 10 year period (1992-2002)
A survey on the current status of burn rehabilitation services in China [23].	China	Determine current status of burn rehabilitation services in China.	<u>Quantitative, cross-sectional</u> Survey	n=39 (44.8% of 87) burn centres

			Questions investigated admissions and staffing of burn centres; availability of rehabilitation services; number and educational background of specialised rehabilitation personnel; difficulties leading to the lag of the burn rehabilitation services	contacted email and phone
Telemedicine Utilization to Support the Management of the Burns Treatment Involving Patient Pathways in Both Developed and Developing Countries: A Case Study [27].	Taiwan	Report on utilization of telemedicine to support the management of burns and improve doctor-patient relationship.	<u>Case Study</u> <u>Documentation of patients admitted to hospital with severe burn injuries. Details of injury, treatment provided and health outcomes 10 months following treatment provided.</u>	n=2 Both cases sent to local hospital and treated by wound dressing without surgical intervention rehabilitation
A quantitative, cross-sectional study of depression and self-esteem in teenage and young adult burn victims in rehabilitation [24].	Brazil	Assess presence of depression and level of self-esteem in teenage and young adult burn victims receiving follow-up (physical and psychological rehabilitation) care for their injuries. Determine whether the location of the burn (hand or head) or current work condition is a factor in psychological condition.	<u>Quantitative, cross-sectional</u> <u>Three instruments for assessing depression/low self-esteem administered to teenagers/young adults undergoing burn rehabilitation.</u>	n=63
Adjustable aesthetic aeroplane splint for axillary burn contractures [31].	India	Describe rehabilitation equipment, namely, an aeroplane splint that is modified to make it more appealing, and improve compliance and acceptance.	<u>Descriptive review</u> An outline of the aeroplane splint and its use in burn injury rehabilitation.	N/A since modifications to the ortho are described. No patient data.
What is missed in self-immolated patients' care? : a grounded theory study[30, 47]	Iran	To explore rehabilitation care process in patients who commit self-immolation, using grounded theory.	<u>Qualitative, descriptive</u> Semi-structured interviews, diaries and observations used for data collection.	5 observations 8 diaries and 28 interviews from 10 participants M and 8 F

Embracing survival: A grounded theory study of parenting children who have sustained burns [29].	India	Explore and discover the process of parenting children in India with burn injury at home and develop a conceptual model to inform interventions.	<u>Qualitative, descriptive</u> Semi-structured interviews (25), diaries and observations used for data collection.	n=22 22 family members burn-injured children
Burn rehabilitation: A challenge, our effort [26].	India	Paper discusses certain examples of successful rehabilitation strategies for burns.	<u>Case study</u> Description of protocols for burns admissions to one medical centre. 2 case studies included to illustrate protocol function.	n=2
Rehabilitation and social adjustment of people with burns in society [25].	Pakistan	To explore the relationship between social adjustment of people with burns and their psychosocial rehabilitation.	<u>Quantitative, cross-sectional</u> Patients from a Burn Treatment Centre ranked their experiences with social adjustment following a burn injury.	n=186
The effect of burn rehabilitation massage therapy on hypertrophic scar after burn: A randomized controlled trial [33].	Korea	To evaluate the effect of burn rehabilitation massage therapy on hypertrophic scar after burn.	<u>Randomised controlled trial</u> Comparison between two groups; intervention (those who received burn rehabilitation massage) and control (those who did not)	n=146 (11 men and 3 women) (76 intervention group; 70 control group)
Speech and swallowing rehabilitation following burn injury: role of speech pathologists in multidisciplinary team [32].	India	To educate burns care team on inclusion of Speech and Language Pathologists (SLPs)	<u>Descriptive review</u> <u>Practical guidelines provided for use by medical facilities.</u>	N/A

Impact of supportive psychotherapy on burns patients [37].	India	To study impact of psychotherapy on depression and body image of burns survivors	<u>Pre-post design</u> Non-experimental. Pre-test post-test design. Participants completed 2 <u>instruments for assessing depression/body image within 72 hours of admission with a burn injury, 1 week after discharge and 1 year following discharge.</u>	n=35 (20 men and 15 women)
A clinical study of post burn contracture of axilla and its management [28].	India	To study axillary contractures based on age, sex, years of post-burn, based on anatomy distortion, and on severity of functional limitation, surgical option used and its complications with follow up of patient and patient compliance	<u>Prospective follow-up study</u> All patients who underwent surgery to treat axillary post burn scar contracture over a 2.5 year period were documented.	n=31
Functional Outcomes of Burn Patients With or Without Rehabilitation in Mainland China [34].	China	To evaluate the functional outcomes of moderate to severe burn patients with and without rehabilitation in terms of self-care performance and quality of life (QOL)	<u>Clinical trial</u> Comparison between two groups; intervention (those who received comprehensive rehabilitation interventions in addition to standard clinical interventions) and control (those who only received standard clinical interventions)	n=55

Figure 1: PRISMA flow diagram of the number of records identified, included and excluded in the study

