

# A Systematic Review on the Epidemiology of Pediatric Burn in Iran

Sayed Saeed Hashemi, PhD,\* Asaad Sharhani,\* Bahare Lotfi,†  
Toraj Ahmadi-Juibari,† Zahra Shaahmadi,† Abbas Aghaei\*

Burn is the most common pediatric injuries all over the world. The aim of this study was to study the epidemiology of burn in under 15-year-old Iranian children by applying a systematic review. The related articles published before 2016 have been gathered from international databases by using the keywords in term of pediatric burns such as ScienceDirect, PubMed, Iranmedex, Google Scholar, Embase, Magiran, and SID. The checklists of STROBE have been applied to evaluate the quality of the reviewed data. A total of 35 relevant studies were extracted and evaluated. In most studies, the incidence of pediatric burns in male patients was more than female patients by 9.5 to 50 cases in 100,000 per children. Mortality rate of pediatric burn was between 1.7 and 18.5%. The most common cause of pediatric burn was hot water or other hot liquids. Pediatric burn in urban areas was higher and the highest number of pediatric burns occurred at home. Burn is considered as one of the major incidents related to children's health that required planning to reduce its incidence, especially in the lower age groups as well as male patients who are more active and susceptible to burn. (*J Burn Care Res* 2017;38:e944–e951)

Burn, considered as one of the most important incidents related to human health, causes several effects such as mortality, disability, pain, and physical, psychological, and economic problems.<sup>1,2</sup> Burn is in fourth place of unexpected incidents in the world ranking after road accidents, falls, and conflicts of people. According to the World Health Organization (WHO), more than 300,000 people died every year by burn and its consequences. Furthermore, 95% of mortality caused by burn happened in countries with low and moderate income.<sup>3</sup>

These damages are the most common pediatric injuries in the world affecting the victims and their families. Growing of these children impose physical and psychological problems, long pain, and high costs on families and government health systems.<sup>4,5</sup> Several mental and physical challenges of burn consequences prevent pediatric burn survivors to return normal life.<sup>6</sup> Although

burn injuries are mainly preventable, accurate and appropriate data are low and incomplete.<sup>7</sup> The type, extent, and causes of burn are different in various parts of the world. Studies have shown that parameters such as lifestyle, the energy source used in the workplace and life, and the social, economic, and cultural level of society can affect the amount and type of burn. Iran is one of the countries with high burn incidents and its tragic consequences, mortalities, and disabilities. Obviously, having enough information about the epidemiology of burn injuries can be used as a convenient and cost-effective solution to deal with the problems.<sup>8</sup>

Considering the importance of this issue and also lack of a systematic study on the epidemiology of pediatric burn in Iran, this study aimed to investigate the epidemiology of pediatric burn in Iran by using a systematic review. This study can be considered as a helpful tool to the nature and extent of pediatric burn in Iran, because it represents the comprehensive information to the relevant authorities for taking appropriate decisions and policies in order to prevent pediatric burn and reduce its costs.

## METHODOLOGY

This study has been conducted to determine the epidemiology of pediatric burn in Iran through a

From the \*Department of Epidemiology, School of Public Health, Shahid Beheshti University of Medical Sciences, Tehran, Iran; and †Clinical Research Development Center, Imam Khomeini and Mohammad Kermanshahi Hospitals, Kermanshah University of Medical Sciences, Iran.

Address correspondence to Abbas Aghaei, Department of Epidemiology, School of Public Health, Shahid Beheshti University of Medical Sciences, Tehran, Iran. Email: aqaei.a@gmail.com  
Copyright © 2017 by the American Burn Association  
1559-047X/2017

DOI: 10.1097/BCR.0000000000000524

systematic review. For this purpose, all published studies on the epidemiology of pediatric burn in under 15-year-old children from all provinces of Iran have been gathered without any time limitation.

### Inclusion and Exclusion Criteria of Studies

All published studies somehow related to the epidemiology of pediatric burn in Iran for under 15-year-old children have been investigated regardless of the type of study (cross-sectional, case-control, etc.), time of the study, and publication language.

### Outcome of the Review

The pediatric burn in under 15-year-old children were separately studied by the estimation of burn percentage using several methods such as differentiated by gender, location (urban and rural), location of the burn (home and away from home), the most common cause of burns, percentage and its position, season, the average length of stay (LoS), mortality rate, and the place and cause of death.

### Search Strategy

To achieve the aim of this study, national and international databases including Embase, SID, Magiran, Google Scholar, Iranmedex, PubMed, and ScienceDirect with the keyword of burn, injury or injuries, trauma,

and accidents with TBSA in general and specifically for children (infants, children, childhood, and pediatric) were reviewed. Furthermore, accepted articles have been reviewed to find additional studies. Quality of studies according to the procedure and reported ability has been evaluated to choose the validated studies by using STROBE checklist of cross-sectional studies comprising five sections and 20 titles.<sup>9</sup> The main criteria of this checklist to achieve the quality of articles were the location of study, date of study, accurate definition of disease, inclusion and exclusion criteria, the number of patients, main keywords, and sampling procedure.

### Selection of Studies

A total of 414 studies have been obtained from mentioned databases by two independent search teams. A total of 166 studies were diagnosed as related studies after repeating the search and re-reading the titles and abstracts of studies. Then, the data of 40 studies were extracted in the stage of reading full text of studies and simultaneous data extracting. However, the studies published under different names for two or more times or related to the all age subgroup without providing any data about pediatric burn have been excluded from the search. Finally, the related 35 studies are found and 11 studies of them specifically were conducted on pediatric burn (Figure 1).

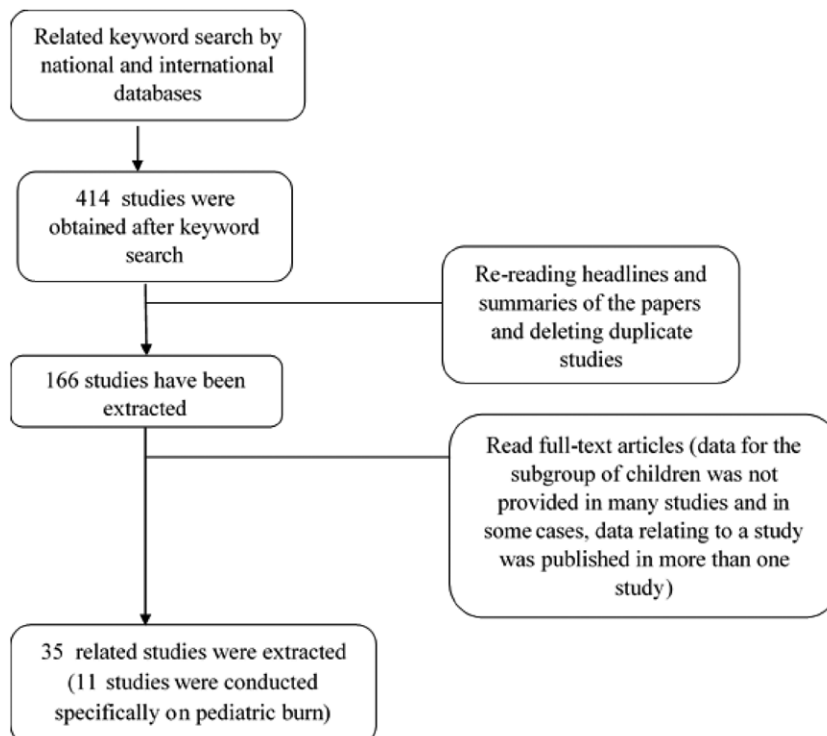


Figure 1. Presentation schematic of the steps of search and selection of studies.

## RESULTS

It should be noted that studies with different categorized groups of children such as under 16 years (study no. 31 in Table 1)<sup>10</sup> or under 18 years (study nos. 20 and 27 in Table 1)<sup>11,12</sup> also have been considered for the optimal use of the available information.

### Age

The average age was not reported in any of the studies on the status of pediatric burn among children under 1, 5, and 10 years. However, only the study conducted by Hakimi et al<sup>41</sup> in Rasht reported the average age of 30.63 months for pediatric burn in 1- to 6-year-old children. The highest and lowest average age among under 15-year-old children were 7.1 years (presented by Rastegar Lari et al<sup>16</sup> in Shiraz) and 3.28 years (presented by Samimi et al<sup>39</sup> in Tehran), respectively. Studies conducted in the provinces of Urmia,<sup>32</sup> Tehran,<sup>19</sup> and Kermanshah<sup>10</sup> reported the same average age between 5 and 6 years. Moreover, the average age was reported between 4 and 5 years for studies conducted in the provinces of Tehran from 2005 to 2009<sup>35</sup> and Hamedan from 2004 to 2007.<sup>15</sup> Finally, studies reported the same average age of 3 to 4 years for Tehran at 2010<sup>39</sup> and Rasht at 2008.<sup>38</sup>

### Gender Distribution

The percentage of pediatric burn incidents for male patients was higher than female patients found in all studies except Groohi et al<sup>17</sup> for 11- to 15-year-old subgroup in Kurdistan, Aghakhani et al<sup>32</sup> for 0- to 5-year-old subgroup in Western Azerbaijan, and Mohammadi-Barzelighi et al<sup>42</sup> for 0- to 15-year-old subgroup in Tehran. Most burns were reported among male patients of Tehran with 72.63%<sup>19</sup> and the least for Kurdistan with 36.29%.<sup>17</sup> Studies from 1995 to 2010 in Tehran<sup>11,19,27,35,39,40,42</sup> showed that fewer pediatric burn was reported for female patients in older studies unlike recent studies.

### Location (Urban–Rural)

The location of patients of burn injuries (rural or urban area) was not reported in the most studies. Eight of 35 reviewed studies reported whether the patients were from urban or rural areas. The rural pediatric burn patients were more than urban ones only in the two of these studies.<sup>13,15</sup> The ratio of pediatric burn patients from urban areas was reported 34.5 to 81.5, which is the lowest and highest ratios reported in the studies of Torabian et al<sup>15</sup> in Hamedan and Emir Alavi et al<sup>38</sup> in Rasht, respectively.

### Incidence Rate of Burn

The incidence rate of pediatric burn based on the number of burns in every 100,000 children of the same age was only reported in seven studies so that it was in the range of 5.9 to 50 cases per 100,000 children. The lowest and highest values of incidence rate were in the age subgroup of 6 to 10 years in Kurdistan (presented by Groohi et al<sup>17</sup>) and the age subgroup of under 15 years in Isfahan (presented by Rafii et al<sup>36</sup>).

### Percentage of Burn

Most reviewed studies used the laws of 9% and palm to calculate the burns percentage of TBSA. According to the 9% law, body is divided to parts comprised 9% of the body surface. The palm of each patient is 1% of their body in palm's law.<sup>45</sup> Using Lund and Browder charts is another method to calculate the percentage of body surface burn.<sup>45</sup> This method was used in two studies.<sup>30,39</sup> Rouzbahani et al<sup>30</sup> did not separately report the percentage of burn for body surface area in children and adult subgroups in Isfahan. However, in a study in under 15-year-old children in Tehran conducted by Samimi et al,<sup>39</sup> they showed that 58% of children had less than 20% body surface burn, and only 10% of them had burns more than 44%. The average percentage of body surface burn of children was reported from 4.95 to 52.59% in other studies by the laws of 9% and palm. The lowest and highest values of the average percentage of body surface burn of children for 11- to 15-year-old subgroup were in Yazd (Mirmohammadi et al<sup>12</sup>) and Sistan-Baluchestan (Shirkhoda et al<sup>34</sup>). In general, most studies reported the percentage of burn between 20 and 30%.

### Mortality Rate

Mortality rate of pediatric burn for under 15-year-old children was reported between 1.7 and 18.5% in the reviewed studies. The provinces of Gilan (presented by Emir Alavi et al<sup>38</sup>) and Sistan-Baluchestan (presented by Shirkhoda et al<sup>34</sup>) had the lowest and highest value of mortality rates, respectively. According to studies which reported the rate of mortality in all age subgroups, the highest percentage of mortality belong to Kurdistan (presented by Groohi et al<sup>17</sup>) in which the mortality rate for the age subgroups of 0 to 5, 6 to 10, and 11 to 15 years were 17.3, 13.3, and 37.1%, respectively. The mortality by gender was reported only in three studies. Alaghehbandan et al<sup>19</sup> showed that mortality rate in the subgroup of 0- to 15-year-old male patients (15.8%) was almost equal to their peers of female patients (16.8%). However,

Table 1. Some characteristics of the selected studies

	Reference	Province	Year of Study	Whole Sample	Sample of Pediatric	Age (yr)	Male Patients	Female Patients	Most Common Cause	Death (%)
1	Majlesi et al <sup>13</sup>	East Azarbygan	1990 (4 mo)	717	209	0-14	127	82		24 (11.5)
2	Stodenejad et al <sup>14</sup>	Kerman	1994	1000	550	0-15	326	224	Hot liquids (63.8)	
3	Torabian and Saba <sup>15</sup>	Hamedan	2004-2007	371	371	0-14	229	142	Scalds (71.7)	13 (3.5)
4	Lari et al <sup>16</sup>	Fars	1994-1998	760	760	0-15	441	319	Scalds (46.2)	131 (17.2)
5	Groothi et al <sup>17</sup>	Kurdistan	1994-2000	1089	213	0-5	126	87	Hot liquids (65.2)	37 (17.3)
		Kurdistan	1994-2000	1089	75	6-10	39	36		10 (13.3)
		Kurdistan	1994-2000	1089	124	11-15	45	79		46 (37.1)
6	Lari et al <sup>18</sup>	Tehran	1995-1997	3341	819	0-5				145 (17.7)
		Tehran	1995-1997	3341	635	6-15				89 (14)
7	Alaghebandan et al <sup>19</sup>	Tehran	1995-1998	1454	1454	0-15	1056	398	Scalds (56)	234 (16.1)
8	Ebrahimian <sup>20</sup>	Fars	1997	357	114	0-10			Hot liquids (64.9)	14 (12.3)
9	Maghsoudi et al <sup>21</sup>	East Azarbygan	1998-2001	2963	82	0-1	53	29		
		East Azarbygan	1998-2001	2963	869	2-9	525	343	Scalds (73.6)	54 (6.2)
10	Tabiei and Nakhaei <sup>22</sup>	South Khorasan	1998-2002	342	106	0-10	76	30		9 (8.5)
11	Khodadadi et al <sup>23</sup>	Kerman (Rafsanjan)	2000	194	194	0-15	114	80	Hot liquids (85.1)	
12	Koushyar et al <sup>24</sup>	Central Khorasan	2000-2002	2394	683	0-10	402	281		71 (10.3)
13	Amani et al <sup>25</sup>	Tehran	2001 (8 mo)	335	71	0-15			Scalds (69.6)	3 (4.2)
14	Ansari-Lari and Askarian <sup>26</sup>	Fars	2001	1493	616	0-15	355	261		
15	Hadian Jazi et al <sup>27</sup>	Tehran	2002	599	599	0-15	351	248	Thermal (98.5)	29 (4.8)
16	Rouzbahani et al <sup>28</sup>	Isfahan	2002	1085	465	0-15	278	187	Hot liquids (61.9)	32 (6.9)
17	Khoshkalam and Jamirzadeh <sup>29</sup>	West Azarbygan	2003	712	235	0-15			Hot liquids (62.1)	
18	Rouzbahani et al <sup>30</sup>	Isfahan	2003	1124	380	0-15	255	125	Hot liquids (48.9)	30 (7.9)
19	Ekrani et al <sup>31</sup>	Khuzestan	2003-2008	6082	1669	0-10	1037	632	Hot liquids (71.5)	
20	Taghavi et al <sup>11</sup>	Tehran	2004	4813	293	0-1	181	112	Hot liquids and vapor (40-74)	
		Tehran	2004	4813	467	2-6	253	214		
		Tehran	2004	4813	481	6-18	329	152		
21	Aghakhani et al <sup>32</sup>	West Azarbygan	2005	639	136	0-5	52	84	Hot liquids (69.8)	
		West Azarbygan	2005	639	76	6-15	39	37	Flame (82.9)	
22	Sasan et al <sup>33</sup>	Central Khorasan	2005 (6 mo)	1000	107	0.5-2			Hot liquids (40.2)	66 (18.5)
23	Shirkhoda et al <sup>34</sup>	Sistan and Baluchistan	2005-2008	1073	180	0-5	120	60	Scalds (48.5)	
		Sistan and Baluchistan	2005-2008	1073	69	6-15	37	32	Scalds (68.2)	92 (10.6)
24	Karimi et al <sup>35</sup>	Tehran	2005-2009	870	870	0-14	550	320	Hot liquids and vapor (51.9)	56 (5.6)
25	Rafi et al <sup>36</sup>	Isfahan	2007-2009	1014	1014	0-15	610	404	Hot water (57.8)	38 (4.9)
26	Aghakhani et al <sup>37</sup>	Tehran	2007-2011	1150	777	0-12			Scalds (62.2)	
27	Mirmohammadi et al <sup>12</sup>	Yazd	2008-2009	1947	725	0-18			Hot liquids (72)	7 (1.7)
28	Emir Alavi et al <sup>38</sup>	Gilan	2008-2009	413	413	0-15	220	193	Hot liquids (78)	4 (4)
29	Samimi et al <sup>39</sup>	Tehran	2009	100	100	0-15	66	34	Hot liquids (60)	
30	Karimi et al <sup>40</sup>	Tehran	2009	6910	1497	0-15	854	643	Hot liquids (79.4)	
31	Karami Matin <sup>10</sup>	Kermanshah	2010	105	105	0-16	62	43	Hot liquids (88)	4 (4.9)
32	Hakimi et al <sup>41</sup>	Gilan	2010	175	175	1-6	91	84	Hot water (59.7)	7 (2.3)
33	Mohammadi-Barzelighi et al <sup>42</sup>	Tehran	2010 (5 mo)	135	19	0-15	9	10		
34	Loghmani et al <sup>43</sup>	Isfahan	2010-2011	303	303	0-15	209	94		
35	Matin et al <sup>44</sup>	Kermanshah	2011	388	83	0-10	53	30	Hot liquids (87)	

the mortality rate of 0- to 15-year-old female patients (27%) was higher than their peers of male patients (14%) in Fars (presented by Lari et al<sup>16</sup>). According to the study of Groohi et al<sup>17</sup> in Kurdistan, the mortality rate of 0- to 5-year-old male patients (19.1%) was higher than their peers of female patients (14.9%), the mortality rate of 6- to 10-year-old male patients (12.8%) was almost equal to their peers of female patients (13.8%), and the mortality rate of 11- to 15-year-old male patients (13.3%) was much lower than their peers of female patients (50.6%). It can be seen from the results of Table 1 that the mortality rate reduced in recent studies when compared with the studies conducted in the 1990s.

### Location of Burn Incident

The location of pediatric burn incidents was reported in six studies which all of them reported houses as a place of pediatric burn incidents. Children's playground (street, alley, ...) and work place were other reported places of pediatric burn incidents. The houses with a range of 72 to 96% burn incidents were the most reported place in the reviewed studies with the minimum and maximum values of pediatric burn incidents reported in Tehran by Alaghebandan et al<sup>19</sup> and Samimi et al,<sup>39</sup> respectively. It should be noted that more than 90% of pediatric burn incidents were reported at houses by all reviewed studies<sup>13,23,35,38,39</sup> except the study by Alaghebandan et al.<sup>19</sup>

### Common Cause of Pediatric Burn

The most common cause of pediatric burn was hot water or hot liquid with the keywords of hot water, scald, and hot liquid in the studies, of which hot liquid was the most frequently used keyword. The highest and lowest percentage of pediatric burn with hot liquid was 87% (reported by Matin et al<sup>44</sup> for Kermanshah) and 40.2% (reported by Sasan et al<sup>33</sup> Central Khorasan county). Flame was the only cause with higher burn percent in comparison with hot liquid for 6- to 15-year-old subgroup by 51.3% in a study of Aghakhani et al<sup>32</sup> in West Azerbaijan province. Burn caused by flames, hot objects, oil materials, electricity, and gas explosions were next in the rankings after burn with hot liquid for children.

### Season of Pediatric Burn

The season of pediatric burn has been reported in five different studies. Spring, summer, and winter were reported in one study (Loghmani et al<sup>43</sup> in Isfahan by 28.87%), two studies (Emir Alavi et al<sup>38</sup> in Gilan by 34% and Karimi et al<sup>35</sup> in Tehran by 32.4%), and

two studies (Matin et al<sup>44</sup> in Kermanshah by 28.5% and Lari et al<sup>16</sup> in Shiraz by 36.8 %) as a most happened burns, respectively.

### Length of Stay

The average days of stay varied from 6.6 to 20.2 days in various studies. The provinces of Kermanshah (by Matin et al<sup>44</sup>) and Tehran (by Mohammadi-Barzelighi et al<sup>42</sup>) had the lowest and highest LoS, respectively.

## DISCUSSION

This study used systematic review method to determine the epidemiology of pediatric burn for under 15-year-old children in Iran. The authors reviewed the related studies in the early 2016 containing 35 relevant studies with published data from 1990 to 2011 in the provinces of Iran (as listed in Table 1). The average age for under 15-year-old children, who were suffering from burn, was between 3.28 and 7.1 years which was higher in comparison with most studies in non-Iranian populations. The average age of children with burn in South Africa (age range of 0 to 12 years),<sup>46</sup> China (age range of 0 to 14 years),<sup>47</sup> United Kingdom and Turkey (age range of 0 to 16),<sup>48,49</sup> were 2.3, 2.28, 3.72 and 4.07 years, respectively. In most studies, the pediatric burn in male patients was higher, and an increase of pediatric burn in female patients over time was observed by repeating some studies in a province (Tehran). The same studies also conducted in other parts of the world showed a high proportion of the burn in male patients. Burn percentage of male patients in South Africa,<sup>46</sup> China,<sup>47</sup> Netherlands (under 5 years),<sup>50</sup> Australia,<sup>51,52</sup> South Asia (India, Sri Lanka, Pakistan, and Bangladesh),<sup>53</sup> United Kingdom,<sup>48</sup> and Turkey<sup>49</sup> were 51, 60.63, 65, 53.33, 61.9, 54 to 70, 67, and 60%. The pediatric burn incidents are more common in male patients because they are daring and vibrant, and there is also the possibility that the families considered less limitation for male patients. In fact, the proportion of pediatric burn in female patients has been increasing by reducing the differences of opinion on child gender in recent years. Most studies showed that the percentage of pediatric burn in urban areas were more than rural areas which were consistent with the studies on the location of non-Iranian burn injuries.<sup>49</sup> These results can be explained by the fact that facilities and healthcare centers are more accessible in cities. Furthermore, the differences are the possibility of visits and registration information between the children of rural and urban areas. The pediatric burn incidence varied between

5.9 to 50 cases per 100,000 children so that this rate was similar to other reports in studies for non-Iranian children.<sup>51,54,55</sup> The average TBSA of reviewed studies varied from 4.95 to 52.59% which most of studies had the average between 20 and 30%. However, the average of TBSA were less than 15% in many studies on burn children in other countries.<sup>46,47,49,50</sup> Mehdi et al<sup>56</sup> showed that under 1-year-old children in Karachi had the average TBSA of 18.63%. Also 52.4% of under 15-year-old Australian children had the average TBSA more than 20% in the study of Abeyasundara et al.<sup>51</sup> The mortality rate ranged from 1.7 to 18.5% in the studies. Most studies conducted in other countries reported the mortality rate between 6.1 and 8.8%.<sup>46,49,52-54</sup> However, the mortality rate was reported from 13.9 to 29.3% in several studies conducted in India.<sup>53</sup> Most reported mortality rate has been reported in Sistan-Baluchestan<sup>34</sup> which it is economically one of the weakest regions in Iran.<sup>57</sup> The main reason for the high mortality rate in this province can be due to lack of facilities, health care centers, and low-economic power of households compared with other provinces. The location of pediatric burn incidents in all reviewed studies was the houses as same as the studies for non-Iranian children.<sup>50,54</sup> In a systematic review about the pediatric burn in South Asian countries, houses were reported as a place of burn incident in the range of 45 and 92.7% of burn cases.<sup>53</sup> The main cause of pediatric burn in reviewed studies was hot liquid scald. Then, flame was reported as the second cause of pediatric burn validated from the results of other studies.<sup>46-49,53,54,56</sup> It can be inferred from the results of studies of Aghakhani et al in Iran<sup>37</sup> and Arslan et al in Turkey<sup>49</sup> that the risk factor varied from hot liquids to flames by increasing the age of the children. The studies showed that the highest pediatric burn incidents were reported in spring and summer for central provinces (tropical climates) and in winter for western provinces (colder climates), respectively. This conclusion cannot be certainly verified, because all studies did not report the season of pediatric burn incidents. Spring was reported as the season with highest pediatric burn incidents in South Asia<sup>53</sup> and Australia,<sup>51</sup> but most pediatric burn incidents were reported in autumn and winter for China.<sup>47</sup> The average LoS varied from 6.6 to 20.2 days which was about the same range in the studies of other countries. The LoS for the Republic of South Africa,<sup>46</sup> Palestine,<sup>54</sup> Netherlands,<sup>50</sup> Turkey,<sup>49</sup> and South Asian countries<sup>53</sup> were 17.1, 11.45, 11.3, 19.6, and 16.9 to 27.6 days, respectively. Because the LOS of children with burns can be affected by factors such as age, percentage of TBSA, general comparison of different studies will not be flawless.<sup>56,58</sup>

## Strengths and Weaknesses of the Current Study

The standard method of the systematic review has been applied in this work for selecting the studies, checking the quality of studies, and extracting data by two independent teams. The selection of studies was restricted to articles published in journals with indexes of Embase, SID, Magiran, Google Scholar, Iranmedex, PubMed, and ScienceDirect. Therefore, some studies published in journals without an index, theses, and unpublished reports were not reviewed. As some studies were not conducted specifically on children, the parts of data for all age subgroups have not been reported in this study. Therefore, comparisons and reports have been limited to the studies presented different variables divided into age subgroups. Finally, outpatient and inpatient cases were not reported in some studies, so the authors decided to give general reports.

## CONCLUSION

Pediatric burn is considered as an important factor in morbidity and mortality of children. The pediatric burn incidents impose more burdens to the family, society, and particularly children who suffered from the lasting injury caused by burn. Presentation and implementation of the main governmental programs are required to prevent the pediatric burn (especially in pre-school age groups and male patients who are more active and susceptible to burn).

## ACKNOWLEDGMENTS

The researchers appreciate clinical research experts of Imam Khomeini hospital for their advice in the preparation of this article.

## REFERENCES

1. Anlatıcı R, Ozerdem OR, Dalay C, Kesiktaş E, Acartürk S, Seydaoğlu G. A retrospective analysis of 1083 Turkish patients with serious burns. Part 2: burn care, survival and mortality. *Burns* 2002;28:239-43.
2. Rouzbahani R, Zamany A, Omranifard M, Rouzbahani A, Faraj Zadegan Z, Rezaie F. Inpatients burns epidemiology in Imam Mosa Kazem Hospital Esfahan. *J Shahrekord Univ Med Sci* 2003;7:80-9.
3. Kumar S, Ali W, Verma AK, Pandey A, Rathore S. Epidemiology and mortality of burns in the Lucknow Region, India – a 5 year study. *Burns* 2013;39:1599-605.
4. Silfen R, Chemo-Lotan M, Amir A, Hauben DJ. Profile of the pediatric burn patient at the Schneider Children's Medical Center of Israel. *Isr Med Assoc J* 2000;2:138-41.
5. Morrow SE, Smith DL, Cairns BA, Howell PD, Nakayama DK, Peterson HD. Etiology and outcome of pediatric burns. *J Pediatr Surg* 1996;31:329-33.
6. Moore P, Moore M, Blakeney P, Meyer W, Murphy L, Herndon D. Competence and physical impairment of

- pediatric survivors of burns of more than 80% total body surface area. *J Burn Care Rehabil* 1996;17(6 Pt 1):547-51.
7. Albertyn R, Bickler SW, Rode H. Paediatric burn injuries in Sub Saharan Africa – an overview. *Burns* 2006;32:605-12.
  8. Heggers JP, Hawkins H, Edgar P, Villarreal C, Herndon DN. Treatment of infections in burns. In: Herndon DN, editor. *Total burn care*. 2nd ed. Philadelphia: Saunders Elsevier; 2002. p. 120-69.
  9. Vandembroucke JP, von Elm E, Altman DG, et al. Strengthening the Reporting of Observational Studies in Epidemiology (STROBE): explanation and elaboration. *Ann Intern Med* 2007;147:W163-94.
  10. Karami Matin B, Rezaei S, Kazemi Karyani A. Factors associated with length of stay and hospital charges among pediatric burn injury in Kermanshah, West of Iran. *Int J Pediatr* 2015;3:403-9.
  11. Taghavi M, Rasouli MR, Boddouhi N, Zarei MR, Khaji A, Abdollahi M. Epidemiology of outpatient burns in Tehran: an analysis of 4813 cases. *Burns* 2010;36:109-13.
  12. Mirmohammadi SJ, Mehrparvar AH, Jalilmanesh M, Kazemeini K, Delbari N, Mostaghaci M. An epidemiologic survey on burns in Yazd from 2008 till 2009. *Acta Med Iran* 2012;50:70-5.
  13. Majlesi F, Poursan R, Shekarvash B. Assessment of injuries in under fifteen children in Tabriz city. *Iranian Health Magazine* 1991;20:43-52.
  14. Stodenejad A, Janghorbani M, Delshad M. Epidemiology of burn in Kerman, assessing of 1000 case. *Kerman Univ Med Sci J* 1995;2:128-34.
  15. Torabian S, Saba MS. Epidemiology of paediatric burn injuries in Hamadan, Iran. *Burns* 2009;35:1147-51.
  16. Rastegar Lari A, Panjeshahin MR, Talei AR, Rossignol AM, Alaghebandan R. Epidemiology of childhood burn injuries in Fars province, Iran. *J Burn Care Rehabil* 2002;23:39-45.
  17. Groohi B, Alaghebandan R, Lari AR. Analysis of 1089 burn patients in province of Kurdistan, Iran. *Burns* 2002;28:569-74.
  18. Lari AR, Alaghebandan R, Nikui R. Epidemiological study of 3341 burns patients during three years in Tehran, Iran. *Burns* 2000;26:49-53.
  19. Alaghebandan R, MacKay Rossignol A, Rastegar Lari A. Pediatric burn injuries in Tehran, Iran. *Burns* 2001;27:115-8.
  20. Ebrahimian M. The cause and mortality of burns in hospitalized patients in Gotbaddine-Shirazi Hospital. *J Qazvin Univ Med Sci* 2000;3:97-102.
  21. Maghsoudi H, Pourzand A, Azarmir G. Etiology and outcome of burns in Tabriz, Iran. An analysis of 2963 cases. *Scand J Surg* 2005;94:77-81.
  22. Tabiei S, Nakhaei M. Epidemiology of burns patients in Imam Reza (AS) hospital, Birjand (1998-2004). *J Shahrekord Univ Med Sci* 2004;6:43-51.
  23. Khodadadi H, Asadpour M, SHabanizade A. The epidemiologic assaying of burns accidents in children referring to emergency center of Rafsanjan medical sciences university. *J Community Health* 2006;1:8-15.
  24. Koushyar H, Amouzgar M, Shakeri M. The epidemiology of burns in Mashhad Imam Reza burn center (MIRBC). *Horizon Med Sci* 2004;10:43-50.
  25. Amani L, Soleymanzadeh Moghadam S, Roudbari M, Roustapoor R, Armat M, Rastegar Lari A. Epidemiology and mortality of burned patients referred to Motahari Hospital, Tehran. *Razi J Med Sci* 2015;21:31-8.
  26. Ansari-Lari M, Askarian M. Epidemiology of burns presenting to an emergency department in Shiraz, South Iran. *Burns* 2003;29:579-81.
  27. Hadian Jazi M, Sajedi F, Sanei Y. The incidence of electrical, chemical and thermal burns in children and adolescents referred to Mottahari Hospital in Tehran in 2002. *Razi J Med Sci* 2004;11:861-6.
  28. Rouzbahani R, Omranifard M, Rouzbahani A, Barkhordari M. An epidemiological study on burned patients admitted in the burn hospital in Isfahan province, Iran in 2002. *Rawal Med J*. 2004;29:13-7.
  29. Khoshkalam M, Jamirzadeh J. The epidemiological study of burned patients in West Azarbalian (1382). *J Urmia Nurs Midwifery* 2004;2:112-26.
  30. Rouzbahani R, Zamani A, Omranifard M, Rouzbahani A, Faraj Zadegan Z, Rezaei F. An epidemiologic study of patients admitted in Imam Musa Kazim (AS) in Isfahan in 1382. *J Shahrekord Univ Med Sci* 2005;7:79-89.
  31. Ekrami A, Hemadi A, Kalantar E, Latifi M, Kayedani A. Epidemiology of hospitalized burn patients during 5 years in Khuzestan province, Iran. *Arch Clin Inf Dis* 2010;5:40-4.
  32. Aghakhani N, Rahbar N, Feizi A. Epidemiology of burn injuries in west Azerbaijan province, Western Iran. *Iran Red Crescent Med J* 2009;11:85-9.
  33. Sasan M, Baikzade E, Saeidi Nejat S, Deldar K, Khaje Doloei M. Epidemiology of 6-24 months infants and toddlers. *Med J Mashhad Univ Med Sci* 2011;54:201-6.
  34. Shirkhoda M, Far KK, Narouie B, Shikhzadeh A, Rad M, Bojd H. Epidemiology and evaluation of 1073 burn patients in the southeast of Iran. *Shiraz E Med J* 2011;12:11-21.
  35. Karimi H, Montevalian A, Motabar AR, Safari R, Parvas MS, Vasigh M. Epidemiology of paediatric burns in Iran. *Ann Burns Fire Disasters* 2012;25:115-20.
  36. Rafii MH, Saberi HR, Hosseinpour M, Fakharian E, Mohammadzadeh M. Epidemiology of pediatric burn injuries in Isfahan, Iran. *Arch Trauma Res* 2012;1:27-30.
  37. Aghakhani K, Mohammadi S, Molanaei A, Memarian A, Ameri M. Epidemiologic study of scald burns in victims in Tehran burn hospital. *Tehran Univ Med Sci* 2013;71:452-7.
  38. Emir Alavi S, Tolouei M, Shodjajei H, Kouchakinejad L. Epidemiology of childhood burns in children referred to Velayat Burn University Hospital of Rasht during 2008-9. *KAUMS J (FEYZ)* 2011;14:512-9.
  39. Samimi R, Fatemi M, Soltani M. The epidemiological assessment of burn injuries in children admitted to Mottahari Hospital, Tehran, 2009-2010. *Iranian J surgery* 2011;19:1-6.
  40. Karimi H, Motevalian SA, Momeni M. Epidemiology of outpatient burns in Iran: an update. *Ann Burns Fire Disasters* 2014;27:115-20.
  41. Hakimi H, Shafipoor Z, Akbari A, Kazemnezhad Leili E. Characteristics of burn children in Guilan Province. *J Holist Nurs Midwifery* 2012;22:9-15.
  42. Mohammadi-Barzelighi H, Alaghebandan R, Motevallian A, et al. Epidemiology of severe burn injuries in a Tertiary Burn Centre in Tehran, Iran. *Ann Burns Fire Disasters* 2011;24:59-62.
  43. Loghmani S, Tavallaie M, Haddadi F. Epidemiologic features of children with burns admitted to Imam Musa Kazem Hospital, Isfahan, Iran. *J Isfahan Med School*. 2012;29:1-7.
  44. Matin BK, Matin RK, Joybari TA, Ghahvehei N, Haghgi M, Ahmadi M, et al. Epidemiological data, outcome, and costs of burn patients in Kermanshah. *Ann Burns Fire Disasters* 2012;25:171-7.
  45. Granger J, Estrada C, Abramo T. An evidence-based approach to pediatric burns. *Pediatr Emerg Med Pract* 2009;6:1-18.
  46. den Hollander D, Albert M, Strand A, Hardcastle TC. Epidemiology and referral patterns of burns admitted to the Burns Centre at Inkosi Albert Luthuli Central Hospital, Durban. *Burns* 2014;40:1201-8.
  47. Zhu L, Zhang H, Shi F, Yi D, Zhu G. Epidemiology and outcome analysis of scalds in children caused by "guo lian kang": an 11-year review in a burn center in China. *Burns* 2015;41:289-96.
  48. Kemp AM, Jones S, Lawson Z, Maguire SA. Patterns of burns and scalds in children. *Arch Dis Child* 2014;99:316-21.

49. Arslan H, Kul B, Derebaşınlioğlu H, Çetinkale O. Epidemiology of pediatric burn injuries in Istanbul, Turkey. *Ulus Travma Acil Cerrahi Derg* 2013;19:123–6.
50. Bakker A, van der Heijden PG, van Son MJ, et al. The relationship between behavioural problems in preschool children and parental distress after a paediatric burn event. *Eur Child Adolesc Psychiatry* 2014;23:813–22.
51. Abeyasundara SL, Rajan V, Lam L, Harvey JG, Holland AJ. The changing pattern of pediatric burns. *J Burn Care Res* 2011;32:178–84.
52. Duke JM, Rea S, Boyd JH, Randall SM, Wood FM. Mortality after burn injury in children: a 33-year population-based study. *Pediatrics* 2015;135:e903–10.
53. Golshan A, Patel C, Hyder AA. A systematic review of the epidemiology of unintentional burn injuries in South Asia. *J Public Health* 2013;35:384–96.
54. Elsous A, Ouda M, Mohsen S, et al. Epidemiology and outcomes of hospitalized burn patients in Gaza Strip: a descriptive study. *Ethiop J Health Sci* 2016;26:9–16.
55. Sharma PN, Bang RL, Al-Fadhli AN, Sharma P, Bang S, Ghoneim IE. Paediatric burns in Kuwait: incidence, causes and mortality. *Burns* 2006;32:104–11.
56. Mehdi SZ, Nizam M, Khan AH, Kumari V, Buksh AR. Duration of hospital stay in infantile burn: a retrospective study conducted at tertiary care hospital. *Ann Abbasi Shaheed Hospital Karachi Medical Dental College* 2015;20:142–47.
57. Farhadian M, Mahjub H, Sadri G, Aliabadi M. Ranking health status of children in Iran's provinces and assessing its relation with socio-economic indicators. *Hakim Research Journal* 2010;13:108–14.
58. Doud AN, Swanson JM, Ladd MR, Neff LP, Carter JE, Holmes JH. Referral patterns in pediatric burn patients. *Am Surg* 2014;80:836–40.