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Epidemiology and Severity of Burns in Children: A Study in Ilam (2015-2019)

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A B S T R A C T

Introduction: Burn injuries represent a prevalent concern among children, often resulting in irreversible complications. Hence, this study aimed to investigate the epidemiology and severity of burns in children under 12 years of age admitted to Imam Khomeini Hospital in Ilam from 2015 to 2019.

Material & Methods: This retrospective descriptive study examined the medical records of 150 children under 12 years old admitted to Imam Khomeini Hospital in Ilam with burn injuries between 2015 and 2019. Data were collected through chart reviews and interviews with the patients' families, and analyzed using SPSS v-19.

Results: The majority of burn cases occurred in children under three years old (61.3%, 92 individuals), with more than half being boys (55.3%, 83 individuals). Second-degree burns accounted for 87.3% (131 individuals) of cases, with approximately 80% (120 individuals) involving burns covering 1-20% of the body surface area. Hot liquids were the leading cause of burns (79.9%, 119 individuals), and 84% (126 individuals) of burns occurred in enclosed spaces. Only 18.7% (122 individuals) of cases required hospitalization, with no fatalities reported.

Conclusion: Preventive measures targeting young children, particularly those under three years old, and boys, given their active nature, are crucial in reducing burn incidents. Additionally, addressing factors such as the availability of combustible materials, particularly hot liquids, through educational programs can significantly contribute to burn prevention efforts.

Keywords: Burns, Epidemiology, Child

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Introduction

Burn injuries are among the most common unexpected injuries that have caused problems for societies around the world (1, 2). Burn is considered one of the most important incidents threatening human health, causing numerous and irreparable complications such as pain, physical, psychological, and economic problems, and death (1). Fire and burns are among the most important causes of disability and death globally, with children under the age of 14 suffering the most in this regard (3). Burn is ranked fourth in the global ranking of unexpected events (4). According to the official statistics announced by the World Health Organization, more than 300,000 people die every year due to burns and their effects (4). Additionally, 95% of burn deaths are reported in low and middle-income countries (1). Injuries caused by burns are among the most common injuries among children globally, resulting in significant psychological consequences for both victims and their families (5). Most of these children suffer from many problems, including long-term pains, physical and psychological issues, as well as imposing high costs on families and health systems (3, 5). Many of these children require long-term treatments, rehabilitation, and frequent surgical interventions, which are financially burdensome for those affected (6). In England, the cost of small burns (2-4% of the total body surface) is estimated to be around 1850 pounds (7), while the social costs of deaths and complications caused by children's burns are estimated at 305 billion dollars (8). Unfortunately, these injuries and psychological complications resulting from burn consequences may hinder children from returning to normal life (1). Although injuries and damages following burns are mostly preventable, accurate information and data about the effective factors in burns are scarce and insufficient (9, 10).

The severity and causes of burns vary across different regions of the world (1). Studies suggest that various factors, including lifestyle, societal, economic, and cultural factors, can influence the severity and types of burns (1). Recent research indicates that several factors, such as knowledge levels regarding burn prevention and care, education, income, supervision, and even household characteristics, significantly contribute to burn occurrences in children (6). A study's findings reveal that children of parents who have never worked or experienced prolonged unemployment face a death rate approximately 37 times higher due to exposure to smoke, fire, and flames compared to children of parents with high-level managerial or professional jobs (11). Additionally, certain physical and social factors, such as housing, child dependency, and socio-economic status, are identified as fundamental determinants in pediatric burn occurrences requiring hospitalization (12). Analyzing burns and identifying their causes are crucial, particularly in the treatment of chemical burns. Iran exhibits the highest prevalence of burns among children compared to other age groups, with approximately 3,000,000 cases occurring annually. Nearly 50% of all burns in Iran occur in individuals under the age of 16, with 72% attributed to burns caused by hot liquids (13).

Iran stands among countries with high statistics regarding the occurrence of burn accidents and their devastating consequences, including disability and death (1). Having adequate information regarding the investigation of causes and etiology of injuries, especially burn incidents in children, is crucial in addressing and preventing these issues. Children constitute one of the high-risk groups vulnerable to burns, and their well-being is pivotal as they represent the national and human capital of any country. Considering that the effects of burns on children can sometimes be irreversible, conducting further studies in this area is imperative. Therefore, this study aimed to investigate the epidemiology, and severity of burns in children under 12 years of age hospitalized at Imam Khomeini Hospital in Ilam from 2015 to 2019.

Materials and methods

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This retrospective descriptive study examined the medical records of 150 children under the age of 12 who were admitted to Ilam Imam Khomeini Hospital for burn injuries between 2015 and 2019. All medical files of children with burns treated at the hospital were collected. Subsequently, utilizing a researcher-designed checklist and interviews with patients' companions, necessary information was obtained. Inclusion criteria encompassed all children under 12 years old referred to the hospital due to burns, while those with non-burn-related primary referrals or missing data in their files were excluded from the study. This project has been approved by the Student Research Committee of Ilam University of Medical Sciences with the ethics code of IR.MEDILAM.REC.1400.122.

The intended data encompass various demographic and clinical factors, including age, gender, place of residence, parental occupation, level of education, and income level. Additionally, parameters such as the death rate due to burns, degree of burns, cause of burns, need for hospitalization, percentage of hospitalizations in the intensive care unit with deterioration in patients' conditions, occurrence of burns in open or closed places, and type of heating device at home (e.g., heaters, oil lamps, central heating systems, water heaters) are included. Qualitative variables were represented as percentages. The calculated estimates were reported with a 95% confidence interval. All analyses were conducted using SPSS v-19.

Results

Table 1 presents the demographic characteristics of the study participants. The findings reveal that the majority of mothers (34.7%) and fathers (39.3%) of children with burns had attained a high school diploma. Most burn cases occurred in children under the age of 3 (61.3%), with boys comprising more than half of the cases (55.3%), and 58.7% residing in urban areas. Additionally, 39.3% of parents were self-employed, while only 22.6% of families earned over 60 million Rials per month. Family size was typically 4 members in 43% of cases, and 43.3% of children with burns were firstborns in their families.

Table 2 depicts the distribution of variables associated with burns in children. The data indicate that the majority of cases involved second-degree burns (87.3%), with approximately 80% of cases exhibiting burn percentages between 1 and 20%. The distribution of burn degree and percentage is illustrated in Figure 1. Hot liquids were identified as the most common cause of burns (79.9%), and over 84% of burns occurred in enclosed environments, with 18.7% necessitating hospitalization

Table 1. Demographic Characteristics of Participants Based on Medical Record Documentation.

Variable		Number (%)	Confidence interval (95%)
Mother's educational level	Illiterate	18 (12)	6.7-17.3
	Elementary	35 (23)	30.2-16.5
	Junior high school	20 (13.3)	18.8-7.8
	High school diploma	52 (34.7)	26.9-42.4
	Academic	25 (16.7)	22.7-10.6
Father's educational level	Illiterate	15 (10.0)	16.1-6.1
	Elementary	28 (18.67)	25.8-13.2
	Junior high school	21 (14.0)	20.6-9.3
	High school diploma	59 (39.3)	47.5-31.8
	Academic	27 (18.1)	25.1-12.6
Age	<3	92 (61.3)	69.2-53.4
	3-6	38 (25.3)	32.4-18.3
	6-9	18 (12)	6.7-17.3
	9-12	2 (1.3)	4.7-0.2

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Gender	Female	67 (44.7)	52.0-36.6
	Male	83 (55.3)	63.4-47.3
Place of residence	Urban	62 (41.3)	49.3-33.4
	Rural	88 (58.7)	66.6-50.7
Job	Self-employed	59 (39.3)	47.5-31.8
	Office worker	19 (12.7)	19.1-8.2
	Farmer or Stockbreeder	31 (20.7)	28.0-14.9
	Construction worker or Driver	41 (27.3)	35.1-20.7
Income (million Rials)	< 25	19 (14.3)	20.3-8.3
	25-40	54 (40.6)	49.1-32.1
	40-60	30 (22.6)	29.8-15.4
	> 60	30 (22.6)	29.8-15.4
Family members	3	45 (30.0)	37.4-22.6
	4	65 (43.0)	51.4-35.31
	5	28 (18.7)	25.0-12.4
	6 ≤	12 (8.0)	13.6-4.2
Birth rank	1	65 (43.3)	51.4-35.3
	2	63 (42.0)	50.0-34.0
	3	14 (9.3)	14.1-4.6
	4 ≤	8 (5.3)	10.3-2.3

Table 2. Distribution of Variables Related to Burns in Children.

Variable		**Number (%)**	**Confidence interval (95%)**
Degree of burn	1	3 (2.0)	0.6-6.1
	2	131 (87.3)	80.9-91.8
	3	16 (10.7)	6.6-16.8
Burn percentage (severity)	1-20%	120 (80)	73.5-86.5
	20-40%	28 (18.7)	12.4-24.9
	40-60%	2 (1.3)	0.2-4.7
Cause of burn	fire	25 (16.8)	10.7-22.8
	Hot liquids	119 (79.9)	73.4-86.4
	Hot objects	5 (3.7)	0.4-6.3
Place of incidence	Indoors	126 (84)	78.1-89.9
	Outdoors	24 (16)	10.1-21.9
Heating device	Fireplace	1 (0.7)	1.7-3.7
	Heater	107 (71.3)	64-78.7
	Water heater	3 (2)	0.41-5.7
	Oil lamp	39 (26)	18.9-33.1
Need for hospitalization	Yes	122 (81.3)	75.1-87.6
	No	28 (18.7)	12.4-25
Burn complication	Death	0 (0)	0-2.4
	Survival	150 (100)	97.6-100

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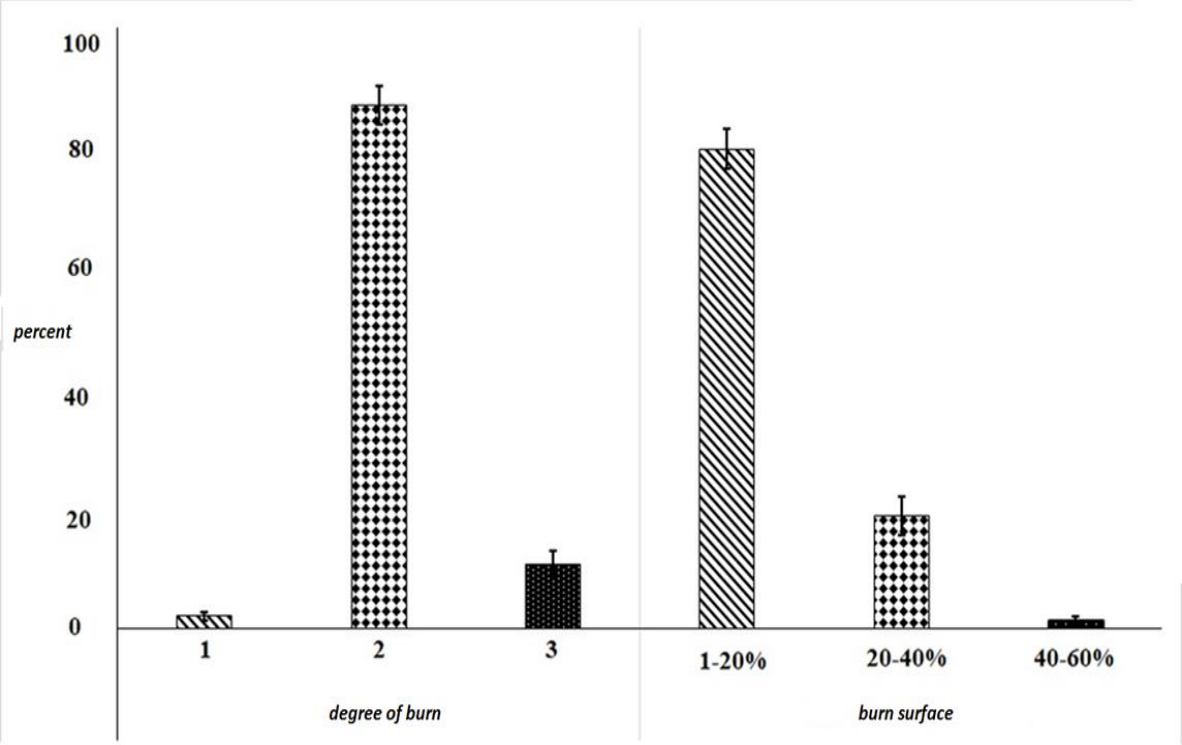


Figure 1. Distribution of Degree and Surface of Burns in Investigated Children

Discussion

The imperative to prevent burn injuries, particularly in children, underscores the significance of investigating the prevalence and causes of such incidents. In this study, the highest incidence of burns was observed in children under 3 years old, with no reported fatalities. In a study conducted by Amir Alavi et al. in Tehran (2002), the highest number of burns occurred in children under 5 years old, with a mortality rate of 4.8% (10). Our findings revealed that 61.3% of burns occurred in children under 3 years old, while the rates for children aged 3-6 years and 9-12 years were 25.3% and 1.3%, respectively. These results align with those of studies conducted by Dehghani et al. in 2016 (13) and Asuquo et al. in 2009, indicating a decline in burn incidence with increasing age among children (14). Additionally, findings from a study by Hashemi et al. (2021) revealed that the majority of burn cases (72%) occurred in children aged 1-3 years old. This trend could be attributed to the inherent curiosity of children at this age, often disregarding potential dangers and risks of injury (15). Furthermore, our study demonstrated that more than half of the hospitalized children were boys, consistent with results from studies by Dehghani et al. (2017) and Natterer et al. (2009), which also highlighted a higher prevalence of burns among boys compared to girls (13, 16). However, contrasting results were reported in a study by Biria et al. (2016), which found that burns were more common in girls under 7 years old than in boys (17). This discrepancy may stem from variations in factors influencing burn incidents across different regions of the world.

In this study, hot liquids were identified as the most common cause of burns (79.9%). Consistently, research by Torabian et al. (2009), Celko et al. (2009), Dehghani et al. (2018), and Maqsoudi et al. (2004) has highlighted hot liquids as the predominant cause, often attributed to children's access to containers containing such liquids (18, 14, 13, 24). Furthermore, findings from Poulos et al. (2009) underscored the significance of environmental factors, with individual characteristics such as single parenthood, young

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parental age, low parental education, large household size, parental negligence, and use of unsafe environments being key contributors to children's burn injuries (3).

The study also revealed that second-degree burns constituted the majority of hospitalized cases, with approximately 7-10% attributed to third-degree burns. These findings align with those of studies by Amir Alavi et al. (2019) and Dehghani et al. (2016), reporting second-degree burn rates of 79% and 69.7%, respectively (10, 13). Moreover, the analysis indicated that the most prevalent burn surface area ranged from 1-20%, with less than 2% of patients experiencing a burn surface area of 40-60%. These observations are consistent with findings from studies by Kumar et al. (2006) and Dehghani et al. (2017) (4, 13).

In this study, the mortality rate was reported to be 0%, which fortunately is lower than the mortality rates reported in other studies. For instance, Hashemi et al. (2021) reported a mortality rate of 4%, while Ahmed et al. (1998) reported a mortality rate of 3.4% (15, 20). This disparity may be attributed to timely referrals and the quality of healthcare services provided.

Furthermore, the study found that the majority of burn cases (58.7%) occurred in urban children, consistent with findings from Hashemi et al. (2021) and Majlesi et al. (1992). However, Shokroush et al. (1997) reported that most burn cases occurred in rural-residing children (21).

One potential reason for the higher incidence of burn cases in urban areas may be the easier access to burn centers and specialized medical services. Among parents, the most common educational level was a high school diploma for both mothers (34%) and fathers (39%). Self-employment emerged as the most frequent occupation, with the majority earning less than 60 million Rials per month. The income level of parents can significantly influence the availability of suitable heating equipment and childcare practices.

A study by Dehghani et al. (2017) found a significant relationship between parents' income level and the occurrence of burns in children, with children from families earning less than 200 thousand Tomans per month being 3.43 times more likely to experience burns compared to those from families with higher incomes (13). Sixty-five percent of families consisted of four members, and the majority of burn cases occurred among firstborns (65%) and secondborns (63%).

Furthermore, 84% of burn incidents occurred in enclosed spaces, consistent with findings from studies by Amir Alavi et al. (2019) and Mashreky et al. (2008), which reported that a large majority of burns occurred indoors (10, 22). Celko et al. (2008) also noted that the kitchen was the most common site for burns in children (23). Approximately 18.7% of burn cases required hospitalization, with outpatient treatment accounting for the majority (81.3%), suggesting that most burns are managed without hospitalization.

Moreover, heaters were the most commonly used heating device in homes, potentially contributing to an increased risk of thermal burns.

Conclusion

In conclusion, preventing burns in children requires focused attention on several key factors. Particularly, emphasis should be placed on young children, especially those under 3 years old, who are more susceptible due to their innate curiosity. Additionally, considering the active nature of boys, tailored preventive measures are essential. Ensuring the unavailability of combustible materials, such as hot liquids, is vital in reducing burn incidents among children.

To effectively tackle these challenges, implementing preventive training programs is imperative. These initiatives can educate both children and caregivers on burn prevention strategies, safe practices, and

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appropriate responses in burn-related emergencies. By raising awareness and promoting safety measures, such programs can significantly reduce the risk of burns and protect the well-being of children.

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Conflict of interest

The authors declare no conflicts of interest.

Authors' contributions

Study concept and design: AB, EGh; data analysis and interpretation: FH, AB; manuscript drafting: AB, PH, NJ; critical manuscript revision: AB, SK; statistical analysis: FH.

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