

TITLE OF THE ARTICLE: THE INCIDENCE OF PEDIATRIC BURNS IN A TERTIARY CARE HOSPITAL- A RETROSPECTIVE 5 YEARS STUDY.

1. Dr. Kabita Kalita (Prof & Head) Department of Plastic Surgery, Gauhati Medical College & Hospital, Guwahati.

2. Dr. Poresh Baruah (Associate professor) Department of Plastic Surgery, Gauhati Medical College & Hospital, Guwahati.

3. Dr. Sarabjot Singh Anant, Senior Resident, Department of Plastic Surgery, Gauhati Medical College & Hospital, Guwahati.

4. Dr. Jyotirmay Baishya, Assistant professor, Department of Plastic Surgery, Gauhati Medical College & Hospital, Guwahati.

5. Dr. Dibyajoti Bora, Registrar, Department of Plastic Surgery, Gauhati Medical College & Hospital, Guwahati.

Corresponding author:

Dr. Sarabjot Singh Anant

Senior resident, Department of Plastic Surgery, Gauhati Medical College, Guwahati, 781005.

Email id: sarabjot.singh48@gmail.com

Abstract :

Background Pediatric burns are a significant international public health problem. Developing and developed countries report similar challenges regarding paediatric burn prevention programs. The study was done to analyse the burn mechanism, the age and circumstances in which children are burned, as well as their home environment variables. Retrospective study also identifies demographics, etiologies, and mortality risk factors.

Methods and Materials This retrospective study included 344 children with age 0 to 15 years of age who were admitted in Burn Unit of GMCH of Guwahati with different etiologies of burn from 1st January 2017 to 31st December 2021. Study started after taking ethical clearance from ethical committee, the records from burn department of GMCH during this period of time.

Results Common age group admitted to burn Icu were 1-5 years which accounted for 43% of total admitted children followed by children with age group of 0-1 year (30%). The most common etiology of burns were found to be scald injuries (57%) followed by flame burns (30%). Maximum number of burns incidents took place in month of November (n=56, 16.2%) followed by January (n=54, 15.6%) and December (n=52, 15.1%).

Conclusions Children should be taken care by parents or guardian specially those who are age group of 1-5 years as these are actively mobile but unaware of the danger they face. Parents should be given education and awareness about the prevention of burns in children.

Keywords pediatric burns, scalds, age group, body surface area.

Introduction

Burns are the fifth most frequent type of non-fatal injury in kids.¹ Burns are now a major public health hazard on a global scale, affecting not just one population or area.² They

are terrible wounds that have an impact on a patient's emotional health and quality of life. According to the World Health Organization, burns caused by fire kill more than 300,000 people each year.³The most typical kind of paediatric burn is a scald, which is followed by flame, contact, chemical, etc.²Burn incidence appears to be highly correlated with regional economic growth. Lower middle income countries have a substantially greater rate of paediatric burns (e.g., Southeast Asia and Africa).⁴Young children are naturally curious and are frequently drawn to the vapour from hot liquids or water.

It's possible that they won't realise how dangerous being burned is until it's too late. Although there are wide variances in the ages of burn injury patients, international research shows that the 0–5 year age group had the highest incidence.^{5,6} Due to children's impulsivity, lack of awareness, increased activity levels, innate curiosity, and complete dependence on their caretakers, burn injuries are more common in this age range.^{7,8} The data presented in this study will provide the idea and clarity of paediatric burn in state of Assam and to improve the strategies to prevent the burns.

Aims and objectives

1. To study the epidemiology of burns in children aged 0-15 years.
2. To study the demographics of paediatric burns.
3. To study the etiology, mechanism, degree and percentage of burns.

Material and methods

The retrospective study will include children aged 0-15 years who were admitted to the Burns Unit of the GMCH, Guwahati with burn injury between 1st January 2017 to 31st December 2021. The records were collected from the department after getting the ethical clearance from the committee. Age, Gender, Etiology and other demographic details were studied. Burns were assessed in terms of depth of burns, percentage of burns. Geographical data was collected as if rural or urban background of burnt children, place of incident and month wise admissions of children. Details were gathered from the charts and diagrams in patients' record. Lund and Browder chart was used to calculate the percentage of burn after clinical assessment of burn. This study didn't include the treatment part. As this is a retrospective study, we didn't include photographs. The record of mortality, morbidity and risk factors were not included in this study. The quantitative data was summarised in tables, charts and graphs using descriptive statistics.

Results

The results are derived from the data collected from 1st January 2017 to 31st December 2021. A total of 344 children were admitted in Burn unit under Plastic Surgery Department, Gauhati Medical College, Guwahati with different etiologies of burns.

1. AGE WISE DISTRIBUTION

The most common age group admitted to burn ICU were 1-5 years which accounted for 43% of total admitted children followed by children with age group of 0-1 year (30%). The mean age of children with burns were 36 months or 3 years. [Table 1.1]

2. SEX DISTRIBUTION

Out of total children admitted to burn icu; male children were 193 and female children were 151. This accounted for 56% and 44% respectively.[Figure 1.1]

3. ETIOLOGY

The most common etiology of burns were found to be scald injuries(57%) followed by flame burns(30%). The scald injuries were found to be more in toddlers with mean age of 18 months. The common mechanism found in these age groups children was spillage of hot liquids and food over themselves. Second factor was found to be fall in bonfires during winters(flame burns).

Apart from this thermal contact burns were found in 26 childrens(8%). While other causes for burns were found to be chemical burns,electric burns and motor bike silencer burns(5%).[Table 1.2]

4. BODY PERCENTAGE BURNS (BODY SURFACE AREA)

Out of 344 children; 192 (56%) were counted in group of 10-20% body surface area burns. It was followed by 104 children (30%) who had >20% body surface area burns. In remaining instances,30 and 14 children had burns that cover 5-10% and 1-5% of their body surface area. [Table 1.3]

5. GEOGRAPHIC AREA AND PLACE OF INCIDENT

It was found that majority of burn children belong to rural population (80%) and urban population accounts for 20% of total cases. Indoor burn incidents were most commonly occurred in kitchens (40%) and in bathrooms (30%). Playgrounds,parties or markets were the scenes for outdoor burns accidents in children,which were responsible for 18 % and 12% respectively.[Figure 1.2]

6. DEPTH OF BURNS

Maximum number of children had second degree superficial burns (n=202, 62%) followed by second degree deep burns which accounts for 28%(n=92).

Only 5 and 25 children had first degree and third degree burns respectively.[Table 1.5]

7. MONTH WISE DISTRIBUTION OF BURNS

Maximum number of burns incidents took place in month of November (n=56,16.2%) followed by janauary (n=54, 15.6%) and December (n=52,15.1).During these months,people used hot water for bathing that contributed to scald burns. People sat around bonfires during winter season where children caught fire to the clothes or they fell into the fire. [Figure 1.3]

Table 1.1

AGE GROUP	NUMBER OF CHILDREN	PERCENTAGE(%)
0 to < 1year	104	30
1 year to <5years	146	43
5 years to < 10years	56	16
10 years to < 15years	38	11

Table 1.2

ETIOLOGY	NUMBER OF CHILDREN	PERCENTAGE(%)
Scalds*	196	57
Flames+	104	30
Thermal contact	26	8
Others^	18	5
*Scalds (spillage of hot beverages,hotsoup,dal,hotmilk,hot water)		
+Flames(fell into bonfire,firecrackers,stove blast)		
^Others(chemical burn,electricburn,motor bike silencer burn,hot rods)		

Table 1.3

BODY PERCENTAGE BURN	NUMBER OF CHILDREN	PERCENTAGE(%)
1-5%	30	10
5-10%	14	4
10-20%	192	56
>20%	104	30

Table 1.4

PLACE OF INCIDENT	PERCENTAGE CHILDREN
Kitchen	40
Bathroom	30
Playground	18
Others (market,party)	12

Table 1.5

DEPTH OF BURN	NUMBER OF CHILDREN	PERCENTAGE (%)
First degree burn	5	2
Second degree superficial burn	202	62
Second degree deep burn	92	28
Third degree burn	25	8

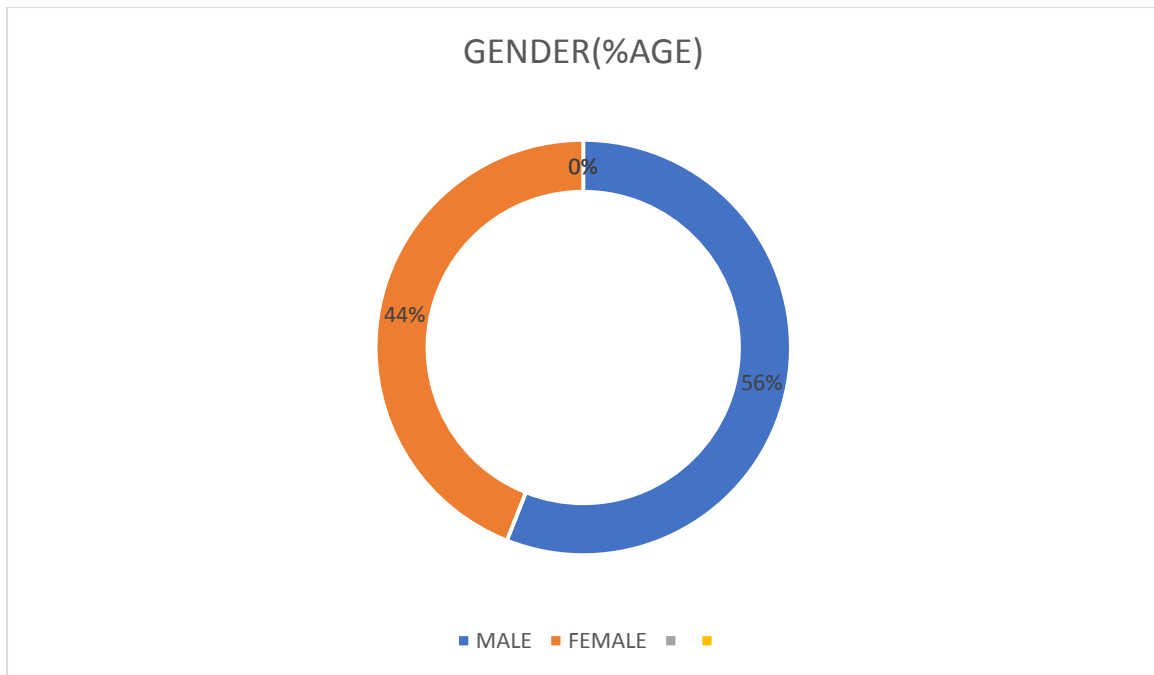


Figure 1.1 Percentage of Male and Female pediatric patients.

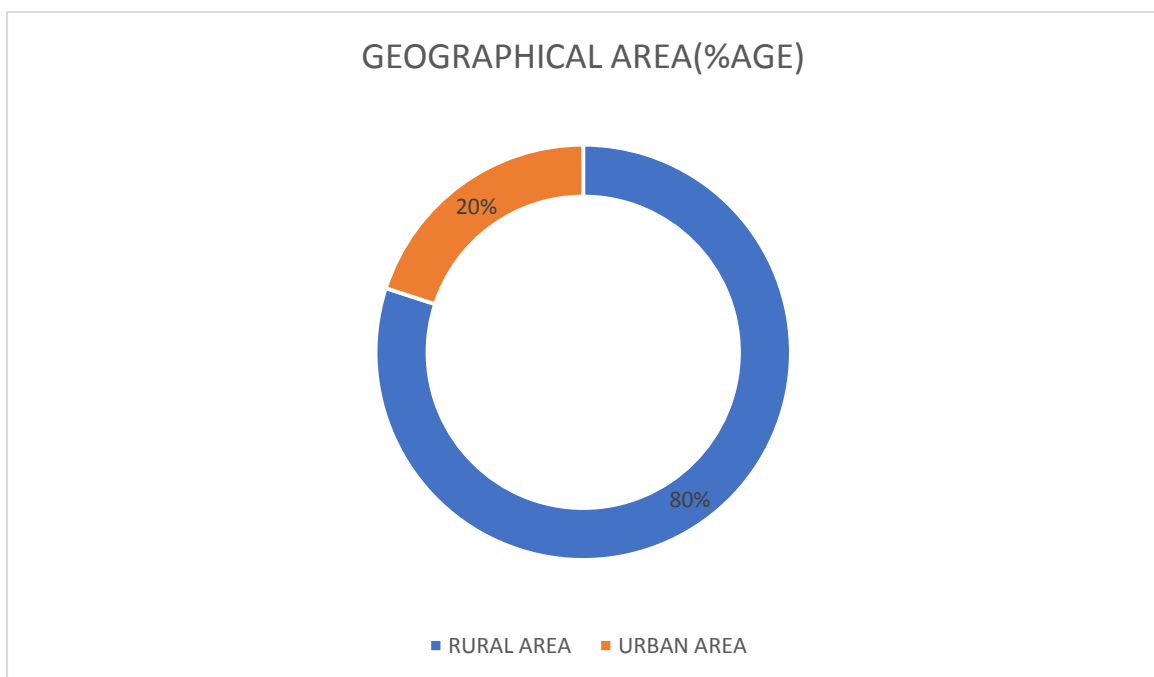


FIGURE 1.2 Percentage data based on Geographical area.

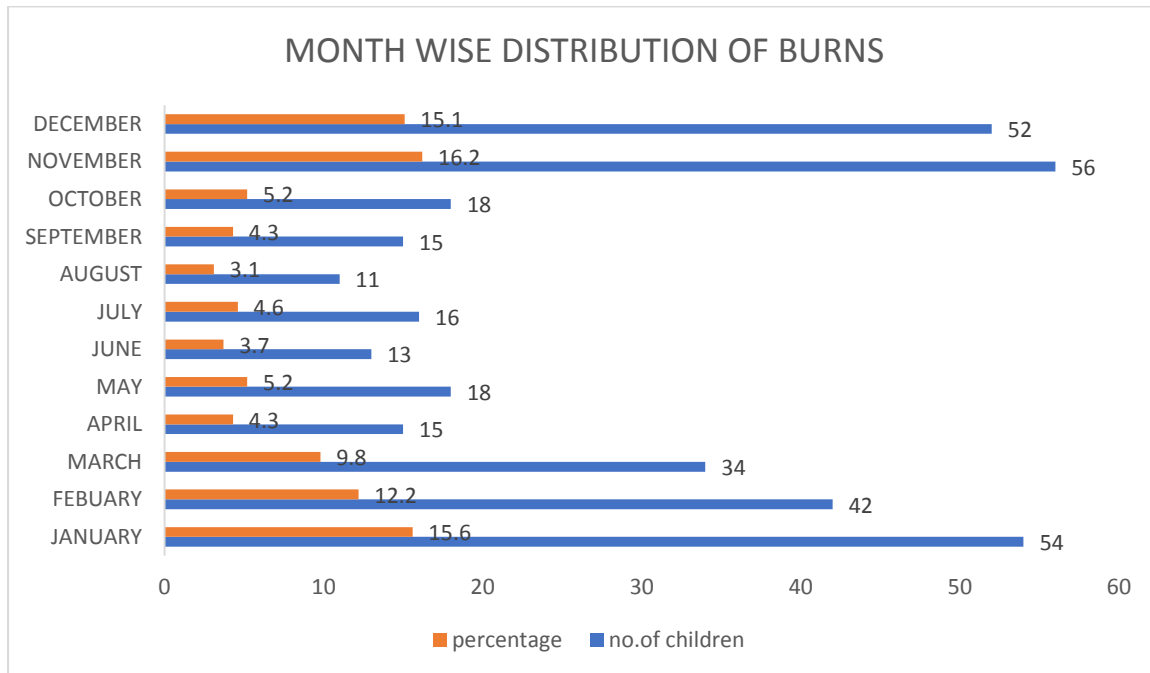


Figure 1.3 Month wise distribution of pediatric burn patients.

Discussion

The burn injuries were more common in children in younger age group. In this study, the most common age group who sustained burn injuries were 1-5 years. It was more in pre school going age group. The results were similar to the study of Julia Natterer et al where they found 78% of the burn children were less than 5 years old.⁹ Due to the curious nature of infants and toddlers and the urge to mostly pull and push things around, they end up getting injured when containers, pots, or pans containing hot fluids overturn and pour on them. Male children were found to be more affected in our study, accounted for 56%. In a study conducted by El-Balawy and Mabrouk they found a similar proportion of boys (53.7%).¹⁰ A study by Agbenorku P et al they found 55.3% patients were male children.¹¹ In another study done by Nakarmi KK et al, the results were similar to this study where 53.47% burn children were males.¹²

In this study the most common etiology of burn was found to be the scald either by pouring hot liquid over themselves or by accidental fell into the hot water followed by burn injury due to flames or fire. The stats showed that 57% of children were burnt due to scalds and 30% were burnt due to flames or fire. The results were in concordance to the results showed by Balseven-Odabasi A et al who reported 62% of burn injuries to children were due to scalds.¹³ Another similar results were shown by Serour et al. where 74.4% children were burnt due to scalds.¹⁴ Study done by Han D et al majority of burn etiology were found due to scalds.¹⁵ flame burns accounted for 30% burns in this study which was similar to some previous studies. Cheng W et al showed flame burns to be the second most common cause of burns in their study.¹⁶ The study of Nakarmi KK shows 32% pediatric burns due to flame injuries.¹² The most common burn injuries were found to be in rural population than in urban population in this study. In this part of country the population belonged to Kamrup rural were considered as rural population and patients belonged to Kamrup urban were considered rural population.

80% of total pediatrics burns were from rural background and 20% patients were from rural background in this study. Similarly, Ali H. Abu Ibaid et al in Palestine found, the prevalence rates were highest in refugee camps and the rural/Bedouin communities (1.79% and 2.75% respectively) and lowest in urban centres (0.68%) in their study.¹⁷ The results we found in this study were similar to one study conducted by Mehmet Akin Tarim et al in Turkey where they discovered that rural area burns were more common than the urban area burns, based on which they gave importance to rural population in making preventive measures to overcome such problem.¹⁸ We strongly believe that more prevalence of burns in rural population were due to lack of parental education, poverty, small houses with big families, lack of medical treatments and knowledge; which contributed to late admissions. The burn injuries in this study showed second degree burn were more prevalent; second degree involved both second degree superficial and deep burns. The stats showed 62% and 28% pediatric patients got second degree superficial and deep burns respectively. The results of Pelizzo G showed 79% pediatric burns were categorised in second degree burns, which were similar to results of our study.¹⁹ The degree of burn was assessed by the clinical examination. The treatment and outcome was not studied in this study. The children with 10-20% total body surface area (TBSA) burns in this study were 56% and children with burns >20% TBSA were 30%. The results of one study done by Pius Agbenorku et al showed that patients with >30% TBSA burns have significant mortality rate ($p < 0.017$).²⁰ But the studied done by us did not include the data of mortality risks. Majority of the children got burnt inside the house. Maximum number of burn injuries occurred in kitchen (40%); mostly scald injuries followed by 30% burns inside bathroom due to spillage of hot water. The study done by F. Serour et al showed most of the injuries occurred at home (228 cases, 85.7%), particularly in the kitchen and bathroom.²¹ Results of both the studies were quite similar. Another similar results were showed by Riedlinger DI et al where he found scald injuries occurred most frequently in the family kitchens or from hot tap water in the bathroom or kitchen.²² The results showed by Nakarmi KK we in concordance with this study showed 75.25% burns occurred inside the house.¹² We believed the rural population where the kitchen is inside the house only caused maximum scald injuries to the pediatrics population. According to one study, WHO standards of average height of one year old children is 74-76cms and the standard kitchen work surface height is 90cms; and due to the wandering and curiosity nature of young children, they are prone to scald injuries more.²³ Another finding in this study is the prevalence of burn injury to pediatric population is during winter season. The results showed maximum number of patients admitted to Burn unit during November, December, January, February month. The stats showed 56%, 52%, 54%, 42% of children admitted during the month of November, December, January, February respectively in last five years records. Similar results showed in study done in Nepal where maximum number of incidents took place in the month of November followed by January and March month.¹² Another Caribbean study done by Frans, F. A., Keli et al stated that most burns occurred at the end and at the beginning of each year.²⁴

Conclusion

Burn injuries possess not only physical limitations but also the mental, psychological and social impact on the life. The early pediatric burns give early trauma to all the components of

burn insult to the patient. So the early preventive measures should be prioritise in children aged from 0 to 5 years as we have seen maximum number of burn injuries in this age group. The parents also suffers financial loss during their stay in the hospital. The burn in pediatrics age group inhibits the physical growth of the children.

The education camps and workshops should be built in both urban and rural areas. Parents should be educated for the lifestyle measures to prevent such incidents. Training protocols should be promoted at all levels especially schools, primary health centres and community centres in order to prevent and tackle these injuries as early as possible. At tertiary level, multidisciplinary team involving pediatricians, plastic surgeons, and ICU teams should work together to treat the pediatric burn injuries.

Acknowledgment : We acknowledge and thank our all doctors, nurses, dressers and other paramedic staff for there services and care they provide to the children during their stay In hospital and keeping the records of all the patients over the years.

Bibliography

1. Lee CJ, Mahendraraj K, Houg A, Marano M, Petrone S, Lee R, et al. Pediatric Burns: A Single Institution Retrospective Review of Incidence, Etiology, and Outcomes in 2273 Burn Patients (1995-2013). *J Burn Care Res.* (2016) 37:e579–e85. doi: 10.1097/BCR.0000000000000362
2. Shah AR, Liao LF. Pediatric Burn Care: Unique Considerations in Management. *Clin Plast Surg.* (2017) 44:603– 10. doi: 10.1016/j.cps.2017.02.017
3. Smolle C, Cambiaso-Daniel J, Forbes AA, Wurzer P, Hundeshagen G, Branski LK, et al. Recent trends in burn epidemiology worldwide: a systematic review. *Burns.* 2017;43:249–57.
4. Armstrong M, Wheeler KK, Shi J, Thakkar RK, Fabia RB, Groner JJ, et al. Epidemiology and trend of US pediatric burn hospitalizations, 2003-2016. *Burns.* (2021) 47:551–9. doi: 10.1016/j.burns.2020.05.021
5. Akerlund E, Huss FR, Sjoberg F. Burns in Sweden: An analysis of 24,538 cases during the period 1987-2004. *Burns* 2007;33:31-6
6. Mashreky SR, Rahman A, Chowdhury SM, Giashuddin S, Svanstrom L, Linnan M, et al. Epidemiology of childhood burn: Yield of largest community-based injury survey in Bangladesh. *Burns* 2008;34:856-62.
7. Dissanaik S, Rahimi M. Epidemiology of burn injuries: Highlighting cultural and socio-demographic aspects. *Int Rev Psychiatry* 2009;21:505-11.
8. Forjuoh SN. Burns in low- and middle-income countries: A review of available literature on descriptive epidemiology, risk factors, treatment and prevention. *Burns* 2006;32:529-37
9. Natterer J. *Targeting burn prevention in the pediatric population: A prospective study of children's burns in the Lausanne area* (Doctoral dissertation, Université de Lausanne, Faculté de biologie et médecine).
10. El-Balawy A, Mabrouk AR. Epidemiology of childhood burns in the burn unit of Ain Shams University in Cairo, Egypt. *Burns.* 1998;24:728-32 .
11. Agbenorku P. Early childhood severe scalds in a developing country: A 3-year retrospective study. *Burns & Trauma.* 2013 Dec;1(3):2321-3868.

12. Nakarmi KK, Pathak BD. Prevalence of Acute Pediatric Burns in a Tertiary Care Hospital. *JNMA J Nepal Med Assoc.* 2020;58(231):862-865. Published 2020 Nov 22. doi:10.31729/jnma.5233
13. Balseven-Odabasi A, Tümer AR, Keten A, Yorganci K. Burn injuries among children aged up to seven years. *Turk J Pediatr*2009;51:328-35.
14. Serour F, Gorenstein A, Boaz M. Characteristics of thermal burns in children admitted to an Israeli pediatric surgical ward. *Isr Med Assoc J* 2008;10:282-6.
15. Han D, Wei Y, Li Y, Zha X, Li R, Xia C, Li Y, Yang H, Xie J and Tian S (2022) Epidemiological and Clinical Characteristics of 5,569 Pediatric Burns in Central China From 2013 to 2019. *Front. Public Health* 10:751615. doi: 10.3389/fpubh.2022.751615
16. Cheng W, Shen C, Zhao D, Zhang H, Tu J, Yuan Z, et al. The epidemiology and prognosis of patients with massive burns: a multicenter study of 2483 cases. *Burns.* (2019) 45:705–16 doi: 10.1016/j.burns.2018.08.008
17. Abu Ibaid AH, Hebron CA, Qaysse HA, et al. Epidemiology, aetiology and knowledge, attitudes, and practices relating to burn injuries in Palestine: A community-level research. *Int Wound J.* 2022;19(5):1210-1220. doi:10.1111/iwj.13716
18. Tarim M.A. Living in rural area is a major risk factor for severe burn injury in Turkey. *EASTERN JOURNAL OF MEDICINE.*2013;18(1):8-12.
19. Pelizzo, G., Lanfranchi, G., Pantaloni, M., Camporesi, A., Tommasi, P., Durante, E., Costanzo, S., Canonica, C.P., Zoia, E., Zuccotti, G.V., Ruotolopalmi, V., Donzelli, C., Tosi, G.L., & Calcaterra, V. (2022). Epidemiological and Clinical Profile of Pediatric Burns in the COVID-19 Era: The Experience of a Reference Center. *Children, 9.*
20. Agbenorku, P. Early childhood severe scalds in a developing country: A 3-year retrospective study. *Burn Trauma* 1, 122–127 (2013). <https://doi.org/10.4103/2321-3868.123073>
21. Serour, F., Gorenstein, A., & Boaz, M. (2008). Characteristics of thermal burns in children admitted to an Israeli pediatric surgical ward. *The Israel Medical Association journal : IMAJ, 10* 4, 282-6 .
22. Riedlinger, D. I., Jennings, P. A., Edgar, D. W., Harvey, J. G., Cleland, M. H., Wood, F. M., & Cameron, P. A. (2015). Scald burns in children aged 14 and younger in Australia and New Zealand—an analysis based on the Burn Registry of Australia and New Zealand (BRANZ). *Burns : journal of the International Society for Burn Injuries, 41*(3), 462–468. <https://doi.org/10.1016/j.burns.2014.07.027>
23. A M Kemp, S Jones,ZLawson,et al. *Arch Dis Child* 2014 99:316-321 originally published online Febuary 3,2014 doi: 10.1136/archdischil-2013-304991
24. Frans FA, Keli SO, Maduro AE. The epidemiology of burns in a medical center in the Caribbean. *Burns.* 2008;34(8):1142-1148. doi:10.1016/j.burns.2008.05.013