

Comparison of scald burns caused by hot water, tea and milk in preschool children

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Abstract

Aim: Burn injury is an important health problem with physical, psychological and economic effects with children being affected the most. The aim of this study is to present the epidemiological and demographic data and clinical results of preschool pediatric patients with scald burns which are treated in a tertiary reference burn center.

Materials and Methods: Preschool children admitted between January 2014 and August 2019 was included in the study. The demographic and epidemiological data, burn etiology, percentage of burned total body surface area and treatment results of patients were evaluated retrospectively from the patient files and the hospital registry.

Results: A total of 1010 preschool children with scald burns were treated in our burn center from January 2014 to August 2019. Patients were grouped by the etiology as; group 1: water, group 2: tea and group 3: milk scalds. There were 628 patients in group 1, 304 in group 2 and 78 in group 3. The percentage of burned total body surface area was higher for scalds with milk and was found as 15.54 ± 12.1 and the difference was statistically significant. The intensive care and the total hospital stay were also higher in scalds with milk. There were similar results with infection, grafting and mortality rates as being higher in the milk group.

Conclusion: The majority of preschool patients in our burn center were scalds with water but the percentage of burned total body surface area, skin grafting and complication rates were higher in scalds with milk. Childhood burns were usually seen indoors at preschool period, necessitating training programs for family members supervising these children and raising the awareness of parents.

Keywords: Burn; complications; epidemiology; milk; scald; preschool children

INTRODUCTION

Children are at particular risk of burn injuries such that globally burns are the fifth most common cause of non-fatal childhood injuries (1). In European hospitals, children are reported to account for nearly half of all burns and scalds (2). Although the majority of burns occur in low and middle income countries, within all countries burn risk is correlated with socioeconomic status. Burn injuries lead to prolonged hospitalization, disfigurement, disability and stigma (1,3). Pediatric burns also impose a socioeconomic burden by affecting the mental health and quality of life of their families (4,5).

Most of the burn injuries under six years of age are scald burns which occur when the cells in the skin or other tissues are destroyed by hot liquids (3,6-8). Hot water is the primary cause of scalds followed by tea, milk, oil, soup and other liquids. Although all the burns caused by hot liquids are referred as scalds, the physical and chemical

properties of the liquids are not the same and there are also differences in the clinical course and outcomes of these patients. There is limited data and studies in the literature with sufficient number of patients comparing scalds caused by different liquids (6,7,9).

Effective strategies are essential to reduce burn injuries, many of which are preventable. The high mortality, disability and deformity rates seen after burns can be reduced with affordable and sustainable methods in prevention and burn care (10). In general, true identification of the problem is considered to be the major component of planning effective interventions. Epidemiological and clinical data are important to define the population at risk thoroughly and to suggest appropriate preventive measures (11). Therefore the aim of this study is to examine the epidemiological and clinical features of scald burns in preschool children treated in our burn center and to suggest preventive measures.

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MATERIALS and METHODS

A total of 1010 preschool children with scald burns admitted to the tertiary burn center between January 2014 and August 2019 were included in the study. The demographic and epidemiological data (age, gender, place of burn, and burn etiology) as well as clinical variables (percentage of burned total body surface area, intensive care unit and hospital stay, infection and mortality rate) were evaluated retrospectively from patient files and the hospital registries.

The standard treatment of scald burns in our burn center comprises early tangential excision and grafting performed in the acute phase of third degree burns. Otherwise, after the excision or the debridement the wound layer is covered with sterile paraffin gauze and compress. The dressing is changed every 48 hours. A split thickness skin graft is considered in wounds which are not epithelized with this conservative method. We applied the appropriate treatment option to all scald burns depending on the degree of burn and the burned body part.

This study was approved by the local Clinical Research Ethical Committee of our hospital.

Statistical analysis

Statistical Package for Social Sciences 20.0 for Windows was used for the analysis of the data. The variables were checked for normal distribution. Kruskal-Wallis test was used for analysis of continuous variables and Chi-Square test was used for analysis of categorical variables between the groups. The results were expressed as mean±SD and median (min-max), n and percent (%). The values of $p < 0.05$ were considered as statistically significant.

RESULTS

Between January 2014 and August 2019 a total of 1010 children at preschool age with scald burns were hospitalized in our burn center. The mean age of the patients was 2.23 ± 1.36 (0.5-6.0) and 55.6% were male ($n=562$) and 44.4% were female ($n=448$). The percentage of burned total body surface area (TBSA) was 10.7 ± 8.6 (1-76) and the length of hospital stay was found to be 11.77 ± 9.72 (1-81) days.

Further analyses were performed according to three groups based on etiology as; group 1: water, group 2: tea and group 3: milk scalds. Demographic and clinical data of the patients by etiology are presented in Table 1.

The burn injury was occurred mainly indoors for all patient groups. A total of 988 patients (97.82%) experienced the burn injury inside the home. Indoor burn ratios were 97.45% for Group 1, 100% for group 2 and 92.3% for group 3. Outdoor burn ratio was 7.7% ($n=6$) for the milk group and all of them were immersion into hot milk in wide pots.

A total of 144 patients (14.26%) in our study population were treated in intensive care unit (ICU). The percentage of ICU admission was highest in group 3. Among our patients 14.19% of 628 patients ($n=89$) in group 1, 9.86%

of 304 patients ($n=30$) in group 2, and 32% of 78 patients ($n=25$) in group 3 were admitted to the ICU. The clinical data of patients treated in the ICU are given in Table 2.

Table 1. Demographic and clinical data of the patient groups based on etiology

	Group 1 (n=628)	Group 2 (n=304)	Group 3 (n=78)	P
Age (years)	2.31±1.4	1.98±1.3	2.49±1.3	0.001
Gender (M/F)	353/275	164/140	45/33	0.013
Nationality (TR/Syr)	523/105	274/30	71/7	0.008
TBSA (%)	11.03±8.9 (1-76)	8.82±5.9 (2-34)	15.54±12.1 (2-60)	0.001
Hospital Stay (day)	12.29±10.1 (1-81)	10.03±8.5 (1-63)	14.32±10.3 (2-63)	0.001

M/F: Male/Female, TBSA: Total Body Surface Area, TR/Syr: Turkish Republic/Syrian

Table 2. Clinical data of patient groups admitted to the intensive care unit

	Group 1 n=89	Group 2 n=30	Group 3 n=25	P
Age (years)	2.82±1.5	1.92±1.1	2.72±1.4	0.01
TBSA (%)	26.72±11.5 (3-76)	19.57±7.3 (8-34)	27.64±12.4 (3-60)	0.005
ICU stay (day)	10.21±8.6 (1-38)	6.73±5.8 (1-22)	11.2±6.9 (1-31)	0.066

TBSA: Total Body Surface Area, ICU: Intensive Care Unit

Table 3. Clinical data and outcomes of patient groups

	Group 1 n=628	Group 2 n=304	Group 3 n=78
Burn Degree	2 ^o	591 (94.1)	289 (95.1)
	3 ^o	37 (5.9)	15 (4.9)
Grafting	63 (10.03)	24 (7.89)	11 (14.1)
Infection	16 (2.54)	1 (0.33)	7 (8.9)
Mortality	4 (0.64)	0 (0)	2 (2.56)

Values are given as n (%)

The ratio of third degree burns were higher in group 3 (11.54%) compared with other groups. The need for split thickness skin grafts was also higher in group 3 in accordance with the ratio of burn severity. Infection rate was found to be 2.38% among all patients detected by blood, urine or wound cultures. Within group analyses revealed that the infection rate was higher in group 3

with a ratio of 8.9%. The most common microorganisms isolated were *Pseudomonas aeruginosa* and *Acinetobacter baumannii*. The mortality rate was 0.46% (n=4) in Turkish patients and 1.41% (n=2) in Syrian patients. The overall mortality rate of the study population was 0.6% (n=6), all being treated in the ICU. The mortality rate in group 3 was 2.56% (n=2) and these two patients were immersion into hot milk boiled in wide pots located outdoors. The clinical data and outcomes of patients are given in Table 3.

DISCUSSION

In studies where burns of all age groups were included, children from birth through 4 years old comprised almost one-third of the total number of cases. This high number of burns in infants and toddlers was attributable largely to their total dependence on their parents and caregivers and are related with the curiosity to explore the environment while there is an imbalance of motor and cognitive function (12-14). The etiology of burns in preschool ages is not very diverse and particularly the scalds comprise the larger part (5,8,15,16). All the burns caused by hot liquids are referred as scalds and there are limited studies in the literature with sufficient number of patients comparing subgroups of scalds. The physical and chemical properties of the liquids are not the same and there are also differences in the clinical course and outcomes of these patients (6,7,9). In this study we aimed to discuss our results of hot water, tea and milk burns in preschool children who are the most affected group. Thereby, improve the outcomes of treatment and to suggest preventive strategies.

The mean age of our patients was 2.23 ± 1.36 and 55.6% of them were male. The burn injury was occurred mainly indoors for all groups. The burned TBSA and the total hospital stay were lowest in patients scalded with hot tea. The differences concerning TBSA and hospital stay were statistically significant with results being highest in hot milk burns. The high number of hot tea burns is attributable to drinking habits of our country. Tea is a popular hot beverage prepared in two pieced teapots which make the upper part to turn over and spill on someone especially who is crawling around (17). The tea is in the upper and smaller part, so explaining the smaller burned TBSA in this group.

Milk burns differ from other scald burns as a result of the properties that the milk has. The pH of milk is slightly less than water and is about 6. Milk has fat in its composition which makes a higher heat capacity compared with water. In addition, the viscosity of milk is higher and high viscosity leads to stronger adherence to skin. These properties lead to greater soft tissue damage compared with hot water. Third degree burns were higher in our patients with hot milk burns and as a consequence the hospital stay was longer and more patients were treated with split thickness skin grafting. Similar findings were reported in the literature (9,14,17). The mortality rate in hot milk group was also higher than the remaining groups. But the main reason of the two mortalities experienced in

this group is high burned TBSA of these patients due to immersion into hot milk boiled in wide pots in addition to above mentioned factors.

In general, scalds in preschool age are results of insufficient supervision by the caregivers. The other factors contributing to high ratios of scalds are cooking and eating on floor, the habit of hot tea consumption prepared in the two pieced teapots, use of common areas for cooking, using large pots for traditional cooking and sterilization of milk by boiling within wide and large pots outdoors. Living in crowded settings also contributes to the problem.

The length of hospital stay was found to be 11.77 ± 9.72 (1-81) days among our patients. Once the burn injury happens a painful and complicated period of treatment begins. Burn prevention studies are cost effective and avoid this long hospitalization and complications that the patients experience. With the help of burn prevention studies, burn morbidity and mortality as well as hospital stay decreased in developed countries (10,16). Our mortality rate is lower than low-middle income countries and is similar to that reported in developed countries (8,11,12,15,16). There are not enough reports on incidence rates in our country. Despite low mortality rates presented in the current study, we should make efforts to avoid burn injuries.

World Health Organization suggests that prevention studies should address the population at risk for burn injuries. Education for vulnerable populations and training the community for first aid are among suggestions (1,10). Burn prevention strategies should be included in an educational brochure or a video which is given to parents prior to discharge with a newborn baby. The family should also be informed by the health care staff during the visits for vaccination. Besides, the patients and caregivers should have enough knowledge on first aid about home accidents.

CONCLUSION

In conclusion, infants and males consist of the majority of our pediatric scald burns. The percentage of TBSA and length of hospital stay was higher in patients scalded with hot milk resulting with significantly higher third degree burns and mortality. The crowded living conditions and traditional cooking and drinking habits contribute to the problem. Therefore, prevention programs focusing on education of the parents and caregivers are required to avoid scald burns. We think that preventive measures, guided by epidemiological data, may contribute to reduce the incidence and severity of burns in preschool children and worth consideration.

Competing interests: The authors declare that they have no competing interest.

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Ethical approval: This study was approved by the local Clinical Research Ethical Committee of the Adana City Research and Training Hospital (Decision no: 461/2019).

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