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Patterns of Burns among Children up to Five Years Old in El-Minya - Egypt

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Abstract: Objective: The purpose of this study is to assess the patterns of burns and scalds among young children in El-Minya.

Methods: 2 years prospective study of all burns involved children (ages, 0- 5years) presenting of five Emergency Departments in El-Minya governorate. Data extracted from the cases by reviewing the medical records of patients attending the emergency department-treated burns include age, gender, body part, causal substance, disposition, mechanism of the injury, and injury pattern.

Results: A 2117 patients ≤5 years old were treated in El-Minya emergency departments and evaluated for burn-related injuries. Boys constituted 61.4% of scalds and 55.6% of thermal burns. 81.4% of injuries were scalds, 13.9% were contact burns, and 4.7% were burns from other causes. One-year-olds was at the highest risk for scalds and thermal burns. Hospitalizations was significantly increased among patients with scalds than did thermal burns. Hot water and soup were the chief causal agents for scalds 59%. The 2 most common scald injury patterns was among children reached up and pulled a pot of hot water and soup off the stove or other elevated surface 29.5% and children grabbed, overturned, or spilled a container of hot water and soup onto him- or herself 24.7%. Scalds affected the front of the body presented 93%. Predominantly to face, arms, and upper trunk. Contact burns caused by touching hot items presented 69.4% and injuries sustained more indoor formed 71.8%.

Conclusion: Burns are common and generally severe in Upper Egypt among children 5 years old and younger. One – year – olds was at the highest risk for scalds and thermal burns who pulled or spilled hot water and soup over themselves and sustained burns from touching hot items as oven, pans, pots, motorcycle exhaust pipe, brazier, kettle, and iron, so one – year – olds are a high priority for targeted prevention. The duty to provide all children with safe surroundings in which to develop.

Recommendation: Preventative strategies should be targeted at creating safe home environments through family education, financial support to poor family, legislation and engineering safer cooking and lighting means.

Keywords: Burns, scalds, pediatric injury.

أنماط إصابات الحروق في الأطفال دون الخامسة من العمر في المنيا - مصر

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الملخص: تعتبر الحروق من اكثر الإصابات تدميرا للجسم نظرا لما تخلفه من أثار تدميريه جسديه ونفسيه وماديه قد تمتد لفتره طويله لذا فهي شديدة الضرر على الأطفال خاصة في السن المبكرة حيث طبيعتهم الفضولية والمتهورة وقلة الخبرة في كيفية التفاعل مع الحدث وتقييم الخطر والضرر ولهذا فقد تم التركيز في هذا البحث على هؤلاء الأطفال في واحده من محافظات صعيد مصر حيث التشابه في الظروف الاجتماعية والاقتصادية والبيئية وكان الهدف من البحث : وصف أنماط إصابات الحروق والسلق في الأطفال 5 سنوات فاقل في محافظة

المنيا للوقوف جيدا واستيعاب لماذا مثل تلك الإصابات مستمرة في الحدوث رغم خطورتها ورغم الجهود المبذولة ولوضع خطط أوليه لمنعها والوقاية منها. وعلى مدار عامين من الدراسة تم حصر حالات الحرق والسلق للأطفال 5 سنوات فأقل الذين ترددوا على أقسام الطوارئ الخاصة بالحروق بمستشفى المنيا الجامعي ومستشفى مغاغه المركزي ومستشفى ملوى المركزي ومستشفى بنى مزار المركزي ومستشفى العدوة المركزي بمحافظة المنيا وكانت البيانات المأخوذة من الحالات تتضمن السن والنوع والجزء المصاب والمادة المسببة وكيفية ونوع الإصابة والتصرف مع الإصابة. وقد اسفرت النتائج عن حصر2117 حاله وكانت نسبة الإصابة في الذكور (61.4%) والإناث (55.6%) والإصابات معظمها إصابات سلقيه (81.4%) مقابل (18.6%) للحروق وكانت الحروق معظمها نتيجة ملامسة ماده ساخنه (69.4%) ومعظمها تحدث داخل المنزل (71.8%) وكان الأطفال ألأقل من عامين الأكثر تعرضاً لخطر الإصابة بالحروق والسلق وكانت الإصابات السلفية الأكثر إقامه بالمستشفيات وقد استحوذ الماء الساخن والحساء (59%) من المواد المسببة للإصابات السلقية. أما كيفية الإصابة بالحروق السلقية فقد كان هناك طريقتان استحوذتا (54.2%) من كيفية الإصابة أولهما أن الطفل يصل إلى الوعاء المملوء بالمادة الساخنة ويجذبه من فوق الموقد وثانيهما أن ألطفل يمسك أو يقلب أو يسفك الوعاء المملوء بالمادة الساخنة على نفسه. وقد احتل صدارة الجسم على (93%) من الإصابات السلقية معظمها في الوجه والأذرع والطرف العلوى.

الاستنتاج: تعرض الأطفال لإصابات الحروق مشكله شائعه وأكثرها حدةً في صعيد مصر وواجبنا أن نوفر لكل أطفالنا محيطاً آمناً فيه ينمون ولكى نقلل الانتشار الهائل لمثل تلك الإصابات بصعيد مصر علينا أن نضع خططاً وقائيةً هدفها بيئة آمنه بالمنزل من خلال الندوات والتوعية الأسرية والدعم المادي للأسر الفقيرة وسن القوانين وصناعة مواقد آمنه وإضاءة فعالة وآمنة.

الكلمات المفتاحية: إصابات الحروق، الإصابات السلقية، في الأطفال.

INTRODUCTON

One cannot engage in the activities of a typical day without interacting and being influenced by environmental factors; many of these factors are considered a nuisance such as burn [1]. Burns are among the most devastating injuries because they can have long-term physical, psychological, and economic ramifications. Children, especially those aged 0 to 2 years, are at risk for scald and thermal burn because of their natural curiosity, impulsiveness, mode of reaction, and lack of experience in assessing danger and risk[2, 3, 4]. Unintentional injury has now become the leading killer of children, and it is interesting to note that for every child who dies of a burn injury, survivors live with varying degrees of disability and psychological scarring[5].Studies have shown that burn injuries account for 0.96-1.4% of all attendances to emergency departments (EDs). The majority of patients attend the ED to seek initial medical assessment[6]. Contributory factors are the complex interaction between the characteristics of the host (child), agent (heat source), mechanism (how the child comes into contact with the agent) and the environment (where the event occurs) [7]. These factors have a direct relationship to the extend, distribution and pattern of injury that the child sustains[8]. Although burns are a common cause of injury worldwide, according to literature reviews, the findings of these studies may focus on real world health problem towards patterns of burns injury in Middle East area which was not reported yet at Upper Egypt. The current study undertaken to describe patterns of unintentional burns and scalds among young children in order to understand better why such injuries continued to occur despite intervention efforts and primary preventative strategies.

METHODS

A prospective cross-sectional study of young children with burns or scalds presented into five emergency departments (EDs) in El-Minya(El-Minya University Hospital, Maghagha Central Hospital, Mallawy Central Hospital, Bani-Mazar Central Hospital, and El-Edwa Central Hospital). Data was obtained by reviewing the medical records of patients attending the emergency department- treated burns. Data was collected according to standardized burn collection form [9]. For each case, data was extracted according to : type of burn(scald or thermal), age, gender, body part(injuried), place of injury, case disposition (treated and released, treated and transferred, admitted) and details of agents, mechanism and severity of the injury were recorded. Victims of household fires were excluded. Data was collected between January 2017 and December 2018.

STATISTICAL ANALYSIS

Analysis of data was done using SPSS version 12. Description of qualitative variables as numbers and percentage; Chi-square test were used to compare qualitative variables between groups. For all tests, a probability (P) $<$ 0.05 was considered significant.

RESULTS

For 2 year period study, 2117 cases ≤ 5 years old child were treated for burns : a total of (1723/ 2117) represents 81.4% were scalds, 13.9% (294/ 2117) were contact burns, and 4.7% (100/ 2117) were burns from other causes.

Table 1 showed the distribution of age, gender, and disposition for each type of burn. Age was significantly related to type of burn (X^2= 342;p= 0.043) and 1 – year – olds constituted the largest percentage for each burn type 40.2% (693/ 1723) scalds; 34.5% (136/ 394) thermal burns. Gender was significantly related to the type of burn (X^2 = 13.63; p= 0.031), with more boys injuried in both burn types. Disposition was also significantly related to type of burn (X^2 = 623; p= 0.048**)**, with more hospitalizations for scalds. All scald incidents happened at homes.

Table 2 showed scald agent mechanism. Hot water was the scald agent in 36.7% (633/ 1723) of cases, followed by soup 22.2% (383/ 1723), tea 16.9% (292/1723), food 12.7% (218/ 1723), and milk 5.6% (96/ 1723). Two mechanisms were reported: reached up and pulled down pot from stove or other elevated surface " and " grabbed, overturned, or spilled pot onto self- accounts 54.1% (933/ 1723) of all scald injuries. The third mechanism (pot contents splashed onto child) accounted for 16.9% (291/ 1723) of scalds, followed by (collided with pot or with person holding pot), and (put hands into pot) accounted for 16.1% (278/ 1723) and 12.2% (211/ 1723), respectively, of scald injuries.

Scalds affected the front of the cases body in 95.8% (1650/ 1723) and rarely affected the, buttocks, groin or back. Children sustained a majority of scalds to the, face, arms, and upper trunk.74% (1275/ 1723) of scalds extend to adjacent sites as the hot liquid flowed away from the first point of contact.

Table 3 showed contact burn agent and mechanism involved. Household agents accounted for 71.8% (211/294), followed by outdoor agents 28.2% (83/294). The heat sources most often implicated in contact burns were ovens 30.3% (89/ 294), pans and pots 22.4% (66/ 294), motorcycle exhaust pipes 11.4% (34/ 294), braziers 9.2% (27/ 294), irons 8.5% (25/ 294), kettles 6.8% (20/ 294), playing with heated plastic bags 6.8% (20/294), and fireworks 4.4% (13/294).

The commonest mechanism of contact burn was touching a hot item 69.4% (204/ 294). 71.4% (210/ 294) affected the hands; 87.6% (184/ 210) were Palmar. Only 11.2% (33/ 294) involved more than one site. Burns of feet were recorded in 30 children from braziers and heated plastic bags.

Table 4 showed that there is 78 flame burns: 32.1% (25/ 78) were from explosion of gas bottles and 23.1% (18/ 78) were from fireplaces and braziers. Playing with matches, aerosols and cigarette lighters were responsible for a further 42.3% (33/ 78). Burns primarily affected hands 33.3% (26/78), or face 23.1% (18/78) and, 37.2% (29/78) extending to more than one site. Electrical burns were reported among 18 children who touched electric cables and machines. Four chemical burns in children who ingested cleaning fluid (KOH).

Table (1) Distribution of Age, Gender, and Disposition for Scalds and Thermal Burns.

Estimated No. of Cases		
	Scald, %	Thermal Burn, %
Age, y		
<1	249 (14.5)	60 (15.2)
1	693 (40.2)	136 (34.5)
2	371 (21.5)	97 (24.6)
3	170 (9.9)	52 (13.2)
4	150 (8.7)	29 (7.4)
5	90 (5.2)	20 (5.1)
Total	1723 (100)	394 (100)
Gender		
Male	1058 (61.4)	219 (55.6)
Female	665 (38.6)	175 (44.4)
Total	1723 (100)	394 (100)

Disposition		
Treated and released	1320 (76.6)	374 (94.9)
Treated and transferred	110 (6.4)	7 (1.8)
Admitted	293 (17)	13 (3.3)
Total	1723 (100)	394 (100)

Figure (1) Children around brazier and playing with flame.

Table (2) Scalds Agent and Mechanism (n = 1723): Number of Children with Scalds from Different Categories of Agent and Proportion of Each Mechanism Involved*:

Mechanism	Hot water 633(36.7%)	Soup 383(22.2%)	Tea 292(16.9%)	Food item 218(12.7%)	Milk 96(5.6%)	Cooking oil 29(1.7%)	Miscellaneous** 72(4.2%)
1- Reached up and pulled down pot 508(29.5%)	178 (28.1%)	118 (30.8%)	71 (24.3%)	64 (29.4%)	35 (36.5%)	14 (48.3%)	28 (38.9%)
2- Grabbed, overturned or spilled 425(24.7%)	164 (25.9%)	91 (23.8%)	63 (21.6%)	50 (22.9%)	28 (29.2%)	8 (27.6%)	21 (29.2%)
3- Pot contents splashed onto child 291(16.9%)	103 (16.3%)	54 (14,1%)	58 (19.9%)	43 (19.7%)	18 (18.8%)	4 (13.8%)	11 (15.3%)

Mechanism	Hot water 633(36.7%)	Soup 383(22.2%)	Tea 292(16.9%)	Food item 218(12.7%)	Milk 96(5.6%)	Cooking oil 29(1.7%)	Miscellaneous** 72(4.2%)
4- Collided with pot or person holding pot 278(16.1%)	93 (14.7%)	61 (15.9%)	60 (20.5%)	40 (18.3%)	11 (11.5%)	3 (10.3%)	10 (13.9%)
5- Child put hand into pot 211(12.2%)	85 (13.4%)	59 (15.4%)	40 (13.7%)	21 (9.6%)	4 (4.2%)	----	2 (2.8%)
6- Flowing hot water 10(0.6%)	10 (1.6%)	----	----	----	----	----	----

* Percentages may not sum to 100% due to rounding.

** Miscellaneous : grease (25), fenugreek (18), anise (16), caraway (7), coffee (6).

Table (3)Contact Burn and Mechanism (n = 294)

Mechanism	Household agents* 211(71.8%)	Outdoor agents** 83(28.2%)
1- Touch 204(69.4%)	146(69.2%)	58(69.9%)
2- Pull-down 39(13.3%)	34(16,1%)	5(6%)
3- Fall 29(9.9%)	18(8.5%)	11(13.3%)
4- Step on 22(7.5%)	13(6.2%)	9(10.8%)

*Household agents : ovens (89), pans (40), pots (26), irons (25),
Kettles (20), braziers (11).

**Outdoor agents: motorcycle exhaust pipes (34), heated plastic bags (20),
braziers (16), fireworks (13).

Table (4) Other Burn Agents and Number of Children Involved:

Flame(78)	Electrical(18)	Chemical(4)
Explosion of gas bottle(25) Fireplace and brazier(18) Playing with aerosol and lighter(13) Playing with matches(12) Playing with cigarette lighter(8) Car crash(2)	Electrica cable(8) Electric machine(10)	Cleaning fluid(4)

DISCUSSION

The current study was undertaken to describe patterns of unintentional burns and scalds among young children in El- Minya to understand better why such injuries continue to occur despite intervention efforts and to inform primary preventative strategies. Upper Egypt governments are nearly similar, especially in rural areas, in social, economic and environmental conditions. Epidemiological studies are important for understanding the needs of burn care and targeting burn prevention programs [10].

This study focused on emergency department-treated childhood burns and scalds. In the two years period covered, the majority of cases were scalds. The greater number of scalds perhaps reflects injury severity; that is, the need for emergency treatment rather than the relative occurrence of these 2 burn patterns in the population, because one would intuitively expect contact burns to occur with much greater frequency than scalds do.

The result of the present work was in agreement with Brusselaers et., al [11]; Duke et.,al [12]; Lorch et., al [13] where they reported that the high prevalence of childhood burns and scalds in young children and the predominance of scalds over contact burns has been described.

Scalds injuries have been reported to occur with greater frequency among boys[14, 15]. In this study, the boy - to - girl ratio was 1.6: 1 for scalds and 1.3: 1 for thermal burns. Consistent with other studies Banco et., al [16]; Ray [17]; Kemp et., al [15], one year olds were found to be at the highest risk for scald injury, with ~ 3 times as many scalds compared with children younger than one and nearly twice as many compared with two years old. The high frequency of scalds among one year old can be related to their inherent nature to explore their

environment. Their motor skill development outpaces their cognitive development, so they can perform physically, but do not understand the associated risks of injury. Simon and Baron[18] attributed increasing motor skill with increasing ability to encounter hot liquids or solids.

The prevalence of burns and scalds falls dramatically at age 3 years, which may coincide with an increased cognitive awareness of the dangers of heat, a more vigilant approach by parents or a greater proportion of time spent outside the home. This trend is consistent with Drago [19]findings and similarly suggests a role of increasing maturity and understanding in reducing the risk for burn injury. He attributed his reported decrease in scalds and contact burns among older toddlers and preschoolers to increased awareness of the consequences of their actions as children develop intellectually.

Greater severity of injury was clearly associated with scalds, as reflected in nearly 25% of cases being transferred or hospitalized, compared with 95% of thermal burn cases being treated and released. This finding is consistent with previous studies Banco et. al [14]; Simon and Baron [18]; Drago [19] and makes sense because scalds tend to affect larger body surface areas, with deeper tissue injury than do thermal burns.

There was a largely predictable relationship between the agent and mechanism, age of the child and anatomical distribution of the burn or scald. The toddler pull-down scald resulted in a scald to upper part of the body. Scalds were predominantly on the front of the body, asymmetrical and rarely affected head, buttocks, genitalia or back of the body. This finding, is inconsistent with Drago [19] Which reported that there was an excess of injuries affecting 25% or more body surface associated with the pattern "reached up and pulled down pot from stove or other elevated surface "? This is not surprising, because this pattern results in a cascade of hot liquid falling onto a standing child.

Hot water and soup were the most common causative agents overall, accounting for more than half of all substances and the most common substances involved in the 3 scald patterns " reached up and pulled down pot from stove or other elevated surface; " grabbed, overturned, or spilled pot onto self "; and " collided with pot or with person holding pot ". Tea ranked third in frequency followed by food item and milk.

Victims of scalds are able to reach a pot that contains the hot substance; therefor, it is appropriate when designing interventions to consider reach capability, especially of children 1 and 2 years of age[19]. The height of an average 1 – year – old is 74 – 76 cm (WHO growth charts). Their reach height is potentially consistent with the average dining table (standard mean height 75 cm cooker hob or kitchen work surface (standard mean height 90 cm)[15]. Unfortunately, the majority of people in rural areas of Upper Egypt, especially poor people, cook food in the living room, use unsafe short mini gas bottles as stoves usually put on the floor and separate kitchen is absent in their houses, they also eat on the floor or on short table (mean height 50 cm)

and people set around it, this is potentially dangerous for children and consistent with the most of scald incidents happened in the home.

Contact burns to the hand in small children may be extensive and carry the risk of long – term disability from contractures and scarring. Children who present with an atypical pattern of burn or scald and an implausible explanation may raise suspicion of intentional injury [20]. Children abuse is recorded in an estimated 1% to 14% of children in the hospital setting with a burn or scald[21,22]. Suspected child abuse were excluded from this study.

Scald interventions strategies recommended in 1977 included turning pots on stoves so that handles faced the wall; placing hot beverages in the center of a table, out of toddler's reach; and removing table – cloths from tables[23]. Successful prevention is most likely to involve product design or environmental modification as has been shown with many modern oven doors have a" cool touch" design. This is not universal and many households have old appliances. While oven, motorcycle exhaust pipe, brazier and fireplaces (figure 1), kettle, and iron must be kept out of the reach of children, there is the potential to explore modification to product design to ensure toddler safety.

Prevention is likely to rely upon heightened awareness and behaviour change by carers [24]. Public information messages, children centres, health visitor or family nurse practitioners should address safety education as a matter of routine. There is evidence that intensive interventions of this kind can successfully reduce scalds to children in the home [25, 26].

Preventative measures have proven effetive for reducing unintentional child trauma in high – income countries with the incidence of pediatric injury related deaths having between 1970 and 1995 [27]. However, such strategies have not been employed in many developing countries where resources for child health are shared with programmes for child nutrition and vaccination[5].

LIMITATINS

My study has several limitations. The results of the present study are unlikely to reflect the true incidence of scalds and burns occurring in El – Minya. Many children are likely to be treated elsewhere, whether by traditional means, pharmacy advice or at another health care establishment. The presentation to hospital is likely to be influenced by patient access to transport to the hospital; the perceived need for medical treatment by the child guardian; the local service provision; and the local populations expectation of their heath service. Correspondingly, there are likely to have been many more minor accidents in the home that escaped the attention of this epidemiological research.

C0NCLUSION

Burns are common and generally severe in Upper Egypt among children 5 years old and younger. One – year – olds was at the highest risk for scalds and thermal burns who pulled or spilled hot water and soup over themselves and sustained burns from touching hot items as oven, pans, pots, motorcycle exhaust pipe, brazier, kettle, and iron, so one – year – olds are a high priority for targeted prevention. According to the convention of the rights of the child, all children are entitled to a safe environment and to protection from harm and violence [5]. Consequently, it is our duty to provide all children with safe surroundings in which to develop. It is important to take into account demographic, cultural, and socioeconomic variables when developing and implementing prevention programs. Preventive measures by education and observation will reduce the incidence of burn and its sequel.

RECOMMENDATIONS

To reduce the high incidence of burns in Upper Egypt, preventative strategies should be targeted at creating safe home environments through family education, financial support to poor family, legislation and lighting means.

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