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Original Article

Analysis of Pediatric Hand Injuries Presenting at A Public Sector Tertiary Care Hospital in Karachi, Pakistan

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ABSTRACT

Objective: To evaluate the pattern of pediatric hand injuries presenting at a public sector tertiary care hospital in Karachi.
Study Design: Cross-sectional study
Place and Duration of Study: Department of Plastic Surgery, Ruth Pfau Civil Hospital, Karachi Pakistan from Mar to Aug 2022.
Methodology: Children of age 1 to 17 years of either gender, presenting to emergency room within 24 hours of hand injury were enlisted into this study. Patients with poly-trauma and those whose parents did not give consent for participation were not invited to be the study part. Patient's age, gender, residence, injured hand, zone and sites and mode of injury was recorded in the pre-designed structured proforma.
Results: Four hundred and thirty-four (n=434) patients were enrolled into the study with median age of 6 (IQR=2-10) years. Majority of children were males 253 (58.3%), had injury in single zone 385 (87.8%). Sixty-eight (15.8%) patients had more than single injury site. The most frequent injury mode was door injury 126 (29.0%) followed by machine injury 109 (25.1%) injury from sharp object 78 (18.0%), road traffic accidents 57 (13.1%), fall 31 (7.1%), blunt trauma 25 (5.8%) and gunshot 8 (1.8%). Only skin laceration injury was present in nearly quarter of the hand injuries 120 (27.6%) whereas fractures 141 (32.5%) and tendon injury 147 (33.9%) was present in about one-third of the total cases.
Conclusion: The present study analyzed that children of age groups 1-10 years are commonly affected with hand injuries. All of the causes of hand injuries are preventable which can be avoided through close monitoring and favorable results can be achieved through early intervention.

Keywords: Children, Hand Injury, Hand trauma, Plastic reconstruction, Toddlers

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INTRODUCTION

The structure of hand is the complex system of muscles and joints that provides mobility and motion in a variety of planes. The highly tangible hand structure is helpful to perform daily tasks and fine movements due to which it comes in contact of harmful objects. In growing children, hands may act as an 'extra eye' for them due to which this age group child is highly vulnerable for hand injuries.

Among pediatric age group, hand injuries are considered as the most frequent cause of visit to emergency trauma which have the potential to lead permanent morbidity including limited hand growth or scar contracture even in trivial incidents.[1,2] Hand fractures, the most common cause of patients' presentation to urgent care clinics, nearly accounts for 2.3% of pediatric emergency visit and 15% of all pediatric fractures[3]. Another most frequently type of pediatric hand injury is fingertip injury, which also requires clinical care in trauma centers[4]. The consequences of fingertip injury are nailbed and nail deformity, if not managed appropriately. In some cases, nail removal or nailbed repair becomes mandatory when the nail plate is tear away or crushed[5].

Several injury causes are uncommon among children as they are more involved in exploring things around during their younger ages. For instance, door slam and bicycle injuries usually cause avulsion or finger crush whereas exercise equipment at home may lead amputations and lacerations[6]. Substandard management of such injuries may lead to poor aesthetic, physiological, functional and economical consequences[7]. It was recently reported in a Cochrane review that there was lack in high level evidence related to hand trauma managment[8].

Many studies have been conducted in various part of the world to ascertain the pattern of pediatric hand injury.[9-10] However, locally investigations are not

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available that determined the pattern of hand injuries. Knowing the pattern of hand injuries will be helpful for plastic reconstruction surgeons for ascertaining the burden of frequently occurring injuries and their modes in our society. Based on this data, the surgeons will be able to modify their surgical capabilities for improved care. Hence keeping in view, the importance of this data, we planned to determine the pattern of pediatric hand injuries presenting at a public sector tertiary care hospital in Karachi.

METHODOLOGY

This cross-sectional study was performed at Department of Plastic Surgery, Ruth Pfau Civil Hospital,Karachi Pakistan with the approval of Institutional Review Board (IRB #:IRB-2229/DUHS/Approval/2021/718) from March 2022 to August 2022. Using 95% confidence interval, 5% margin of error ad proportion of 29%[11] for middle finger injuries, the estimated sample size was 317. Online available calculator Open-Epi was used for sample estimation.

Inclusion Criteria: Children of age 1 to 17 years of either gender, presenting of emergency room within 24 hours of hand injury were enlisted into this study.

Exclusion Criteria: Patients with poly-trauma and those whose parents did not give consent for participation were not invited to be part of the study.

Parents/Guardians bringing patients to emergency departments were asked to give written consent to be the part of study. The on-call plastic surgery team managed the patients' conditions. Patients' age, gender, residence, injured hand, zone and sites and mode of injury was recorded in the pre-designed structure proforma. Injury details such as fractures, lacerations, tendon injury were also recorded after clinical and radiological assessment.

The collected data was entered into Statistical Package for Social Sciences (SPSS) version 23 for statistical analysis. Frequency and percentages were computed for categorical data. Non-normal distributed data (Age) was presented as median with inter-quartile range (IQR).

RESULTS

A total of 434 patients were enrolled into the study with median age of 6.0 (IQR=2.0-10.0) years. Figure-1 presents the frequency distribution of different age groups. Majority of children were males 253(58.3%) and were belonging to urban areas 385(88.7%). Nearly half of children had injury in right hand 208(47.9%). 19(44.9%) had injury in left hand whereas few had injury in both hands 31(7.1%). Majority of them had injury in single zone 381(87.8%). Most common injured zone was zone-I 207(45.2%), zone-II 191(41.7%), zone-III 34(7.4%), zone-VI 22(4.8%) and zone-VII 4(0.9%).The most frequent injury mode was door injury 126(29.0%) followed by machine injury 109(25.1%) injury from sharp object 78 (18.0%), road traffic accidents 57(13.1%), fall 31(7.1%), blunt trauma 25(5.8%) and gunshot 8 (1.8%). Only skin laceration injury was present in nearly quarter of the hand injuries 120(27.6%) whereas fractures 141(32.5%) and tendon injury 147(33.9%) was present in about one-third of the total cases. Figure-2 displays frequency distribution of injury site. Among 434 patients, total injury sites were 502. 15.7% patients had more than single site. Sixty-eight (15.7%) patients had more than single site.

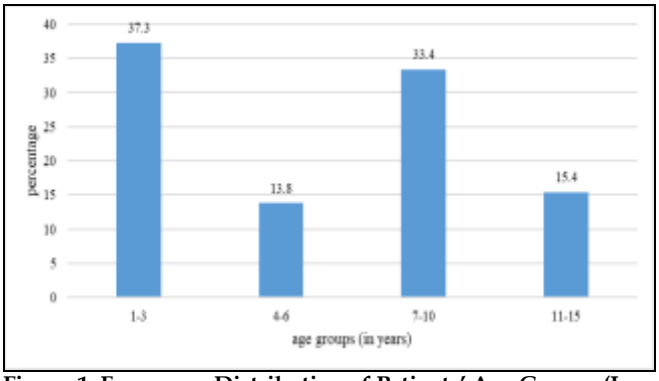

Figure-1: Frequency Distribution of Patients' Age Groups (In Years) (n=434)

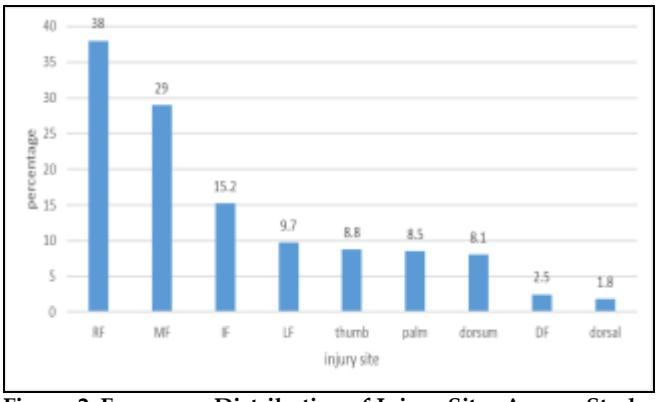

Figure-2: Frequency Distribution of Injury Sites Among Study Participants (n=434)
RF= Ring finger, MF= Middle finger, IF= Index finder, LF= Little finger DF= Distal forearm

DISCUSSION

When a hand injury occurs either on its own or as part of a significant trauma, treatment must be given

top priority, just like other critical organ systems in the body, because hand injuries can be crippling if not properly controlled. The management implemented during the acute period of the injury heavily influences the hand's ability to perform effective work following recovery. Early restoration of pain-free, effective hand function in infants requires a carefully designed and expertly executed surgical operation. Children were included in certain research on hand injuries that included people of all ages, even though there were few studies on pediatric hand injuries in our context.

In this study, median age of children was 6 years. In a study of Belie.[12] from Nigeria, the reported mean age was 5.4 ± 0.53 which is comparable to our study findings. A Serbian study reported median age of 9 years.[13] Some studies also reported mean age of 10 years.[14,15] The most likely reason of injuries among 6-10 years children may be that these children are mature enough to left alone at home and they are engaged in door and outdoor activities due to which they are high vulnerable for trauma events. Secondly, we also noted that early one-third children were in age group of 1-3 years. Belie *et al*.[12] also reported that proportion of toddlers and preschool children was the most affected group in his study. One-third toddlers were having hand injuries (33%). About one-third children of age group 0-3 years were also found to be affected in a Korean study that analyzed 3432 pediatric hand injuries[16]. The higher proportion among this group is also obvious that children of this age group are new to the surroundings and environment around them and the curiosity of exploring things around them leads to trauma.

In our study, majority of the affected group were males (58.3%). Many similar research reporting that ratio of male gender is consistently higher when observing the trauma frequency among the two genders.[12,14] The likely reason for the higher injury rate among male youngsters is that they frequently participate in more sports and leisure activities, which puts them in greater danger of mishaps and injuries.

This study analyzed that the most frequent injury mode was door injury (29%) followed by machine injury (25.1%), injury from sharp object (18%), road traffic accidents (13.1%), blunt trauma (5.8%), fall (7.1%) and gunshot (1.8%).Children frequently sustain hand injuries from automobile or house doors that crush their fingertip[3]. In houses with young children, doors must adhere to safety standards. As preventative precautions, one might place a stopper on the door's bottom or hinge side, a plastic guard to cover the hinge, or guards that restrict how far the door can close. Interestingly, in this study there no injury due to sports. However, there are studies reporting sports as a cause of injuries among pre-school and young school children.[14,18] In past literature injury mechanism including road accidents, falls and sharp object injuries are also commonly seen among children of age 1-15 years.[17,18]

The analysis showed that skin laceration injury was present in nearly quarter of the hand injuries (27.6%) whereas fractures (32.5%) and tendon injury (33.9%) was present in about one-third of the total cases. Unlike to our findings, Sung et al reported skin laceration in more than half of the cases (58.4%).[16] Belie and coworkers also reported that majority of soft tissues injuries because of lacerations.[12] In agreement to our study, tendon injuries and fractures are also commonly reported among different studies.[12,13]

LIMITATIONS OF STUDY

This study has few limitations including its cross-sectional nature, data being investigated from a single institution and descriptive analysis of contributing factors. Moreover, we did not aim to determine exploration of surgical interventions and follow-up of cases. However, doing so would be further beneficial for plastic reconstructive surgeon in knowing the pattern of surgical management and outcomes of patients. Therefore, a future study with larger sample size will address the gap of the current study.

CONCLUSION

The present study analyzed that children of age groups 1-10 years are commonly affected with hand injuries. All of the causes of hand injuries are preventable which can be avoided through close monitoring and early intervention.

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Authors' Contribution

Following authors have made substantial contributions to the manuscript as under:

EN & FAAK: Data acquisition, data analysis, critical review, approval of the final version to be published.

BZ & RF: Study design, data interpretation, drafting the manuscript, critical review, approval of the final version to be published.

SK & SAC: Conception, data acquisition, drafting the manuscript, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity

of any part of the work are appropriately investigated and resolved.

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