

**ASCENDANCY OF AGE AND TYPE OF FALL IN INFANTS AND TODDLERS WITH
TRAUMATIC HEAD INJURY**

Peer Asad Aziz*, Sanaullah Pathan, M. Hamid Ali, Abdul Rauf Memon, Ahson Memon and Peer Abdul Ahad Aziz

Liaquat University of Medical & Health Sciences.

*Corresponding Author: Peer Asad Aziz

Liaquat University of Medical & Health Sciences.

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ABSTRACT

Significant cranial changes including developing head size & neural function and suture ossification can be observed among growing children of age up to 4 year. An effect may appeared by these changes in type of head trauma due to un- intentional falls can cause significant head injury. The study aims to determine the impact of age and height of fall causing head injuries in infants and toddlers. 80 children of age ranged 0-52 months with head injuries due to accidental fall, were tracked retrospectively for this study. The children were divided in to two groups i.e. infant & toddlers. Age, fall height and type of head injury were taken into consideration. 49 (61%) were infant and 31(39%) were toddler. The mean age for infant group was 5.5 ± 4.1 months and of toddler was 32 ± 12.2 months. We observed in our study that high height fall is more common in toddlers rather than infants (n= 18 toddlers, n=2 infants). This difference is statistically significant (p value ≤ 0.05). Whereas in-case of low height falls, 22(71%) infants and 16 (33%) toddlers were reported. This difference is also statistically significant (p value ≤ 0.05). Skull fracture and scalp/facial soft tissue injury were observed more frequently in infants compared to toddlers for low and intermediate height falls (P value < 0.05). The head injury patterns differs age and mechanism wise among both groups of children who had head injury from accidental falls. Even the difference can be observed in fall type also among infants and toddlers.

KEYWORDS: Head injury patterns, accidental falls, Skull fracture, Head Trauma, infant & toddler.

INTRODUCTION

Head Trauma due to fall is common in pediatric population. In US it is the most common cause of death among children.^[1,2] These injuries accounts for 95,000 hospital admissions and 29,000 permanent disabilities annually. In most treated closed head injuries, injuries due to falls are commonest. The head trauma mechanism and pattern for infant and toddlers differs in published literature.^[1,3-7] However it is somewhat unclear whether injury patterns also vary by age within a given mechanism of injury.^[8-10] Significant cranial changes including head size/ circumference increase, neural function development and suture ossification can be observed among growing children of age up to 4 year. An effect may appeared by these changes in type of head trauma due to un- intentional falls. In some institutes, skull radiographs are broadly used in children with minor head trauma. Although several studies suggest that the guidelines for skull radiography in children are too wide and a skull fracture is not a reliable indicator of an intracranial injury.^[11-13] The planned the study not only to examine the head injury pattern, mechanism but also to refine the age. This may aid us in understanding age-dependent contributors to injury and injury mechanisms in unintentional head trauma in infants and toddlers. We

postulate the hypothesis for age and type of fall as an influence to the head injury pattern among infant and toddlers. The objective of the study was to determine the impact of age and fall type on head injuries in infants and toddlers.

MATERIAL AND METHOD

A cohort of children ranging age between 0-52 months was examined retrospectively over a period of three years. The venue of the study was department of neurosurgery liaquat university hospital. The common aspect of the cohort is the unintentional head injury from fall in all children. A total of 80 children were selected for this study. The exclusion criteria include the children fall onto anon-flat surface, previous history of neurological conditions, child abuse and the children with incomplete data were excluded from the study. Whereas patients of either sex of earlier mentioned age group with head injury due to accidental fall were included. Patients (children) with associated head injury pattern were reviewed and demographics, including radiological investigation, mechanism of injury and its related pattern were taken and the records. Further classification was made to children as, a) below one year (infant) b) 13-48 months (toddlers). All the falls were categorized in to

low, intermediate and high on the bases of height i.e. Below 3 feet fall grouped in low height fall. In case of unspecified height, the fall object was considered and an estimated height was recorded on the base of object. Moreover the fall injury outcomes like Injury severity score (ISS), loss of consciousness (LOC), Glasgow coma score (GCS), intracranial injury and Injury patterns to scalp were taken into vital considerations. All understatement outcomes were calculated and compared across age and type of fall.

Statistical analysis

All manual records were stored electronically & analyzed later by using SPSS version 20. Descriptive statistics were applied to calculate mean and standard

deviation. Frequency distribution and percentages were calculated for clinical manifestation and injury type. Over all a P values less than 0.05 was considered statistically significant.

RESULTS

During three years almost 200 children with head injury where the cause was unintentional fall was reported in hospital. Examining the full record and exclusion criterion, 80 children were taken as sample. 49 (61%) were infant and 31(39%) were toddler. The mean age for infant group was 5.5 ± 4.1 months and of toddler was 32 ± 12.2 months. The distribution of injury type among understatement groups can easily be seen in figure 1.

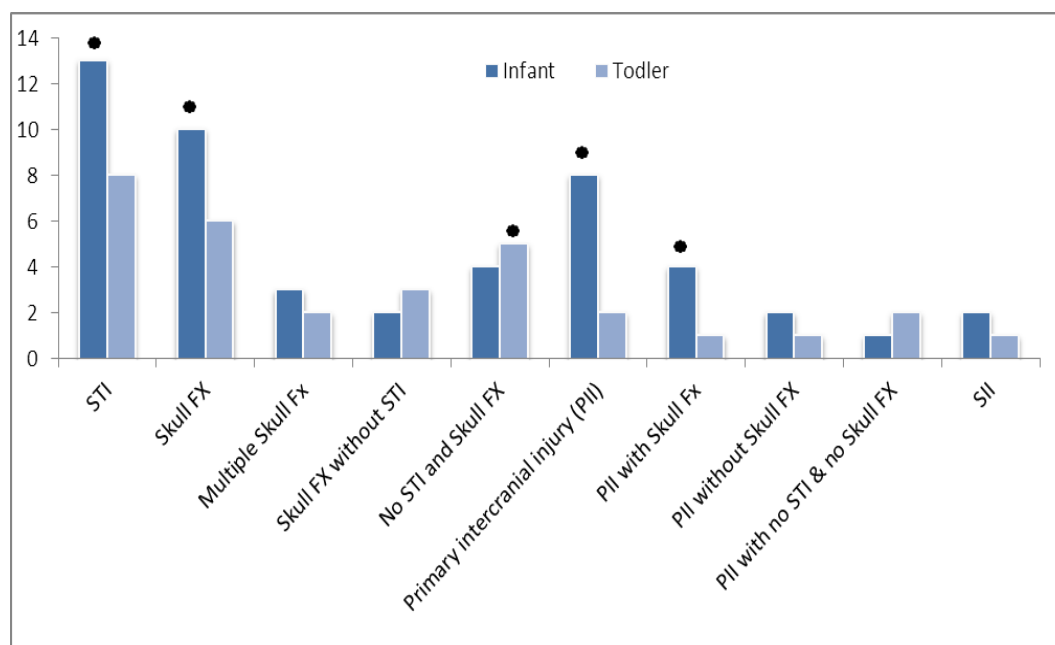


Figure 1: Distribution of injuries among groups; Statistically Significant (p-value ≤ 0.05)

We observed in our study that high height fall is more common in toddlers rather than infants (n= 18 toddlers, n=2 infants). This difference is statistically significant (p value ≤ 0.05). Whereas in-case of low height falls, 22(71%) infants and 16 (33%) toddlers were reported. This difference is also statistically significant (p value \leq

0.05). Skull fracture and scalp/facial soft tissue injury were observed more frequently in infants compared to toddlers for low and intermediate height falls (P value < 0.05). The distribution of type of injuries for toddler and infant as per category of height of fall can be seen in table 1.

Table 1: distribution of type of injury as per height falls

Low height falls			Intermediate height falls	
Type of injury	Infant	Toddler	Infant	Toddler
STI	8(16%)	3(10%)	5(10%)	5(16%)
Skull FX	9(18%)	3(10%)	1(2%)	3(10%)
Multiple Skull FX	2(4%)	0(0%)	1(2%)	2(6%)
Skull FX without STI	2(4%)	0(0%)	0(0%)	3(10%)
No STI and Skull FX	3(6%)	1(3%)	1(2%)	4(13%)
Primary intracranial injury (PII)	3(6%)	0(0%)	5(10%)	2(6%)
PII with Skull FX	3(6%)	0(0%)	1(2%)	1(3%)
PII without Skull FX	2(4%)	0(0%)	0(0%)	1(3%)
PII with no STI & no Skull FX	1(2%)	1(3%)	0(0%)	1(3%)
SII	0(0%)	0(0%)	2(4%)	1(3%)

DISCUSSION

The purpose of the present study was to determine ascendancy of age and fall type on head injuries in infants and toddlers. Secondly, to determine the significance of the difference for fall type and injury type among understatement age groups. Our study findings report the different types of head injury from fall in infant and toddler. The head injury type and fall height differs significantly among both age groups. Toddlers were more commonly fallen from high heights (above 10 feet) than the infants. Fall height is an important predictor of the frequency and severity of injury patterns.^[14] Our study did not report any correlation for the injury pattern with fall height. Whereas, published literature reported most hospitalization from falls <10 ft.^[15] Our study results are incorporate with the study finding of Duhaime A, et al.^[8] We observe low & intermediate height falls can cause intracranial injury more often. This finding is inconsistent with Murray JA, et al.^[16] In our study, toddlers who fell from high heights were more prospective to have multiple skull fractures compared to falls from low and intermediate heights, suggesting that injury patterns may be unique in falls >10 ft. Whereas other published studies report the High height falls linked to high mortality and morbidity.^[17,18] Our study shows that falls from high heights result in distinctive and serious injuries, but not necessarily more severe in intracranial injuries. This mechanism can be very complex in general. The complexity is an outcome of multifactorial effect. We had used fewer factors in our study. The falling position and angle plays vital role to determine the injury pattern. Further studies required to determine their exact role in head injury due to fall. A higher incidence of skull fracture and head soft tissue injury in infants was reported as compared to toddlers, which was also published by other investigators.^[6,19] A conservative approach was observed for hospitalization of children aged 0-12 months after head injury, a large number of infants were put under observation despite of lack of severity of head injury, whereas, the hospitalization only observed in toddlers; if they fall from intermediate or high heights. It is generally considered that falls are direct influence happenings that end in sign of trauma with or without intracranial injury. The finding in our study, suggest a noticeable number of children with skull fracture from falls does not possess any scalp wound in either group nor in fall height. Moreover, we had observed no skull fracture in 9% of our patients with a primary braininjury from a fall and. Thus with our findings we can claim that young children can have primary intracranial injury from a fallwithout external signs of impact. This earlier statement is very importantin valuing the injured child with fall history. A concern may be arisen for child abuse just because of the discrepancy among type of injury and history. In detail a physicians may look for evidenceof external trauma to corroborate a history of a fall with impact. The absence of external softtissue swelling may be interpreted as evidence that a skull fracture is unlikely and raise the suspicion of abuse. One after the other, this absence

may be thought unpredictable with injuries resulting from a fall. Our study over ruled this and claimed it untrue. With our findings the victims of abusive head trauma may present for medical care withintracranial injury in the absence of external signs of trauma, and that non-contactmechanisms of injury are commonly identified in victims of child abuse.^[20, 21]

CONCLUSION

The head injury patterns differs with age and mechanism wise among both groups of children who had head injury from accidental falls. Even the difference can be observed in fall type among infants and toddlers.

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