

# Audit of pediatric trauma in a secondary care urban public hospital



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## Abstract

**Objective:** To study the demographic profile and outcomes of pediatric trauma victims.

**Methods:** A prospective observational study was performed at a secondary care centre in urban India over 15 months. Permission from the local ethics body was obtained prior to the commencement of the study. Children under the age of 12 years admitted with trauma to the General Surgical department were included. Demographic data, history of events leading to trauma, clinical findings and treatment were recorded. Pediatric Trauma Score (PTS), Functional Independence Measure (FIM) and Pediatric Quality of Life Index (PQLI) were used to assess the outcomes.

**Results:** A total of 178 patients were included in the study. Preschool age group (3-5 years) (45%) was the most commonly affected. Majority of traumas occurred at home (75%). These homes were informal slum houses where children stayed in lofts. Fall from height (49%) due to fall from lofts (44%) was observed to be the most common mode of injury at home. Majority of patients had minor trauma with PTS (9-12) presenting with head injury (88%). However, only 35% had positive radiologic findings. There was a significant difference in PQLI of all patients and in FIM of preschool age group patients, irrespective of severity of trauma before admission and at one month of follow up.

**Conclusion:** Child's home was found as the most common site of trauma. Physical, psychosocial and cognitive impairment were seen in all pediatric trauma patients and functional impairment was seen mainly in preschool age. Majority of pediatric injuries are preventable.

**Keywords:** Pediatric trauma, PTS (Pediatric Trauma Score), PQLI (Pediatric Quality of Life index), FIM (Functional Independent Measure)

## Introduction

Pediatric trauma is one of the commonest causes of mortality and morbidity in the pediatric age group (0-12 years) (1). Children present a unique challenge in trauma care because they are different from adults - anatomically, developmentally, physiologically and emotionally (1).

The burden of pediatric trauma in India is not well known because our knowledge is inadequate about their epidemiology, severity and management. There is a paucity of literature on pediatric trauma from India. This is an obstacle in the development of effective protocols and preventive measures. Therefore, data on trauma is very critical in planning healthcare policy in India. This study is an attempt to bridge the gap in our knowledge concerning pediatric trauma.

The present study was carried out in K.B. Bhabha Municipal General Hospital, Mumbai which is a secondary healthcare delivery institution in an urban

setting. This hospital has all basic facilities and speciality units, but lacks facilities for specialized medical services like pediatric surgery, neurosurgery, plastic surgery, etc. The burden of injury on children is observed unequally in different socioeconomic populations. It is substantial among the poor with the burden greatest on children in the poorer countries with lower incomes. Overall, more than 95% of all injury deaths in children occur in low-income and middle-income countries (2). This hospital mainly deals with low to middle socioeconomic populations, primarily slum dwellers.

## Methods

This study was conducted in the department of General Surgery at K.B. Bhabha Municipal General Hospital over 15 months from 1/11/2013 to 31/03/2015. It is a secondary health care public hospital in Bandra, Mumbai. In this study, 178 patients were included. Among this batch, 106



patients were followed up for one month. Participants entered the study based on the following inclusion and exclusion criteria.

**Inclusion Criteria:** 1) All trauma patients below the age of 12 years who were admitted in the department of General Surgery over a period of 15 months. 2) Patients who expired in the hospital after admission, hence, they were not followed up for one month.

**Exclusion Criteria:** Patients who were admitted, but were not followed up for one month in order to assess outcomes (i.e. Functional Independence Measure (FIM) and Pediatric Quality of Life (PQLI))

The children were classified according to age as: Infants (up to 1 year), toddlers (1 to <3 years), preschool (3-5 years) and school-age children (above 5 to 12 years). Permission from the local ethics body was obtained prior to the commencement of the study. All patients/ parents/ guardians were informed about the study and informed consent was taken. A detailed history was obtained from the child/parents/guardians and police if necessary and thorough examination was done. Pediatric Trauma Score (PTS) was calculated after primary assessment and necessary investigation. The eventual outcomes of the patients were documented. Appropriate questions were asked from the child/parents/guardians according to the questionnaire related to FIM and PQLI outcome measures in their language they understood.

All details pertaining to the study were noted as per set proforma. Primary survey, resuscitation, secondary survey and appropriate investigations were done. The management was done as per department protocol. The patients were followed up at one month in the Out-Patient Department (OPD) with a verbal interview. Again, the same questions were asked from the child/parents/guardians in the language they understood. Seventy two patients could not be followed up at one month in order to assess outcomes in spite of multiple attempts to contact the patient, parents or guardians. All the data collected were subjected to statistical analysis and meaningful observations as well as conclusions are made.

All the data were initially entered in the pro forma and then re-entered in the Master chart prepared by Microsoft Excel 2010. SPSS statistical software version 21 was used for data analysis. Appropriate tables and graphs were drawn based on the data. Paired *t* test and Wilcoxon signed-rank test were used as the tests of significance for appropriate comparison of FIM and PQLI before admission and at 1 month of follow up with age and PTS. *P* value less than 0.05 was considered as significant.

## Results

A total number of 2075 pediatric trauma cases got registered in the out-patient and emergency department, in which 178 patients were admitted. All admitted patients entered the study.

The mean age of presentation in this study was 4.3. We

observed that pediatric trauma was most commonly seen in preschool age group (45%) followed by school age group (26%) (Table 1). Findings showed male predominance with male to female ratio of 1.17:1 (Table 1). Data revealed that Home was the place where the majority of traumas (75%) occurred followed by road accidents (13%). The percentage of trauma taking place at home was mostly seen in the younger age groups and road accidents were seen in the older age group of children. Fall from height (49%) was observed to be the most common mode of injury taking place at home followed by staircase (42%). Similarly, fall from height was the most common mode of injury contributing to 37% of all pediatric traumas followed by fall from stairs (32%). Majority of the patients had Head injury (88%) with or without injury to other parts of the body, similarly, injury to the extremities was found to be the second most common site (12%). Forty-four percent of pediatric traumas occurred inside the house due to fall from lofts and 32% occurred on account of fall from stairs in and around the house. Ten percent of patients suffered from burns in the whole study. Fifty-five percent of burn injuries occurred at home. Burn injuries were highest in the school age group and lowest in the preschool age group.

We found out that, in spite of head injury being the most common site of injury in all age groups; but children from the school age group are also prone to get injuries in the other parts of the body. Head injury was most commonly

**Table 1.** Distribution as per age and sex

	No.	%
<b>Age</b>		
Infants	13	7
Toddlers	39	22
Preschool	80	45
School	46	26
<b>Sex</b>		
Male	96	54
Female	82	46

**Table 2.** Distribution of age groups with PTS

Age		PTS-12				Total
		<0	0 to 5	6 to 8	9 to 12	
Infants	No.	0	3	9	1	13
	%	0	23	69	8	100
Toddlers	No.	0	8	15	16	39
	%	0	20.5	38.5	41	100
Preschool	No.	0	0	13	67	80
	%	0	0	16	84	100.0
School	No.	2	0	5	39	46
	%	4	0	11	85	100
Total	No.	2	11	42	123	178
	%	1	6	24	69	100

seen in preschool age group. Radiological imaging of brain was not done in 15% of children with head injury. Among the rest, only 35% of the patients had positive radiological findings with skull fractures being the most common injury reported (25%). Out of intracranial lesions, Extradural haemorrhage was most commonly found in 72% of the patients.

The mean of PTS in this study was 9. Sixty-nine percent of children had minor trauma with PTS of 9 to 12. Fifty-four percent of those having minor trauma were from the preschool age group. Eighty-five percent of the patients in the school age group suffered from minor trauma with PTS of 9 to 12. It was observed that the severity of trauma was seen mostly in the lower age group. As the age increases the severity of trauma decreases (Table 2). Majority of the patients were discharged (93%) and 5.5% were transferred to a tertiary health care hospital. Seventy-three percent of patients who were discharged had minor trauma with PTS of 9 to 12. Overall, 60% of transferred patients had moderate to severe trauma with PTS of 0 to 5. Fifty-five percent of patients who had moderate to severe trauma

were transferred. Only 3 patients expired in the study, all of them had extreme severity of trauma (Table 3).

There was significant statistical difference ( $P < 0.05$ ) in PQLI measured before admission and during follow up at one month irrespective of the severity of trauma. There was significant statistical difference ( $P < 0.05$ ) in FIM before admission and during follow up at one month in children undergoing minor (PTS 9-12) and moderate (PTS 6-8) trauma. Both the comparisons were made using the paired *t* test and Wilcoxon signed-rank test (Table 4). In addition, there was significant statistical difference ( $P < 0.05$ ) in PQLI measured before admission and during follow up at one month in all age groups. Besides, there was a significant difference ( $P < 0.05$ ) in FIM measured before admission and during follow up at one month only in preschool age group. These outcomes were also compared using the paired *t* test and Wilcoxon signed-rank test (Table 4).

### Discussion

The PQLI measures the functional and psychological outcomes of the patients. There was a significant difference in PQLI scores measured at preadmission and at follow up after 1 month with a *P* value less than 0.05 in all severity of traumas measured by PTS ranging from 6 to 12. This study signifies that trauma has an impact on the quality of life of all pediatric patients irrespective of the severity for a short period of time at least for one month.

Findings from the study conducted by Hyder et al showed that nearly 50% of children under the age of 12 years who had suffered an unintentional injury, severe enough to be present at an emergency department, were left with some form of disability. Some of the problems encountered in the years following injury included inability to attend

**Table 3.** Distribution of Outcome with PTS

Outcome		PTS-12				Total
		<0	0 to 5	6 to 8	9 to 12	
Discharge	No.	0	5	40	120	165
	%	0	3	24	73	100
Expired	No.	2	0	0	1	3
	%	67	0	0	33	100
Transfer	No.	0	6	2	2	10
	%	0	60	20	20	100
Total	No.	2	11	44	123	178
	%	1	6	24	69	100

**Table 4.** Comparison of FIM and PQLI before admission and during follow up at one month with PTS

Study Parameter	Count	Mean	SD	Median	IQR	Wilcoxon signed-rank test	P value
<b>0-5</b>							
FIM before admission	7	37.00	39.60	20.00	13.00	-1.000	0.317
FIM at follow up	7	35.57	40.16	18.00	13.00	Difference is not significant	
PQLI before admission	5	30.20	10.18	29.00	5.00	-2.023	0.043
PQLI at follow up	5	42.20	9.28	42.00	8.00	Difference is significant	
<b>6 to 8</b>							
FIM before admission	28	59.35	35.965	55.00	70	-2.1	0.036
FIM at follow up	28	57.00	34.70	55.00	55.00	Difference is significant	
PQLI before admission	23	14.00	14.75	11.00	18.00	-3.411	0.001
PQLI at follow up	23	21.36	15.38	21.00	19.00	Difference is significant	
<b>9-12</b>							
FIM before admission	71	87.13	33.99	89.00	59.00	-2.207	0.027
FIM at follow up	71	86.42	33.65	88.50	58.00	Difference is significant	
PQLI before admission	70	9.49	8.51	7.00	13.00	-5.662	0.002
PQLI at follow up	70	12.73	8.95	10.00	12.00	Difference is significant	

school, find suitable work or engage in an active social life (3).

The study by Max et al showed that 2- to 14-year-old children who had mild head trauma continued to have physical complaints at 1 month after trauma including headache and vomiting, eating problems, problems with speech or vision, walking difficulties or unsteady balance and limitation in daily activities and play (4).

According to several psychological outcome scores, an increasing incidence of anxiety and depression was found to be associated with increasing age having pediatric trauma. Max et al stated that posttraumatic psychiatric disorders occur significantly more often after pediatric traumatic brain injury, but they were not associated with the severity of injury or age at the time of injury (4). In a study by Anderson et al, it was observed that patients with traumatic brain injury had persistent adaptive, social and behavioural disability after 10 years of trauma and the recovery showed a plateau after 5-10 years for all age groups, regardless of injury severity (5).

Vitale et al found that pediatric trauma had profound effects on the physical and psychological health of children and their families. They observed that among children who experienced major trauma 71% had persistent physical limitations, 41% had behavioural disturbances and many children exhibited a decrease in academic performance. Also, 54% had limitations at the six-month follow-up (6). The quality, availability and access to medical care are important factors that can influence not only the likelihood of surviving an injury but also the long-term consequences. Children who survive their injuries may require continuing care, with disabilities that impact not only their health, but also their education and their family's livelihoods (7).

Hospitalization plays an important role in affecting PQLI of all age groups after trauma irrespective of severity of trauma. Toddlers admitted in the hospitals have fear of strangers, painful events, noisy equipment, and nightmares, but they have early regression to normal state. Preschool age group children admitted in hospitals have increased fear/anxiety, but it takes time to regress to normal state. School age group children remember previous hospital experiences affecting PQLI after 1 month (8).

During the hospital stay, parents of injured children experience considerable distress and anxiety. Providing frequent, correct, clear and accurate information may decrease these negative emotions. In addition, opportunities to participate in the child's care and permission or encouragement to stay close to the child may also alleviate the parents' anxiety and distress. After discharge, parents continue to require monitoring because they are at risk for depression, distress, and anxiety. This may be especially true for mothers whose child's injury was more severe. Identifying such parents who are having significant problems with depression or distress and helping them seek treatment are critical to the parent's

health and functioning and, thus, to the child's health and well-being (9).

It is also important to remember that all members of the family may be affected by the child's injury. Healthy siblings may also experience a variety of problems including emotional disturbances, school problems and aggression. Financial problems may occur because of health care expenses or loss of a job by one or more of the family members (9). Financial problems and poor living conditions have been found to preoccupy adults, with the result that they spend less time supervising children. Even after suffering open or complex fractures, children in low-income countries can make a good recovery if they receive proper care. All the same, permanent disfigurement and functional impairment from such fractures are frequently seen in poorer settings (2). In addition, in some families, the marital couple's relationship worsens while in others, it improves (9).

Discussing these possibilities before discharge, identifying resources for each potential problem and encouraging families to use them when necessary may allow the family to plan better for the child's discharge and the first few months postdischarge (9).

The hospital facilities, as they currently exist in many developing countries especially in a secondary healthcare hospital, are not adequate in quality and quantity to improve the outcome of childhood trauma. The facilities and interventions necessary to improve survival for these children are very expensive and often unavailable. There are scarce studies on the functional outcome evaluations for children. Potoka et al (10) found that there were improved functional outcomes such as feeding, locomotion, transfer, social functioning and expression for severely injured children whose definitive treatment occurred at a pediatric trauma centre compared to an adult trauma centre.

In the interpretation of the data, one of the limitations of this study is that 40% of the study population were not followed up at 1 month, therefore, the results of outcome assessment at 1 month after trauma may be partly affected. Since our hospital is a secondary healthcare setup with limited facilities, smaller number of patients with severe trauma were observed in this study. Also, forty percent of transferred patients were not followed up as the patients did not come back to the hospital after discharge and they had follow-up in a tertiary centre where they were transferred. Only 9% of pediatric trauma patients were admitted, hence, there is a need for community-based studies instead of hospital-based studies. In this study, data on outcomes were also obtained from the parents/guardians which should also be taken into account.

### Conclusion

Majority of pediatric injuries are preventable. It may be worth considering preventive measures to decrease the incidence in pediatric trauma, to reduce the impairment

after trauma and to improve the outcomes after management. Prevention can be a low-cost strategy to overcome this problem.

### Authors' contributions

HS and VJ conceived the study and were involved in the design and data collection. SN, MJ and NB were involved in the data collection and statistical analysis. BPV and HS made the final draft of the manuscript. All the authors read and approved the final manuscript.

### Ethical issues

Approval for the study was granted from the ethics and research committee of the K.B. Bhabha Municipal General Hospital, Bandra, Mumbai (Ethical Code Number: HO/1007/KBB).

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