

# Vomiting as a Predictor of Fracture Skull in Head Injury Patients

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## ABSTRACT

**Background:** Fracture skull due to head injury along with its associated sequelae is a leading cause of mortality and morbidity of present industrial era. Head injury is accompanied by a number of symptoms and posttraumatic vomiting is one of them and it can prognosticate serious brain tissue damage

**Aim:** To find out any relationship between fracture skull and post traumatic vomiting

**Methods:** The study population included 98 patients of different age groups and both sexes who were brought to the department of neurosurgery of Lahore General Hospital Lahore for treatment after sustaining injury to head area. Characteristics included were age, sex, cause of head injury, incidence of skull fracture and the presence of post traumatic vomiting.

**Results:** Among these 98 patients 56(58.16%) were male and 41(41.83%) were female and age of patients ranged from 2 to 80 years. On history, 53(54.08%) patients presented with post traumatic vomiting. X-ray or CT scan skull of all of these patients was done to detect fracture skull which was reported in 66(67.34%) patients. Amongst them 37(56.06%) were male and 29(43.93%) were female. 51 patients were positive both for vomiting and fracture skull. Fall from height and road traffic accidents were frequent causes of head injury leading to fracture skull.

**Conclusion:** These results firmly support the assumption that post traumatic vomiting is a strong predictor of fracture skull.

**Keywords:** Post traumatic vomiting, Predictor, Head injury.

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## INTRODUCTION

In humans, head region being upmost and maximally exposed is frequently subjected to a variety of trauma resulting in several types of structural or functional damages. Globally, head injury remains to be the prime reason of morbidity, mortality and economic losses. In developed countries, it is estimated to cause an annual loss of \$30 billion<sup>1</sup>. Traumatic brain injury (TBI) is a potentially awful clinical situation causing substantial financial burden on individual as well as state resources. Head trauma is the cause of death in more than 50% of trauma patients<sup>2</sup>. Head injury can range from mild, moderate to severe forms<sup>3</sup>. In United States head injury accounts for 500000 emergency visits 95000 hospital admissions and 7000 deaths per year<sup>4,5</sup>.

In U.K each year about 5000 cases are received in an average emergency department. On first evaluation more than 80% of these are classified as mild scoring 13 points or more on Glasgow coma scale<sup>6</sup>. It is a well recognized fact that fractures skull are associated with 200 times more risk of developing extradural haematoma and if it is detected and treated early, the outcome can be improved<sup>7</sup>. In more than 50% of trauma patients the cause of death is head injury<sup>8</sup>. Most common causes of head injury include motor vehicular accidents,

sports and falls from height and physical assault cases<sup>9</sup>. Common Post traumatic symptoms following head injury range from headache, dizziness, nausea and post traumatic vomiting (PTV), motor and sensory symptoms to psychological signs<sup>10,11</sup>. In post head injury period in children vomiting is a common feature though its etiology remains controversial<sup>12,13</sup>.

Studies in children have suggested that post-traumatic vomiting is more likely related to personal or familial disposition to vomiting than the presence of intracranial lesions<sup>14</sup>. The 2007 National Institute for Health and Clinical Excellence (NICE) delineates prompt guidelines for the care of patients presenting with head injuries, with separate guidance being issued for adults and children. Currently, CT head imaging within 1 h is recommended following trauma if there is more than one episode of post-head injury vomiting in adults and three or more episodes in children<sup>15</sup>. Radiological examination is essential for medicolegal examination and for clinical management of patients suffering from head injury. The necessity of x-ray and CT scan becomes even more when the patient is brought with closed head injury and the examiner has to rely upon the history and clinical symptoms and signs of patients. X-ray or CT for patients of head injury has to triage as skull fractures are frequently associated with intracranial hemorrhages and or brain injuries.

In Pakistan, according to Qisas and Diyat Act the nature and subsequent punishment in homicidal head injuries is decided according to the report of

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radiologist whether fracture is present or not. If there is simple fracture then the injury is shajjahhashima with punishment of Arsh(10% of diyat) and ten years imprisonment as ta'zir. But if there is also displacement along with fracture then it is called as shajjahmunaqqilah with punishment of Arsh (15%of diyat) and, ten years imprisonment as ta'zir<sup>16</sup>.

The objective of the present study is quick prompt diagnosis of fracture skull from clinical sign vomiting because many a time fracture skull is associated with life threatening intracranial haematomas and or cerebral damage which need quick response.

### SUBJECTS AND METHODS

The present cross-sectional study was conducted in accident and emergency department of Lahore general Hospital Lahore (LGH). LGH is a tertiary care hospital of Punjab with state of art well equipped neurosciences institute. Head injury patients are received here directly as well referred from other hospitals. The cases brought for traumatic head injury in the month of Oct 2015 with a total of 98 patients were included in this study. The purpose of this study was to determine whether post-traumatic vomiting (PTV) can predict the risk of fracture of skull in both adults and children brought with history of injury to head region. A questionnaire was filled for each of the patient, which included all the details like COD registration number, name, age, sex, cause of head injury, manner of infliction, consciousness status, associated vomiting and fracture skull etc. History of vomiting was inquired by the conscious patients whereas in case of unconscious it was asked from the attendants. After taking history and assessing conscious level by Glasgow Coma Scale, these patients were referred to radiology department for x-ray skull or CT scan and reported by radiologist. These data were transferred into the computer MS office excel sheet. The compiled data was analyzed using SPSS21. The data was presented in the form of frequency and percentages. Chi-square test was applied to determine the association between fracture and study variables.

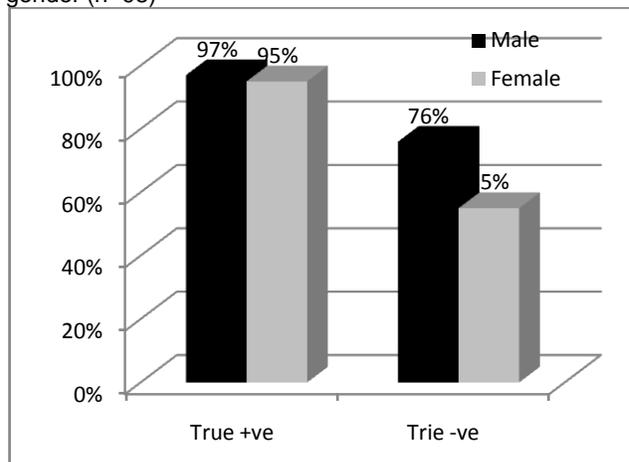
### RESULTS

In this study 98 patients were included who presented with history of head injury. Out of them 56(58.16%) were male and 41(41.83%) were female. The age of patients ranged from 2 to 80 years. X-ray or CT scan skull of all of these patients was performed. Fracture skull was reported in 66(67.34%) patients of whom 37(56.06%) were male and 29(43.93%) were female.

53(54.08%) out of 98 patients presented with vomiting after head injury while 45 (45.91%) did not vomit. Out of these 53 (100%) who were positive for vomiting 51(96.22%) also had fracture skull while only 2(3.77%) were without fracture. Risk in Exposed was 96.23%with 95% C.I (86.52- 99.69) where as Risk in Unexposed was 33.33% with 95% C.I (21.3- 47.99) Overall Risk was 67.35% with 95% C.I(57.54- 75.85) and Risk Ratio of 2.887 with 95% C.I (1.903-4.379), diagnostic accuracy was 82.65% with 95% C.I (75.16%-90.15%). So vomiting was statistically significantly associated with fracture (p-value <0.001). Whereas of 66 (100%) with fracture skull, 13(19.69%) patients did not vomit.

Among subjects with history of fall from height, fracture was present in 89.7%; among road traffic accident cases fracture was present in 74.4%; and among others like history of physical assault fracture was present in 32%.

Fig.1: Relative risk of PTV and fracture skull in relation to gender (n=98)



Chi square test, p-value is significant at 0.005

Table 1. Frequency distribution of patients according to variable characteristics (vomiting and fracture) and cause of head injury (n=98)

Variables	Cause of head injury			P value
	Fall	RTA	Assault	
Fracture	26(89.7%)	32(74.4%)	8(32.0%)	<0.001
Vomiting	26(89.65%)	25(58.13)	2(7.69%)	<0.001

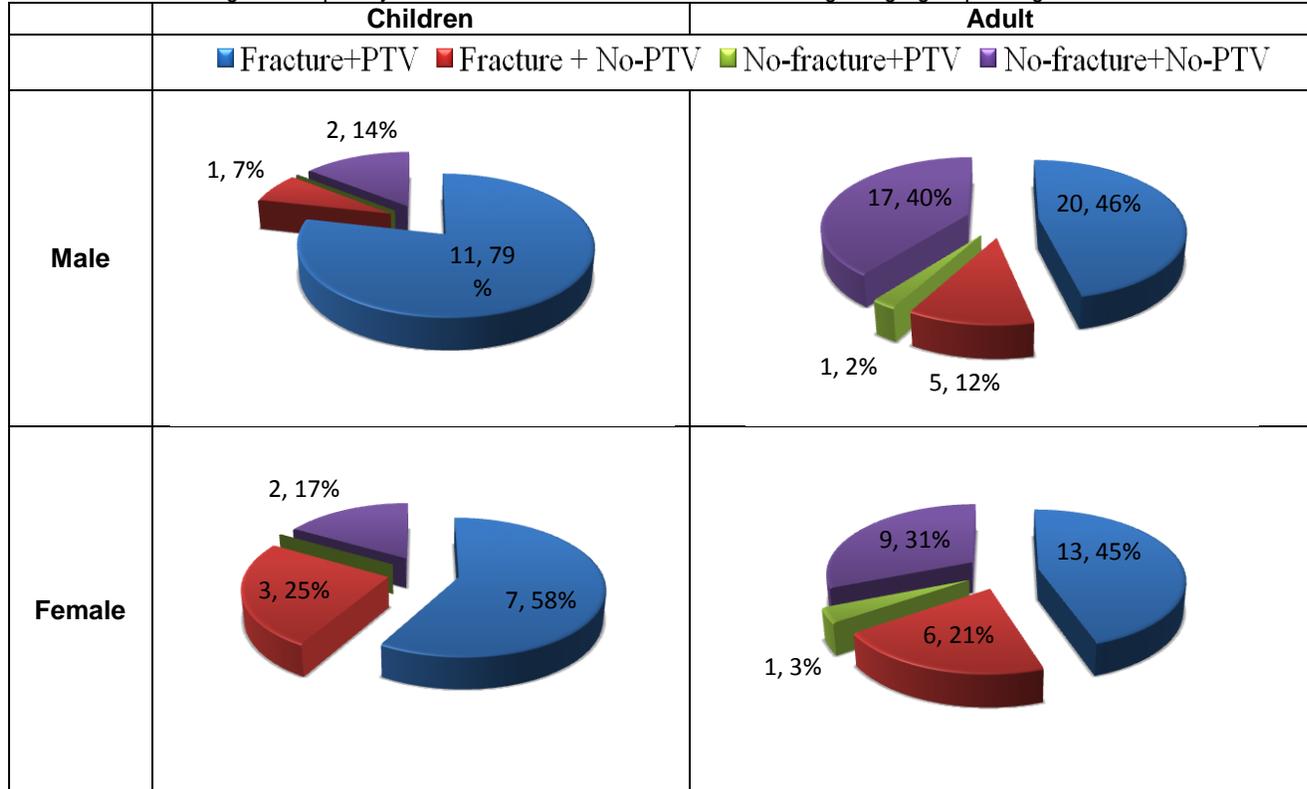
Chi square test, \*p-value significant at 0.05

Table 2. Frequency distribution of patients according to fracture and PTV (n=98)

Vomiting	Fracture		Total
	Positive	Negative	
Positive	51(96.23%)	2(3.77%)	53
Negative	15(33.3%)	30(66.7%)	45
Total	66(67.3%)	32(32.7%)	98

Chi square test, \*p-value significant at 0.05

Fig. 2. Frequency distribution of fracture and PTV according to age group and gender



**DISCUSSION**

It is a fact that presently head trauma can be contemplated as a "silent epidemic of post-industrialization era" and it is one of common factors for medical visits to any emergency trauma center<sup>17</sup>. In our study males were slightly more affected than females which is in contrast to past studies which report that up to two thirds of head trauma is experienced by males<sup>18</sup>. But in this study male to female ratio is 1.3:1 which is quite less and is due to more participation of females in outdoor activities resulting in more exposure to traumatic causes. . Fracture was not found gender specific as there was no association between the gender and the fracture.

It is known that skull, particularly in adult, is exceptionally strong and unless the traumatic force is high enough it escapes fracture. But at the same time if there is fracture it is frequently associated with various types of intracranial hematomas and brain tissue damage leading to temporary or permanent sensory or motor deficits or sometimes even death. Although some previous studies to find any association between vomiting and fracture skull vary widely but we have shown highly increased incidence of skull fracture in head injury patients who had also history of post-traumatic vomiting<sup>19</sup>. Fifty

three (54%) out of 98 patients reported with PTV and of these there were some 51(96.22%) who had also fracture skull with p-value <0.001 which is similar to a study published in 1999 reporting increased co-occurrence of vomiting and skull fracture in alert patients<sup>20</sup>. The vomiting fracture relationship is not gender biased as the reported coincidence in our study, both for female and male, is (95.2%) and (96.9%) respectively. This is against common popular belief that women can vomit more frequently as compared to men.

The exact mechanism of post traumatic vomiting in head injury cases is yet unrecognized but it is hypothesized that pressure strains caused by concentration and rarefaction produced because of movement of membranes and brain matter are important factors in its etiology.<sup>21</sup> These strain forces cause shearing and compression in the brain stem leading to stimulation of the vomiting centre. Such strain forces are common in high speed impacts than slow speed as well as in stationary objects. Therefore it is seen in our results that fall from height and road traffic accidents which result in high speed impact cause more frequent vomiting 89.65% and 58.13 respectively than simple trauma cases where it was just 7.69%. Similarly skull fractures are also more frequent in high speed impacts than slow ones. 89.7% and 74.4% in falls from heights and road

traffic accidents respectively. These results are similar to some previous studies which report RTA the most common cause of head injury<sup>22,23</sup>.

As it is obvious that fatal head injuries resulting in fracture and associated intracranial damage are caused by fall from height and road traffic accidents and they can be prevented. Fall cases are ascribed to working, sleeping, playing and flying kites on fenceless roofs especially by children. Similarly fall from stairs, crossing fence and during tree climbing are also leading causes of head injury. In case of children these can be prevented by parental care and adults can prevent them by observing proper precautions. In RTA use of safety equipments like helmets by motor cyclists, safety belts and air bags by motorists can reduce the likelihood of such bad experiences. At the same time the training of drivers, public awareness about road safety and implementation of traffic rules and regulations are equally important.

## CONCLUSION

We have seen there is strong association between post traumatic vomiting and fracture skull. Also post traumatic vomiting is quite prevalent in cases of fall from height and road traffic accidents. So in any patient of head injury the history of vomiting should arouse the suspicion of fracture skull. Therefore, x-ray skull or CT scan skull must be taken routinely before declaring the nature of injury in every victim of head injury.

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