

Outcome of Severe Traumatic Brain Injury in Patients with or without Pre Hospital Care

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ABSTRACT

Introduction: Traumatic brain injury (TBI) is the leading cause of death and disability worldwide in the young ones. A severe TBI not only affects the life of a patient and his family, but it is also a social and economic burden. Furthermore, the cost of fatal TBIs and TBIs requiring hospitalization, several of which are severe, account for 90% of the total TBI medical costs. The transportation of TBI patients to hospitals specializing in neurosurgical care is significant regarding outcome. The rationale of our study is that most sophisticated of emergency, operative, or intensive care units cannot reverse damage that has been set in motion by suboptimal protocols of triage and resuscitation, either at the injury scene or en route to the hospital. The quality of pre-hospital care is a major determinant of long-term outcome for patients with traumatic brain injury. Pakistan being a developing country traumatic brain injury patients have a poor outcome due to lack of structured pre-hospital care and availability of emergency neurosurgical care in all the hospitals. Pre-hospital care is the care provided by Rescue 1122 from the scene of trauma to emergency department of hospital in the form of airway management, fluids, oxygen inhalation, analgesia and pressure bandage for scalp wounds. This study delineate guidelines for management and supervision of these patients in terms of pre-hospital care based on their outcome in the form of mortality at four weeks follow-up.

Methods and Results: Patients were divided in to two groups (150 each) with and without hospital care. Mean age of the patients was 33.35 ± 13.56 . Male patients were 231 (77%) and female patients were 69 (23%). The stratification of various modes of injury regarding road traffic accident was 243 (81%) while of fall was 57 (19.0%). There was a high mortality in these patients as 143 (47.7%) died and just 157 (52.3%) remained alive. Ninety one (63.6%) patients in without pre hospital care group and 52 (36.4%) patients with pre hospital care group died showing a significant difference in favor of pre hospital care.

Conclusion: Pre hospital care results in significant decrease in mortality in patients with severe TBI as compared to patients without pre hospital care.

Key words: Severe traumatic brain injury, road traffic accident, pre hospital care.

Abbreviations: TBI: Traumatic Brain Injury. GCS: Glasgow Coma Scale. ICU: Intensive Care Unit. RTA: Road Traffic Accident.

INTRODUCTION

Traumatic brain injury (TBI) is the leading cause of death and disability worldwide in the young ones.¹ TBI is a part of third (30.5%) of all injury – related deaths in the United States. Approximately 1.7 million people have traumatic brain injury per year.¹ A severe TBI not only affects the life of a patient and his family, but it is also a social and economic burden.

Furthermore, the cost of fatal TBIs and TBIs requiring hospitalization, several of which are severe, account for 90% of the total TBI medical costs.²

The Glasgow Coma Scale (GCS) used to evaluate coma and conscious level, is most widely used for TBI scoring.³ Patients with GCS score 8 or less are grouped as severe TBI, with score 9 – 13 as moderate TBI and with score 14 – 15 as mild TBI.⁴ TBI leads to

widespread short or long-term issues regarding cognitive function, motor function, sensation and emotion.

The American College of Surgeons Committee on Trauma and Centers for Disease and Prevention has established field triage guidelines for patients with TBI in combination with the Brain Trauma Foundation's pre-hospital guidelines, a well – known pre-hospital TBI triaging and treatment structure.^{5,6} These endorse transportation of TBI patients to hospitals with neuro-surgical care such as CT scan, intracranial pressure monitoring and treatment.⁶ Despite following the guidelines if the transfer of patient is not to a neurosurgical center, almost 50% of TBI patients show increase mortality.⁷

The provision of effective pre hospital care is an important factor affecting the outcome of patients with severe traumatic brain injury.

OBJECTIVE

The objective was to compare outcome of Severe Traumatic Brain Injury among patients with and without pre-hospital care. Outcome was in terms of mortality in 4 weeks.

MATERIAL AND METHODS

Pre-hospital Care

Pre hospital care was the care provided by Rescue 1122 from the scene of trauma to emergency department of hospital in form of:

1. Airway management by chin lift, jaw thrust, required suction and oropharyngeal airway.
2. Oxygen inhalation with face mask/ nasal canuula.
3. Analgesia in the form of intramuscular diclofenac sodium.
4. Pressure bandage for scalp wounds.
5. Intravenous fluids in the form of 500 ml Ringer Lactate.

Sample Size

It was estimated as 300 cases (150 in each group; Group A with pre-hospital care and Group B without pre-hospital care) using 95% as level of significance, 80% power of test with an expected percentage of mortality in pre-hospital care group as 9.9% and without pre-hospital care group as 2.7%.⁹ The sampling technique was Non-probability / purposive sampling.

Inclusion Criteria

1. Age 14 – 60 years of either gender.
2. Severe traumatic brain injury (GCS 8 or less).
3. Traumatic brain injuries to emergency Jinnah Hospital Lahore within 12hours.

Exclusion Criteria

1. Subjects with Traumatic injuries of other organs e.g. multiple fractures, chest injury, injuries to viscera assessed on clinical examinations and investigation.
2. Subjects with traumatic brain injuries with severe chronic diseases like CCF, uncontrolled diabetes mellitus assessed on clinical examinations and investigations.
3. Firearm injury brain.

Data Collection

300 subjects those fulfilling the inclusion criteria were recruited for the study and divided into two groups with and without pre-hospital care. Treatment was given according to the plan of surgical team. Patient outcome was measured in hospital and for those who were discharged over a period of 4 weeks.

Data Analysis

Data was entered and analyzed in SPSS version 17.0. Mean and standard deviation were calculated for numerical variables like age, duration of injury. Frequency and percentage were calculated for outcome in terms of mortality within 4 weeks. Data was stratified for age, gender, type of injuries (High velocity and low velocity), with outcome among both groups to address effect modifiers. Chi square test was applied. Post stratification with P value < 0.05 taken as significant.

RESULTS

Age Range

There were total 300 patients who fulfilled the inclusion criteria and were considered for this study. Mean age of the patients was 33.35 ± 13.56 . The mean age in group A patients was 32.62 ± 11.85 and group B was

Table 1: Distribution of Age.

Total	Mean	Standard Deviation
300	33.35	13.56

34.06 ± 15.09.

Table 2: Distributing according to Age in groups.

Group	Total	Mean	Standard Deviation
A	150	32.62	11.85
B	150	34.06	15.09

Gender

Male patients were 231 (77%) and female patients were 69 (23%) Table 3.

Table 3: Distribution according to Gender.

Gender	Frequency	Percentage
Male	231	77.0
Female	69	23.0
Total	300	100.0

Etiology

As per type of injury severe traumatic brain injury due to road traffic accident (STBI – RTA) was 243 (81%) while of severe traumatic brain injury due to history of fall (STBI – H/O Fall) was 57 (19.0%). High mortality

Table 6: Stratification with respect to Gender.

		Gender		Total
		Male	Female	
Mortality	Yes	114 (79.9%)	29 (20.3%)	143 (100.0%)
	No	117 (74.5%)	40 (25.5%)	157 (100.0%)
	Total	231 (77.0%)	69 (23.0%)	300 (100.0%)

P-value = 0.337

Table 7: Stratification with respect to type of injury.

		Type of Injury		Total
		High Velocity	Low Velocity	
Mortality	Yes	116 (81.1%)	27 (18.9%)	143 (100.0%)
	No	127 (80.9%)	30 (19.1%)	157 (100.0%)
	Total	243(81.0%)	57 (19.0%)	300 (100.0%)

p-value = 1.000

Table 4: Distribution according to Type of Injury.

Type of Injury	Frequency	Percentage
STBI-RTA	243	81.0
STBI-history of FALL	57	19.0
Total	300	100.0

was noted, 143 (47.7%) died and just 157 (52.3%) remained alive Table 5.

Table 5: Distribution according to Mortality.

Mortality	Frequency	Percentages
Yes	143	47.7
No	157	52.3
Total	300	100.0

Statistical Analysis

When data was stratified for gender, there was no significant difference with respected to gender for both groups for mortality (p-value = 0.337, Table 6). There is no significant difference with respect to frequency as p-value was 1.00 (table 7). Similarly there is insignificant difference (p-value = 0.06) in mortality among various age groups (table 8). There were 91 (63.6%) patients in the group without pre hospital care (B) whereas 52 (36.4%) patients in the group with pre-hospital care (A) who died. This mortality rate was thus significantly different for both the groups (p-value = 0.000).

DISCUSSION

The age – old concepts of management of head injured patients in the pre-hospital setup have recently been challenged.

Effectiveness of pre hospital care has always been a matter of discussion in the treatment of patients with severe traumatic brain injury. Different protocols of pre hospital care are established according to evidence based management and even the efficacy of pre hospital care has also been studied at many centers.

Table 8: Mortality Cross tabulation for age.

		16 – 25	26 – 35	36 – 45	46 – 60	Total
Mortality	Yes	51 (35.9%)	39 (27.5%)	23 (16.2%)	29 (20.4%)	142 (100.0%)
	No	63 (41.7%)	40 (26.5%)	19 (12.6%)	29 (19.2%)	151 (100.0%)
Total		114 (38.9%)	79 (27.0%)	42 (14.3%)	58 (19.8%)	293 (100.0%)

P-value = 0.06

A study conducted in Oman showed trauma patients transported by EMS had 36% reduction in mortality when compared to privately transported patients but it needs further work in future.⁸

A study done in Austria to describe pre-hospital status and treatment of patients with severe TBI showed that ICU mortality was 32%, 90 – day mortality was 37%, and final outcome was favorable in 35%, unfavorable in 53% Administration of > 1L of fluid and helicopter transport were associated with better outcomes than expected, while endotracheal intubation in the field had neither a positive nor a negative effect on outcomes.⁹

In our study the pre hospital care showed significant reduction in mortality and our results were comparable with that of study of Oman.⁸ Mortality was 36.4% in patients with pre hospital care group and 63.6% in without pre hospital care. It showed that protocols of pre hospital care can vary among different centers but the efficacy of pre hospital care is confirmed.

Although the administration of fluid was 500 ml as compared to more than 1 liter in a study done in Austria and patients were not air lifted but the outcome in the form of mortality was comparable in the favor of pre-hospital care.⁹

Anesthetists can be ideal trauma life support physicians because they can take proper care of the airway, have practical experience, and can use neuromuscular blocking drugs and induction agents. Their experience and expertise is of immense help in the management of pediatric head trauma.

Recently, however, Di Bartolomeo et al., have failed to demonstrate any outcome benefit brought about by a combined ALS, physician – led, and rotorcraft – flown pre-hospital team.¹⁰ Immediate endotracheal intubation and ventilation in the head injured patients

Table 9: Stratification with respect to Group.

		Group (Pre-hospital Care)		Total
		No	Yes	
Mortality	Yes	91 (63.6%)	52 (36.4%)	143 (100.0%)
	No	59 (37.6%)	98 (62.4%)	157 (100.0%)
Total		150 (50.0%)	150 (50.0%)	300 (100.0%)

p-value = 0.000

have shown to improve survival.

In a retrospective study, Murray et al., observed there was high mortality (81%) in pre hospital intubated patients as compared to those patients who were intubated in hospital (43%).¹¹

Recently, similar trends of higher mortality in pre-hospital intubated patients as compared to patients without pre hospital intubation were observed in a study conducted by Bochicchio et al, 23% vs. 12.4%.¹²

In our study pre hospital care was provided by Rescue 1122 service. In the initial phase of establishment of this service in Punjab Province of Pakistan pre hospital intubation was included in pre hospital care but it was abandoned shortly afterwards due increase in on scene time but evidence based study is still lacking, although international studies showed increase in mortality with pre hospital intubation.^{11,12}

Similar observations have also been reported in pediatric trauma victims.¹³

A pre-hospital trauma care service remains a dynamic field of medicine for care of trauma patients. Therefore, improvements in the field of trauma services are required to ensure “golden hour” compliance for all trauma victims as an achievable goal by coordinating activities between pre-hospital care and specialized hospital care services. One technical aspect of pre-hospital trauma care is to improve access and to

establish a uniform emergency access telephone number. Due to great heterogeneity in the literature, firm conclusions cannot be drawn. However, present literature review provides useful information about the current status of pre-hospital trauma care in developing countries that will assist in strengthening and expansion of pre-hospital trauma care.^{7,8,14} A specific and unique model system should be developed to address the needs of the trauma patient. The goal should be to get ‘the right patient, to the right place, at the right time, to receive the right care’ following trauma.

CONCLUSION

There was significant difference in mortality among those who were given pre hospital care and those who were brought to hospital without it.

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