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ORIGINAL ARTICLE

Outcome of Traumatic Subarachnoid Hemorrhage in Patients Presenting to Neurosurgery Department Lady Reading Hospital Peshawar

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ABSTRACT

Objective: *To know about outcome of Traumatic Subarachnoid Hemorrhage based on Glasgow outcome scale at the time of discharge from the hospital.*

Material and Methods: *We conducted prospective observational study at Neurosurgery Department Lady Reading Hospital Peshawar from January 2016 to June 2016 with total 6 months' duration. All patients with traumatic subarachnoid hemorrhage having both genders and having age from 10 to 60 years were included. Patients with sub arachnoid hemorrhage due to aneurysm, AVM, brain tumors, neuroinfections, anticoagulants, sickle cell anemia and having other forms of traumatic brain injuries were excluded. SPSS version 20 was used for data analysis and showed in the form of tables and graphs.*

Results: *48% patients were in age group from 2nd to 4th decade while 19% had age< 2nd decade and remaining 33 % patients age > 40 years. 32 years ± 2.12SD was the mean age for all patients. 72% patients were male and 28% females. RTA (58.97%) was most common cause and majority of the patients initially at arrival were in the GCS range of 3 to 8 (74.74%). At the discharge from the hospital 60% patients had unfavorable traumatic subarachnoid hemorrhage while 40% patients had favorable traumatic subarachnoid hemorrhage.*

Conclusion: *Our study concluded that the frequency of unfavorable traumatic subarachnoid hemorrhage is higher in KPK as compare to other international studies because of severity of the trauma, late presentation of the patients in the hospital, less community education about traumatic brain injuries, short time of follow up, Deficiency of neurosurgical icu,s in our set up.*

Key Words: *Outcome, Traumatic, Subarachnoid Hemorrhage.*

Abbreviations: *tSAH: Traumatic Subarachnoid Hemorrhage. GCS: Glasgow Coma Scale. GOS: Glasgow Outcome Scale. KPK: Khyber Pakhtun Khwa. GOS; E: Extended Glasgow Outcome Scale. TBI: Traumatic Brain Injury. TCD: Trans cranial Doppler. ATLS: Advanced Trauma Life Support. AVM: Arteriovenous Malformation. RTA: Road Traffic Accidents.*

INTRODUCTION

In population having age less than 45 years' head injury is considered in one of the leading causes of morbidity and mortality. Head injury is responsible for 70% deaths in trauma patients and furthermore those who remain alive after trauma the permanent disabilities are mostly due to the head injuries.[1] Approximately 100 billion dollars are spent every year on patients of head injuries in United States .[2] When a person sustains head injury the protocols of both basic and advanced life support are applied even at the site of the scene by prehospital person and it has a positive effect on the outcome of patients. It has been proved

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by the studies that application of ATLS protocols on head injury patients at the scene of injury are extremely important for patient's future functional outcome and betterment.[3] Traumatic subarachnoid hemorrhage (tSAH) has a high incidence (61%) in patients with TBI. It can carry a poor prognosis however; prognosis can vary significantly according to the grading of Traumatic subarachnoid hemorrhage (tSAH) and the severity of CT findings.[4]

Those patients who have only traumatic subarachnoid hemorrhage have more favorable prognosis than those who have associated other types of head injuries like contusion, subdural and epidural hematomas this is why it is mandatory to refer those patients with associated other types of head injuries more vigorously to specialized neurosurgical centers so they can be treated on time in the hope of better outcome.[5] Glasgow coma scale of patients after trauma , age of the patients, extent oftraumatic subarachnoid hemorrhage (tSAH) and extension of blood into the ventricles of brain are extremely important for outcome of patients after diagnosis of traumatic subarachnoid. Cerebral vasospasm has more chances to occur if there is extensive subarachnoid hemorrhage.[6] Traumatic brain injury is considered as a high risk event in patients having age > 70 years if he is on anti-coagulant therapy with associated accidental fall and additionally if traumatic subarachnoid hemorrhage is detected on CT brain then its mortality rate increases furthermore.[7] The precision and accuracy in diagnosis of traumatic sub arachnoid hemorrhage increases if highly qualified radiologist and latest generation computed tomographic scan is available while it is done within the 6 hours of the onset of headache.[8] Regarding thickness of sub arachnoid hemorrhage on CT it is regarded as a major independent prognostic factor for mortality. Anatomical distribution per se did not affect clinical outcome.[9] Traumatic subarachnoid hemorrhage has profound effect on persistent cognitive disturbance of patients after recovery from acute stage of head injury. Initial Glasgow coma scale (GCS)and extended Glasgow outcome scale (GOS-E) on the follow up the extent of tSAH is the main variable which is responsible for cognitive deficits which occurs after head injuries an independent risk.[10]Nowadays Glasgow Outcome Scale (GOS) is an acceptable option for the assessment of prognosis after head injury but still there are some deficiencies in it and it can be overcome by following the standard format while interviewing the patients.[11] The favorable outcome of the traumatic subarachnoid hemorrhage (tSAH) is reported in literature from 45%[12] to 58%[10] and unfavorable outcome ranges from 47.5 %[6] to 55%.[12]

MATERIAL AND METHODS

After permission from hospital ethical committee, patients with traumatic subarachnoid hemorrhage admitted in Neurosurgery Department of Lady Reading Hospital was approached. All those patients who were included in the study a written informed consent was explained to them and then signed. After this they were assessed by history specially asking the variables like name, age, gender, residential address, signs and symptoms, duration of symptoms, initial GCS score and diagnosis of tSAH was made on the basis of CT brain.The decision for admission of patients whether to admit in neurosurgical ward or in ICU was made mainly on patient's clinical status. The patients were assessed at the time of discharge from the hospital and were categorized as either favorable having GOS 4 or 5 or unfavorableoutcome having GOS 3 or less. An exclusion criterion was followed strictly on all patients. SPSS version 20 was used to analyze the data and based on category just like descriptive variables mean ± standard deviation was used for age and initial GCS while for categorical variables percentages and frequencies were used for gender. Furthermore, outcome was stratified among age and gender of patients. Results were presented in tables and charts for different variables.

RESULTS

195 patients fulfilled the inclusion criteria among 37 (19%) patients age was < 20 years, 94(48%) had 21-40 years, 45(23%) were in age range of 41-60 years while 19 (10%) patients age was > 60 years. The mean age was 32 years ± 2.12 SD (Table 1). Patients were also

Table 1: *Age of the patients (n = 195).*

Age of Patients	Frequency	Percentage
< 20 years	37	19%
21-40 years	94	48%
41-60 years	45	23%
> 60 years	19	10%

Total	195	100%

Mean age was 32 years with SD ± 2.12

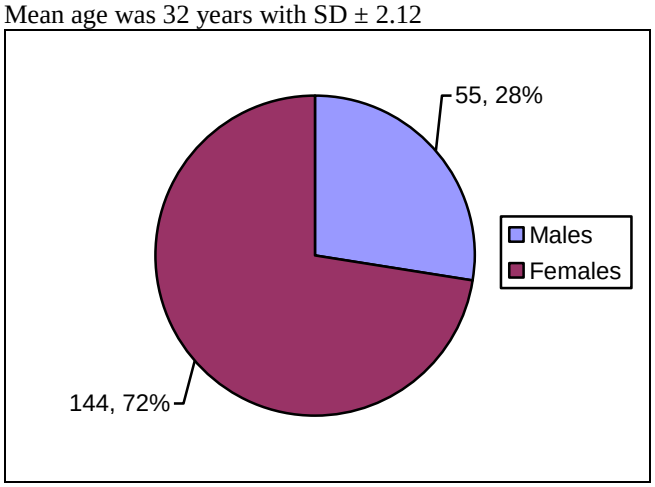

Fig. 1: *Gender distribution (n = 195).*

Table 2: *Etiology of Traumatic Subarachnoid Hemorrhage (n = 195).*

Etiology	Number of Patients	Percentage of Patients
RTA	115	58.97
Fall from height	55	28.20
Blunt trauma	25	12.82

divided in groups according to the gender in which male's patients were 140 (72%) so effected more than females (Fig. 1). Regarding etiology of traumatic sub arachnoid hemorrhage, the leading cause was RTA having 115 (58.97%) followed by fall from height with 55 (28.20%) and minimum number of cases were that of blunt trauma having 25 (12.82%) (Table 2).

Initial GCS score at the time of admission was from 3 to 8 in 138 (70.76%) patients while 9 to 15 in 57 (29.4%) patients (Table 3). Traumatic subarachnoid hemorrhage among 195 patients was analyzed as 117

Table 3: *Initial GCS at the Time of Admission (n = 195).*

Initial GCS	No of Patients	Percentage of Patients
3 – 8	138	70.74
9 – 15	57	29.26

Mean GCS score was 7 with SD ± 2.1

(60%) patients had unfavorable traumatic subarachnoid hemorrhage with GOS ≤ 3 while 78 (40%) patients had favorable traumatic subarachnoid hemorrhage with GOS > 3 (Table 4 & 5). The outcome of traumatic subarachnoid hemorrhage was also categorized according to age and gender whichhave been given in (Tables 6, 7).

Table 4: *GOS at the Time of Discharge from the Hospital (n = 195).*

GOS Score at the Time of Discharge	Frequency	Percentage
≤ 3	117	60%
> 3	78	40%
Total	195	100%

Mean GOS score was 3 with SD ± 1.78

Table 5: *Outcome of Traumatic Subarachnoid Hemorrhage (n = 195).*

Outcome	Frequency	Percentage
Un Favorable	117	60%
Favorable	78	40%
Total	195	100%

Table 6: *Stratification Outcome of Traumatic Subarachnoid Hemorrhage (n = 195).*

Outcome	< 20 Years	21-40 Years	41-60 Years	> 60 Years	Total
Un Favorable	22	56	27	12	117
Favorable	15	38	18	7	78

Total	37	94	45	19	100%

Chi Square test was applied in which P value was 0.003

Table 7: *Stratification Outcome of Traumatic Subarachnoid Hemorrhage with Respect to Gender (n = 195).*

Outcome	Male	Female	Total
Un-Favorable	84	33	117%
Favorable	56	22	78%
Total	140	55	100%

Chi Square test was applied in which P value was 0.002

DISCUSSION

In population having age less than 45 years' head injury is considered in one of the leading causes of morbidity and mortality. Head injury is responsible for 70% deaths in trauma patients and furthermore those who remain alive after trauma the permanent disabilities are mostly due to the head injuries[1]. Approximately 100 billion dollars are spent every year on patients of head injuries in United States.[2]

195 patients fulfilled the inclusion criteria among which 37 (19%) patients age was < 20 years, 94 (48%) had 21-40 years, 45 (23%) were in age range of 41-60 years while 19 (10%) patients age was > 60 years. The mean age was 32 years ± 2.12 SD. Patients were also divided in groups according to the gender in which male's patients were 140 (72%) so effected more than females having males to females ratio of 2.69;1. Phelan HA and colleagues[13] in their study of 102 patients of isolated traumatic sub arachnoid hemorrhage has shown that the mean age of the patients was 42.5 ± 19.2 SD and the total number of males (71) were greater than females (29) with the males to females ratio of 2.24:1. Similarly In studies of Rubino S[14] and Harvey LA and colleagues[15] the mean age of the traumatic sub arachnoid hemorrhage is greater than our study while in both studies males were predominantly affected due to traumatic sub arachnoid hemorrhage. Our results resemble with them in terms of males to female's ratio but the mean age of the patients was greater than patients in our study.

In our region traffic rules regulations are not followed properly, Roads infra-structure is not fully developed, Transport vehicles are not properly maintained and these are also fully loaded with passengers, Peoples specifically younger population who ride motor bikes on the roads did not wear protective helmets, increase poverty, less education ratio and more job less ratio as compared to European countries therefore peoples migrate to work in the major cities in order to earn the money for the whole family in very young age therefore they suffer more in early age from traumatic subarachnoid hemorrhage due to RTA's, falls etc.

Nowadays Increased mortality and morbidity due to road traffic accidents has become a serious issue. In KPK most of the trauma patients received in trauma centers are due to road traffic accidents and the same picture was also dominant in our study such that most of the patients of traumatic sub arachnoid hemorrhage in our study were due to road traffic accidents which were 115 (58.97%) followed by the fall from the height which had 55 (28.20%). In study of Paiva WS et al[12] the leading cause of traumatic sub arachnoid hemorrhage was road traffic accidents having 87 (72%) cases followed by fall from the height with 27 (23%) cases. Similarly Okten AI1 et al[16] had shown that the etiology of tSAH included traffic accidents (73%) on the top, then falls (20%) and others (7%). So our results resemble these two based on etiology. We received major bulk of patients with low GCS in range of 3 to 8 having 138 (70.74%) cases while remaining 57 (29.26%) were from 9-15. In the same study of Okten Ai1 et al[16] 52% of the patients were initially with low GCS from 3 to 8 and 48% were in the range of 9 to 15. Similarly Lee JJ and colleagues[17] in their study conducted on isolated traumatic sub arachnoid hemorrhage have also documented that majority of the patients 53% of the total presented initially with GCS 3 to 8. In our series the total number of patients with GCS 3 to 8 at the time of presentation are more as compared to previous two series this is because in KPK major population is located in the periphery due to which arrival to the tertiary care hospitals is late due to many problems along with deficient pre hospital management and lake of ATLS protocols application.

So the patient's in spite of initial good consciousness level become deteriorated then presented to us. Outcome of traumatic sub arachnoid hemorrhage in all 195 patients was assessed by using Glasgow Outcome Score while discharging the patients from the hospital. Among these 117 (60%) patients had unfavorable outcome and remaining 78 (40%) patients with favorable outcome. Paiva WS and colleagues[12] prospectively followed 121 patients of traumatic subarachnoid hemorrhage (tSAH) being diagnosed on non-contrast CT scan of the brain from January 2004 to January 2007 which were admitted to their trauma intensive care unit. They classified all cases of tSAH by applying the criteria of Fisher scale

along and then followed all the patients till to 6 months after initial injury on regular basis by assessing the patients by means of Glasgow outcome scale. At the end of the follow up session they noted thatin 54 (45%) patient's outcome was favorableand unfavorable outcome was documented in 67 (55%) patients.

In Chinese population outcome of traumatic sub arachnoid hemorrhage was assessed by Wong GKC and colleagues.[10] They followed 41 patients till to the 5 years out of total 111 patients and remaining 70 were unable to do the proper follow up due to different reasons. GOS was used for outcome measurement. At the end of follow up session favorable outcome was noted in 58% of patients and remaining 42% patients suffered from unfavorable outcome. In another series[16] the neurological outcomes of patients in 59% patients was favorable and unfavorable in 41% according to GOS.In available literature it has been documented that those head injury patients who have associated traumatic subarachnoid hemorrhage has more poor outcome than those who have only traumatic brain injury without it. Subsequent changes after traumatic subarachnoid hemorrhage just like cerebral vasospasm and ischemia are the main causes which lead to poor outcome in approximately 40% of severe TBI patients.[17] Lin TK[6] in their series have also shown the same cause of deterioration in patients having traumatic subarachnoid hemorrhage.Their study was basically an associative type of study in which they studied the correlation between cerebral vasospasm after traumatic subarachnoid hemorrhage and clinical status of patients in 117 patients. They categorized the patients in 4 groups among them Group I patients were those in which traumatic sub arachnoid hemorrhage was detected in the region of posterior interhemispheric fissure, Group II patients with traumatic sub arachnoid hemorrhage located elsewhere. Group II patients were categorized further in sub groups based on extent of traumatic sub arachnoid hemorrhage in which IIa were those having small amount of sub arachnoid hemorrhage, II b with extensive, II c had small subarachnoid hemorrhage but extension to ventricular systems and IId were characterized by extensive sub arachnoid hemorrhage with extension to ventricular systems. Trans cranial Doppler sonography was used for measuring the velocity of cerebral blood flow.

According to their study observations the outcome of traumatic subarachnoid hemorrhage was more poor in those patients in whom extension was more both in terms of ventricular involvement and without it as compared to those patients in which it was less extensive and no involvement of ventricles. They noted that poor outcome was 7.4% in group I, 18.4% in IIb, 33.3% in IIc, and IId had 90.9%. They further categorized the outcome of patients based on extension and isolated involvement of ventricular systems in which those patients who had isolated extensive tSAH (group IIb + IId) without involvement of ventricular system had poor outcome that of 47.7% while those with little traumatic sub arachnoid hemorrhage without involving the ventricles (group IIa + IIc) poor outcome was noted in 26.1%. Furthermore, isolated involvement of ventricles had also poor outcome than those in which the ventricular system was not involved. Group IIc + IIdhaving isolated intra ventricular hemorrhage after trauma had 78.9% poor outcome which is much higher than those having no intraventricular hemorrhage after sustaining head injury from trauma. So group IIa + IIb patients who have no intraventricular hemorrhage the total number of patients were 25.4% with poor outcome. On trans cranial Doppler study 37.5% patients of group IIb and IId who had extensive traumatic subarachnoid hemorrhage on CT brain were found to have cerebral vasospasm while patients in group I with 5.9% poor outcome and those of group IIa + IIc patients had 7.7%.

When clinical outcome was correlated with the findings of cerebral vasospasm on trans cranial Doppler ultrasound it was found that those patients who had cerebral vasospasm detected on trans cranial Doppler ultra sound had poor outcome (47.4%) than those who have no cerebral vasospasm on trans cranial Doppler ultrasound of the brain (24.7 %).

From all the above studies to which the results of outcome were compared our patients suffered slightly more from the unfavorable outcome except from Lin TK.[6] This is because majority of our patients presented to us with low GCS due to late to late arrival, deficient pre hospital management, lake of ATLS protocols superimposed by deficient neurocritical care facilities in our hospital.According to the Servadei F[18]the outcome of traumatic subarachnoid hemorrhage was strongly associated with presence or absence of subarachnoid hemorrhage on CT brain because in their series 41% patients having no subarachnoid hemorrhage on CT brain attained good recovery while in those having subarachnoid hemorrhage only 15% patients were able to achieve good recovery. Additionally they also found that patients with poor outcome were older than those having good outcome

and the same tendency of poor outcome along with increasing age was also noted in our series.

CONCLUSION

In our set up patients who present with traumatic subarachnoid hemorrhage have poor outcome as compared to developed countries because of severity of the trauma, late presentation of the patients to the tertiary care hospitals, deficient ATLS protocols in pre hospital stage and lake of full arrangement of neurointensive care units for the patients even in tertiary care hospitals. If these barriers are overcome along with the community education and proper legislation of traffic rules the mortality and morbidity due to traumatic subarachnoid hemorrhage can be significantly reduced.

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