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Prevalence of Mortality Following Traumatic Brain Injuries Considering Glasgow Coma Scale – Kabul, Afghanistan

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ABSTRACT

Background: Traumatic brain injuries are external mechanical injuries that can cause damage to the scalp, skull, or brain tissue. These injuries are significant causes of mortality in low-income countries and can result in death and disability at all ages. The most common causes of traumatic brain injuries a traffic accident and fall. It is estimated that traumatic brain injuries account for 9% of all deaths worldwide and are directly related to the severity of the brain injury. This study aims to determine the mortality rate following traumatic brain injuries based on the level of the Glasgow Coma Scale (GCS), age, gender, and causes of traumatic brain injuries.

Materials and Methods: This cross-sectional analytical study conducted at Aliabad University Hospital in Kabul City in 2022. Data was collected from hospital files of 618 patients aged 15 years and above using census sampling.

Findings: Out of the total 618 patients with traumatic brain injuries, 524 (84.8%) were male and 94 (15.2%) were female. Among them, 79 patients (12.8%) have died, with 61 (77.2%) being male and 18 (22.8%) being female. The highest occurrence of deaths occurred between the ages of 16-35 years (44.3%), and the most common causes were traffic accidents (53.2%). The mortality rates were 78.5% in GCS 3-8, 13.9% in GCS 9-12, and 7.6% in GCS 13-15.

Conclusion: Traumatic brain injury is a significant cause of mortality, and the severity of brain injury is directly related to the level of consciousness (GCS). The prevalence of deaths following traumatic brain injuries is 12.8%, with a higher occurrence in the 16-35 age groups and among males.

Keywords: Glasgow Coma Scale, Head Injury, Mortality, Traumatic Brain Injury

INTRODUCTION

Traumatic brain injuries refer to external mechanical injuries that can cause structural or functional changes in the scalp, skull, or brain tissue (Gezehagn, et al., 2022). Traumatic brain injuries are among the leading causes of death in low- and middle-income countries, affecting individuals of all ages, especially the elderly. Traffic accidents cause most traumatic brain injuries and falls (Kirollos et al., 2019). Traumatic brain injuries account for 30% of all deaths from injuries; their severity is determined by the Glasgow Coma Scale (GCS). GCS scores of 3-8 indicate severe traumatic brain injuries, 9-12 indicate moderate injuries, and 13-15 indicate mild injuries (Agarwal, 2019).

International studies report different results regarding the mortality rates of traumatic brain injury. In Scotland, the mortality rates for severe, moderate, and mild traumatic brain injuries are reported as 28.3%, 12.1%, and 5.6%, respectively (McMillan et al., 2011). In Ethiopia, out of 205 patients with traumatic brain

injuries in 2022, 27 patients (13%) died, and the most common cause of traumatic brain injuries was motor vehicle accidents (Gezehagn et al., 2022). In Germany, between 2002 and 2013, out of 9,959 patients with traumatic brain injuries and a GCS score of 3, the mortality rate was reported as 85% (Pedram et al., 2017). In New Zealand, between 1999 and 2008, 4,347 deaths were attributed to traumatic brain injuries, with 70% being male and 30% female. The highest mortality rates were observed in individuals aged 65 and above and those aged 15-24 (Kool et al., 2013).

In the United States, the mortality rate from severe traumatic brain injuries was 39% in 1984, which decreased to 27% in 1996 (Lu et al., 2005). At Aliabad University Hospital, Kabul, the neurosurgery department's mortality rate was 6.65% in 2019. The leading causes of traumatic brain injuries were traffic accidents (47%) and falls from height (33.5%). In terms of gender, 80% of patients were male and 20% were female (Rahimi, 2019). In Scandinavian countries, the mortality rate from traumatic brain injuries is reported as 12.6 per 100,000 populations per year, with a three-fold higher prevalence in males compared to females (Sundstrom et al., 2007). In a study conducted at Tokyo Women's Medical University, out of 68 deaths due to traumatic brain injuries, 7 (10.3%) occurred after mild to moderate injuries, and 61 (89.7%) occurred after severe injuries (Kibayashi, 2019). In a study in Afghanistan, 49% of traumatic brain injuries were caused by traffic accidents, and 29% by falls. Based on the GCS score, 36% were classified as severe injuries, 33% as moderate injuries, and 41% as mild injuries (Tawhid, 2019).

It is estimated that traumatic brain injuries account for 9% of all global deaths, which is attributed to population growth and the mechanization of human life. Therefore, traumatic brain injuries are considered a silent epidemic. In a study (Iran, 2000), it was found that 45% of individuals with traumatic brain injuries were between the ages of 15 and 44, with 60% being male and 40% female. The mortality rate for severe traumatic brain injuries is reported to be 20-50%, while for moderate injuries it is 4-8% (Tarassoli, 2017). Thus, this study aims to explain and clarify the prevalence of deaths after traumatic brain injuries, taking into account the (GCS), age and gender of patients, and causes of injuries in the neurosurgery department of Aliabad University Hospital.

MATERIALS AND METHODS

Study setting

This analytic cross-sectional study was conducted at Aliabad University Hospital, Kabul – Afghanistan, during January to December 2022.

Samples collection

Data was obtained secondarily from patient records and the archives of Aliabad University Hospital. Census sampling was used, including all patients above the age of 15 who were hospitalized for traumatic brain injuries in 2022. Patients who were hospitalized for stroke were excluded from the study. The mortality rate, considering the age, gender, causes of injuries, and level of consciousness of patients in the categories GCS 3-8 (severe traumatic brain injuries), GCS 9-12 (moderate traumatic brain injuries), and GCS 13-15 (mild traumatic brain injuries) (Agarwal, 2019), were studied.

Statistical Analyzes

For the variables of age, gender, GCS and cause of the injury, we defined numerical values like, 1, 2, 3 and then entered to SPSS version 24, to evaluated and analyzed.

RESULTS

In 2022, a total of 618 patients were hospitalized for traumatic brain injuries in the neurosurgery department of Aliabad University Hospital. Among them, 524 (84.8%) were male and 94 (15.2%) were female. Out of these, 79 (12.8%) patients have died, with 61 (77.2%) being male and 18 (22.8%) being female. The number of deaths among males was 61 (11.65%) and among females was 18 (19.15%). The highest occurrence of deaths occurred between the ages of 16-35 years (35 patients, 44.3%) (Table 1). In terms of causes of traumatic brain injuries leading to death, 42 incidents (53.2%) were due to motor vehicle accidents, and 25 (31.6%) were due to falling (Table 2). In terms of level of consciousness (GCS), the majority of patients who died had low consciousness levels, with mortality rates of 78.5% in GCS 3-8, 13.9% in GCS 9-12, and 7.6% in GCS 13-15 (Table 3). Similarly, it is observed that the most prevalent cause of death from traumatic brain injuries in young age groups (16-35 years) is traffic accidents (57%) (Table 4). Table 3 shows the highest prevalence of death due to traumatic brain injuries is at a low level on the Glasgow Coma Scale (GCS=3-8).

Table (1): Prevalence of Mortality following traumatic brain injuries, in terms of Age. This table shows the highest prevalence of death caused by traumatic brain injuries is among those aged 15-35.

Age	Frequency	Percent
16-25 year	19	24.1
26-35 year	16	20.3
36-45 year	7	8.9
46-55 year	12	15.2
56-65 year	11	13.9
66 years or more	14	17.7
Total	79	100.0

Table (2): Prevalence of Mortality following traumatic brain injuries in terms of Causes. This table shows that the majority cause of traumatic brain injury, which leads to death, is motor vehicle accidents.

Causes	Frequency	Percent
Road Traffic Accident	42	53.2
fall down	25	31.6
Criminal Events	8	10.1
war	4	5.1
Total	79	100.0

Table (3): Prevalence of mortality following traumatic brain injuries, in terms of Glasgow Coma Scale.

	Frequency	Percent
GCS: 13-15	6	7.6
GCS: 9-12	11	13.9
GCS: 3-8	62	78.5
Total	79	100.0

Table (4): Association between the age of the deceased and the cause of traumatic brain injuries.

	Motor Vehicle Accident	Fall down	Criminal Events	war	Total
16-25 year	12	3	3	1	19
26-35 year	8	6	0	2	16
36-45 year	5	1	1	0	7
46-55 year	9	2	1	0	12
56-65 year	5	4	2	0	11
66 years or more	3	9	1	1	14
Total	42	25	8	4	79
P-Value	0.22				

DISCUSSION

A total of 618 individuals were admitted to the Ali Abad University Hospital with traumatic brain injuries, 79 (12.8%) have died, and the percentage of death was higher in men. This indicates that, according to the prevailing culture in Afghan society, men are more engaged in activities outside the home and are more prone to brain injuries, resulting in a higher number of male fatalities (61 deceased, 11.65%) compared to females. The highest occurrence of deaths due to traumatic brain injuries is observed among patients aged 16-35 years, indicating that young people, due to their involvement in work outside the home, are more exposed to brain injuries and therefore have a higher mortality rate. In terms of the cause of fatal traumatic brain injuries, motor vehicle accidents and falling down were the most prevalent causes (Table 2). Regarding the level of consciousness, the majority of deceased patients had a low GCS (3-8), (Table 3). It is evident that as the patient's level of consciousness decreases, the severity of brain injury increases, and consequently the risk of death increases. Similarly, it is observed that the most prevalent cause of death from traumatic brain injuries in young age groups (16-35 years) are traffic accidents (57%) but there is no significant relationship between the age of the patient and the causes of brain injuries (P-Value=0.22) (Table 4), although this may indicate a high level of recklessness among young people while driving.

In this study, the mortality rate due to traumatic brain injuries in Ali Abad University Hospital, is 12.8%, which is consistent with the mortality rates reported in Ethiopia (13%) (Gezehagn, et al., 2022), Scandinavian countries (12.6%) (Sundstrom, Sollid, Wentzel-Larsen, & Wester, 2007), and close to global statistics (9%) (Tarassoli, 2017). Similarly, it is observed that as the patient's level of consciousness (GCS) decreases, the severity of brain injury increases, and the risk of death increases (Table 3). This finding has been supported by

international studies as well in Scotland, the mortality rates for severe, moderate, and mild traumatic brain injuries are reported as 28.3%, 12.1%, and 5.6%, respectively (McMillan, Teasdale, Weir, & Stewart, 2011), In Germany, in GCS score of 3, the mortality rate was reported as 85% (Pedram , et al., 2017), In Tokyo Women's Medical University, 89.7% death occurred after severe injuries (Kibayashi, 2019), the mortality rate for severe traumatic brain injuries is reported to be 20-50% (Tarassoli, 2017).

In terms of gender, males, and in terms of age, young individuals aged 16-35 are more susceptible to traumatic brain injuries and mortality (Tables 1), which is consistent with other research findings as well in New Zealand, 70% male and 30% female, and the highest mortality rates were observed in aged 15-24 (Kool et al., 2013), in Aliabad University Hospital, Kabul, 80% of patients were male (Rahimi, 2019). In Scandinavian countries, it is a three-fold higher prevalence in males compared to females (Sundstrom et al., 2007). All these findings indicate that traumatic brain injuries are a global issue and can lead to death with varying severity.

Strengths of the study: This research was conducted at Ali Abad University Hospital, one of the reputable treatment centers for brain injuries in Afghanistan.

Limitations of the study: This study was limited to one hospital (Ali Abad University Hospital) and only includes data from one year (2022), making it difficult to generalize the findings to the entire country.

Recommendation: It would be beneficial to conduct a comprehensive study across multiple reputable hospitals in Kabul city, considering data from 5-10 years, to obtain more reliable and generalizable results at a national level.

CONCLUSION

Traumatic brain injuries are significant causes of mortality, and as the patient's level of consciousness (GCS) decreases, the severity of brain injury increases, leading to a higher risk of death. The prevalence of deaths following traumatic brain injuries is 12.8%, and it is more common among patients aged 16-35 and among males.

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