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Full Length Research Paper

Causes, patterns, and mortality of traumatic head injuries in a Tertiary Hospital in Tabuk, Saudi Arabia

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ABSTRACT

Objectives: The current study aimed to describe the demographics and causes of brain injuries, to determine the severity and to evaluate interventions and outcomes of these injuries in a major hospital in Tabuk region in Saudi Arabia. Methods: A retrospective, descriptive hospital-based study conducted at King Khalid Hospital in the city of Tabuk. All cases admitted with head trauma during the period from December 2010 to October 2015 were included. Results: The majority of admitted head injury cases were males (87, 6%) and about 74 % were less than 30 years old. Road traffic accident was the cause of traumatic brain injury in (71.8 %). Using Glasgow coma scale (44.9%) presented with mild injury (GCS; 13 – 15), and 247 (44.3) with severe injury (GCS; ≤8). Chest trauma was the most common associated injury. Favourable outcome evident by safe discharge was the fate of (64.5%) of the victims and the overall mortality was (13.3%) and there where significant correlation between the mortality and severity of head injury. Conclusion: The majority of victims of traumatic brain injury are young adults and adolescents followed by children and the leading cause is Road traffic accidents. Head injury is a preventable problem. Considering public education and Legislation for protective measures such as mandatory seatbelt usage and helmets for motorcyclists and bicyclists, and can reduce the incidence, the morbidity, and mortality of TBI and should be applied strictly in our community.

Keywords: Traumatic head Injuries, traumatic brain injury, multiple injuries and road traffic accident.

INTRODUCTION

Trauma is a leading cause of mortality and morbidity globally. In the developing countries, injuries are estimated to cause more than five million deaths per year, roughly equal to the number of deaths from HIV/AIDS, malaria and tuberculosis combined (Gosselin et al., 2009). Trauma represents a challenge in the Arab Middle Eastern countries, owing to the rapid industrial development, the rate of Road Traffic Accident (RTA) and occupational injuries increased significantly in the region (Mohammad et al., 2014). In Saudi Arabia statistics, trauma is ranked as the number one killer (Ansari et al., 2000). Severity and danger characterize trauma in this country, and according to the records of the ministry of interior for each eight incidents, there are six injuries compared to the global ratio which is one injury for each eight accidents (Traffic statistics for Saudi ministry of interior). It has been estimated that in the kingdom, one person is killed and four are injured every hour. Traumatic head injury (THI) in particular is a major health and socioeconomic problem worldwide (Hyder et al.,

2007; Peter, 2007; Ghajar, 2000; Jennet, 1996). It is one of the injuries that most likely to result in death or disability (Thurman et al., 1999). Each year about 10 million people are supposed to be affected by TBI and by the year 2020, it will surpass many diseases as the main cause of death and disability (Hyder et al., 2007). These facts make TBI a pressing public health and medical problem. Traumatic brain injuries (TBI) account for one-quarter to one-third of all accidental deaths, and for two-thirds of traumatic deaths in hospitals (Jennet et al., 1996; Thomas et al., 2015).

Estimates of THI incidence show substantial variation between countries. In the United States data from the CDC indicate that in 2010, 2.5 million sustain TBI. Of these persons, 87% are treated in emergency departments, with 11% hospitalizations and 2% deaths, while in Europe the incidence of TBI is estimated to be 262 per 100,000 (Peeters et al., 2015; Thomas et al., 2015; Li et al., 2016).

In Saudi Arabia, similar to neighboring Gulf countries, Qatar and the United Arab Emirates, the most common causes of hospital admission following injury are motor vehicles collision and pedestrian injuries.They are also the most common causes of injury-related deaths (Al-Habib et al., 2013; El-Matbouly et al., 2013).

Causes of TBI vary widely across the world with road traffic accidents being the most common causes in developing countries, whereas the fall-related TBIs are the most common causes in developed countries (Li et al., 2016). In the area of Arab Gulf road traffic accidents have been reported as the single most important causative agent of TBI (Li et al., 2016; El-Matbouly et al., 2013; Alhabdan et al., 2013; Bruns et al., 2003).

In a large-scale study reviewing adult traumatic brain injuries conducted at a major trauma center in Riyadh, Saudi Arabia, RTA related injuries accounted for more than 85 % (69.4% MVC and 16.8% Pedestrian injuries) of adult brain injuries (Al-Habib et al., 2013). Another study at the same institute had indicated that falls were the most common causative agent in children under six years (45.6%), and MVC was the leading cause in high school students (74.4%) (Alhabdan et al., 2013). These findings are alarming and mandate more efforts towards Public awareness concerning the seriousness of RTA in addition to the good preventive measures which are adopted in SA.

Research has shown that TBI tends to affect males more than females, predominantly during their top productive ages (Li et al., 2013; Alhabdan et al., 2016; Al-Kuwaiti et al., 2012; El-Matbouly et al., 2013; Teasdale et al., 1974). Moreover, patients with TBI usually requires long-term care and rehabilitation further exhausting the economic systems of the countries.

Glasgow Coma Scale (GCS) is routinely assessed in patients with head injury. It objectively records the conscious state of a person making it a useful tool for determining the severity of head injury (Roozenbeek et al., 2013). The GCS classifications are as follows: Severe: score of 3–8; Moderate: score of 9–12, and Mild: score of 13–15. In patients with moderate and severe TBI, death was the most common outcome. In TBI patients with all severities, recovery is the major clinical outcome (Al-Kuwaiti et al., 2012).

The current study aimed to describe the demographics and causes of brain injuries, to determine the severity, and to evaluate interventions and outcomes of these injuries in a major hospital in Tabuk region in Saudi Arabia.

METHODS

The present study is a retrospective, descriptive hospital-based study conducted at King Khalid Hospital in the city of Tabuk, North West area, Saudi Arabia. All consecutive cases admitted with head trauma during the period from December 2010 to October 2015 were included. The demographics, cause, and severity of head trauma, hospital stay, and type of brain injury, interventions and outcome of the patients were extracted from the patient's medical records and transferred to the study questionnaire. Data were entered into a database and analyzed using the SPSS computer software (SPSS Inc., Chicago, Illinois, USA) version 20.

Descriptive and correlation studies were done to highlight the results and significance of the relevant results were tested using the Chi-square test. The study was approved by the Research Ethics Committee at the University of Tabuk.

RESULTS

Patients involved in the present study were 557, 488 (87.6%) of them were males, and 69 (12.4%) were females. The male to female ratio is 7.1: 1. Two hundred and fifty-eight (46.3%) of the victims were adolescents and young adults (age 15-29 years), followed by children (14 years or less) who were 156 (28.0%). In contrast, only 19 (3.4%) were 60 years or more. Majority of patients (439, 78.8%) were Saudi (Table 1).

Road traffic accident was the cause of TBI in 400 (71.8 %) of the study population without any preference to specific age group, followed by fall which occurs in 115(20.6%). Falls happened predominantly to children less than 14 years (52%), never the less it came second to RTA as TBI cause in this age group. (Table2).

The severity of brain injury among the study population was assessed using Glasgow coma scale. Two hundred and fifty (44.9%) presented with mild injury (GCS; 13 – 15), and 247 (44.3) with severe injury (GCS; ≤9) as in figure (1). A considerable number of the victims (245) had

Table 1. Demographic features of TBI patients

Age /years	Gender			Nationality		
	Male	Female	Total	Saudi	Non-Saudi	Total
0 – 14	111	45	156	143	13	156
15 – 29	247	11	258	220	38	258
30 – 44	48	7	91	48	43	91
45 – 59	28	5	33	15	18	33
≥ 60	18	1	19	13	6	19
Total	488	69	557	439	118	557

Table 2. Causes of head injury related to the age group.

Age	Causes			Total
	RTA	Fall	Other	
0 -14	79	60	17	156
15 - 29	224	23	11	258
30 - 44	60	18	13	91
45 - 59	23	9	1	33
≥ 60	14	5	0	19
Total	400	115	42	557

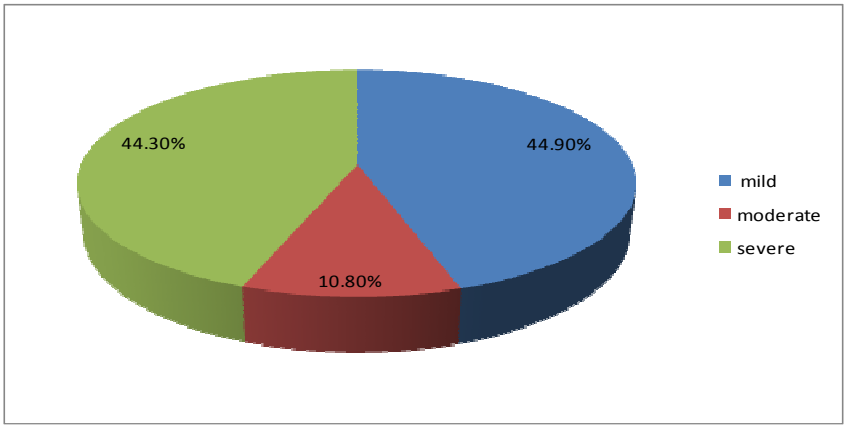

Figure 1. Distribution of patients according to the severity of head injury

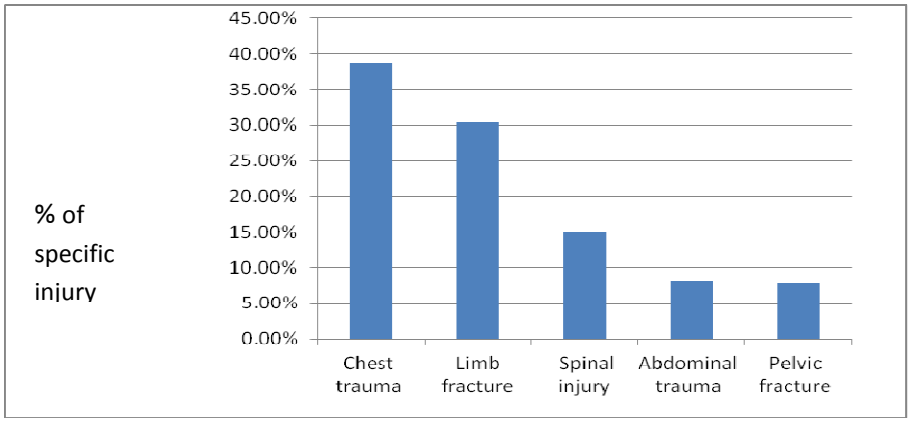

Figure 2. % of specific injury from total cases of head injuries associated with other injuries

Table 3. The outcome of head injury related to the cause of injury.

Cause	Outcome					Total
	normal	DND	Referred	Died	DAMA	
RTA	235	32	53	62	18	400 (71.8%)
Fall	89	1	4	9	12	115 (20.7%)
Other	35	1	1	3	2	42 (7.5%)
Total	359	34	58	74	32	557

Table 4. The outcome of head injury related to the age group.

		Outcome					
Age group		Normal discharge	Discharge with neurological deficit	Referred for further management	Died	Dama or obsconded	Total
0-14 years	Count	112	9	11	14	10	156
	% within age	71.8%	5.8%	7.1%	9.0%	6.4%	100.0%
	% within Outcome	31.2%	26.5%	19.0%	18.9%	31.3%	28.0%
	% of Total	20.1%	1.6%	2.0%	2.5%	1.8%	28.0%
15-29 years	Count	156	20	33	38	11	258
	% within age	60.5%	7.8%	12.8%	14.7%	4.3%	100.0%
	% within Outcome	43.5%	58.8%	56.9%	51.4%	34.4%	46.3%
	% of Total	28.0%	3.6%	5.9%	6.8%	2.0%	46.3%
30-44years	Count	56	4	8	14	9	91
	% within age	61.5%	4.4%	8.8%	15.4%	9.9%	100.0%
	% within Outcome	15.6%	11.8%	13.8%	18.9%	28.1%	16.3%
	% of Total	10.1%	0.7%	1.4%	2.5%	1.6%	16.3%
45-59years	Count	21	1	3	6	2	33
	% within age	63.6%	3.0%	9.1%	18.2%	6.1%	100.0%
	% within Outcome	5.8%	2.9%	5.2%	8.1%	6.3%	5.9%
	% of Total	3.8%	0.2%	0.5%	1.1%	0.4%	5.9%
60years	orCount	14	0	3	2	0	19
more	% within age	73.7%	0.0%	15.8%	10.5%	0.0%	100.0%
	% within Outcome	3.9%	0.0%	5.2%	2.7%	0.0%	3.4%
	% of Total	2.5%	0.0%	0.5%	0.4%	0.0%	3.4%
Total	Count	359	34	58	74	32	557
	% within age	64.5%	6.1%	10.4%	13.3%	5.7%	100.0%
	% within Outcome	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
	% of Total	64.5%	6.1%	10.4%	13.3%	5.7%	100.0%

Table 5. The outcome of head injury related to the severity of head injury (GCS).

GCS	Outcome					Total
	Normal	DND	referred	Died	DAMA	
13-15	213	4	10	0	23	250 (44.9%)
9-12	46	3	7	2	2	60 (10.8%)
≤ 8	100	27	41	72	7	247 (44.3%)
Total	359	34	58	74	32	557
	64.5 %	6.1%	10.4%	13.3%	5.7%	100 %

multiple injuries. Chest trauma was the most common associated injury affecting 131 (23.5%). Limbs fractures (103, 18.49%), spinal injuries (51, 9.15%), abdominal trauma and pelvic fractures also reported in different combinations. Figure (2).

Favourable outcome evident by safe discharge was the fate of 250 (64.5%) of the victims, on the other hand, 74 patients (13.3%) died. Fifty-eight patients referred to other hospitals, and 32 discharged against medical advice. Major neurological deficits reported in 6.6%. Mortality was also observed to be more among RTA victims (Table 3). We found no significant difference

regarding mortality in different age groups (Table 4 above).

We observed a strong correlation between patients' outcome and their GCS at admission and fatality was almost confined to the severe brain injury group 72 (97.3%) with GCS score of 3-8 (*P < 0.0001)* (table 5 above).

DISCUSSION

Trauma is considered the leading cause of death worldwide. Polytrauma patients with TBI have a 10-times higher mortality than those without TBI; Furthermore, TBI accounts for two-thirds of in-hospital trauma mortality. Disability following TBI may require longer rehabilitation, placing a greater economic burden (Patel et al., 2005; Jennett., 1998; Jennett et al., 1978; Jagger et al., 1984).

Traumatic brain injuries occurring in this region usually reported to the hospital where the study was conducted because of the neurosurgery unit at it. In the present study, we reviewed a total of 557 patients who were presented with TBI in five years time. Most of the study population was males of the age group 15-44 years afflicted by RTA. Two reasons could explain this finding; first the fact that young and middle age people are physically and socially active. Moreover, they are mostly the breadwinners of their families which necessitates being outside most of the day-time. Secondly, the Saudi Arabia legislation doesn't license females driving, therefore, the small percentage of women involved in RTA. Our findings are in agreement with other studies (Al-Habib et al., 2103; Li et al., 2016; Al-Kuwaiti et al., 2012; El-Matbouly et al., 2013; Alhabdan et al., 2013; Teasdaleet al., 1974; Wu et al., 2008). In our study, people over 60 years were least involved. We think this could be due to the fact that more than half of Saudi Arabia population is 24 years old or less with people over 60 years representing about 5 % only of the whole population (general authority for statistics kingdom of Saudi Arabia), and that elderly usually remain at home.

The most common cause of THI in adult in this study was RTA followed by fall; the same observation noticed in Habib et al. (2013) as also in UAE (Al-Kuwaiti et al., 2012) and Qatar (El-Matbouly et al., 2013). Unfortunately, this reflects the high incidence of road traffic accidents in the area of the Arab Gulf. The contribution of RTA to the occurrence of TBI in our study exceeded that reported in China (Wu et al., 2008) and India (Gururaj. 2002) where it was about 60%.

In developed countries, the order of frequency of mechanisms causing TBI has changed during the last decades with fall being number one cause and it tends to affect older adults more than other age groups (Peeters et al., 2015; Tagliaferri et al., 2006; Roozenbeek et al., 2013).

Fall also reported as the commonest cause in New Zealand and the USA. This decline of the role of RTA as a major cause of TBI may attribute in part to successful road safety programs and public awareness in developed countries; However, they have a higher incidence of TBI in older people (Feigin et al., 2013; Faul et al., 2002); Whereas in our review, 44.3% of patients presented with severe trauma with Glasgow coma scale 8 or less. Traffic accidents were responsible for majority of them.

Fatality of TBI in our review was observed mostly in adolescents young adults (15-29 years), followed by children less than 15 years. Most of the dead are RTA victims, and almost all of them were in the severe brain injury category with GCS equal or less than 8. The mortality in this study is comparable to that reported in Qatar 11% (El-Matbouly et al., 2013), but it is far less than that in Alhabib which is 30%. Alhabib explained their higher mortality to the fact that most of their admitted cases initially had a severe head injury (GCS below 8) (Alhabib et al., 2013).

The high correlation between Glasgow Coma Scale score and fatality in this study indicating the role of GCS score as a valuable prognostic predictor for head-injured patients this correlates with that of Alhabib et al. (2013); Aldawood et al., (2012).

CONCLUSION

It is evident that majority of the victims of traumatic brain injury are young adults and adolescents followed by children and the leading cause is Road traffic accidents. Head injury is a preventable problem. Considering public education and Legislation for protective measures such as mandatory seatbelt usage and helmets for motorcyclists and bicyclists, and this can reduce the incidence, the morbidity and mortality of TBI cause by RTA and should be applied strictly in our community.

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REFERENCES

Aldawood AS, Alsultan M, Haddad S, Alqahtani SM, Tamim H, Arabib YM (2012). Trauma profile at a tertiary intensive care unit in Saudi Arabia. Annals of Saudi medicine. 32(5):498.

Alhabdan S, Zamakhshary M, AlNaimi M, Mandora H, Alhamdan M, Al-Bedah K, Al-Enazi S, Al-Habib A (2013). Epidemiology of traumatic head injury in children and adolescents in a major trauma center in

Saudi Arabia: implications for injury prevention. Ann Saudi Med. 33(1):52-6.
Al-Habib A, A-Shail A, Alaqeel A, Zamakhshary M, Al-Bedah K, Alqunai M, Al-Enazi S (2013). Causes and patterns of adult traumatic head injuries in Saudi Arabia: implications for injury prevention. Ann Saudi Med. 33(4):351-5.
Al-Kuwaiti A1, Hefny AF, Bellou A, Eid HO, Abu-Zidan FM (2012). Epidemiology of head injury in the United Arab Emirates Ulus Travma Acil Cerrahi Derg. 18(3):213-8.
Ansari S, Akhdar F, Mandoorah M, Moutaery K (2000). Causes and effects of road traffic accidents in Saudi Arabia. Public Health. 114:37–9.
B Jennet (1996). Epidemiology of head injury. J Neurol Neurosurg Psychiatry. 60(4): 362–369.
Bruns J, Hauser WA (2003). The epidemiology of traumatic brain injury: a review. Epilepsia. 44(s10):2-10.
El-Matbouly M, El-Menyar A, Al-Thani H, Tuma M, El-Hennawy H, Abdulrahman H, Parchani A, Peralta R, Asim M, El-Faramawy A, Zarour A, Latifi R (2013). Traumatic brain injury in Qatar: age matters-insights from a 4-year observational study. ScientificWorldJournal.
Faul M, Xu L, Wald MM, Coronado VG (2002); (2006): (2010). Traumatic Brain Injury in the United States. Emergency Department Visits, Hospitalizations, and Deaths.
Feigin VL, Theadom A, Barker-Collo S, Starkey NJ, McPherson K, Kahan M, Dowell A, Brown P, Parag V, Kydd R, Jones K (2013). Incidence of traumatic brain injury in New Zealand: a population-based study. The Lancet Neurology. 12(1):53-64.
Gennarelli TA, Champion HR, Copes WS, Sacco WJ (1994). Comparison of mortality, morbidity, and severity of 59,713 head injured patients with 114,447 patients with extracranial injuries. Journal of Trauma and Acute Care Surgery. 37(6):962-8.
Ghajar J (2000). Traumatic brain injury. Lancet, 356, pp. 923–929.
Gosselin, Richard A., David A. Spiegel, Richard Coughlin, and Lewis G. Zirkle (2009). "Injuries: the neglected burden in developing countries." *Bulletin of the World Health Organization* 87(4): 246-246a.
Gururaj G (2002). Epidemiology of traumatic brain injuries: Indian scenario. Neurological research. 24(1):24-8.
Hyder AA, Wunderlich CA, Puvanachandra P, Gururaj G, Kobusingye OC (2007). The impact of traumatic brain injuries: a global perspective. NeuroRehabilitation. 22 pp. 341–353.
Jagger J, Levine JI, Jane JA, Rimel RW (1984). Epidemiologic features of head injury in a redominantly rural population. J. Trauma 24:40-4.
Jennett B (1998). Epidemiology of head injury. Arch Dis Child 78:403-6.
Jennett B, Carlin J (1978). Preventable mortality and morbidity after head injury. Injury 10:31-9.
Li M, Zhao Z, Yu G, Zhang J (2016). Epidemiology of Traumatic Brain Injury over the World: A Systematic Review. Gen Med (Los Angel) 4:275.
Mohammad A, El-Menyar A, Al-Thani H, Husham A, Ahmad Z, Rifat L (2014). Blunt traumatic injury in the Arab Middle Eastern populations. J Emerg Trauma Shock. 7(2): 88–9.
Patel HC, Bouamra O, Woodford M, King AT, Yates DW, Lecky FE (2005). Trauma Audit and Research Network. Trends in head injury outcome from 1989 to 2003 and the effect of neurosurgical care: an observational study. Lancet 366:1538-44.
Peeters W, van den Brande R, Polinder S, Brazinova A, Steyerberg EW, Lingsma HF, Maas AI. Epidemiology of traumatic brain injury in Europe. Acta neurochirurgica. 2015 Oct 1; 157(10):1683-96.
Peter Reilly. The impact of neurotrauma on society: an international perspective. Prog Brain Res, 161 (2007), pp. 3–9.
Roozenbeek B, Maas AI, Menon DK. Changing patterns in the epidemiology of traumatic brain injury. Nature Reviews Neurology. 2013 Apr 1; 9(4):231-6.
Tagliaferri F, Compagnone C, Korsic M, Servadei F, Kraus J. A systematic review of brain injury epidemiology in Europe. Acta Neurochir (Wien). 2006; 148: 255-268.
Teasdale G, Jennett B. Assessment of coma and impaired consciousness: A practical scale. Lancet. 1974; 2:81–4.
Thomas R. Frieden, Debra Houry, Grant Baldwin. Traumatic Brain Injury in the United States: Epidemiology and Rehabilitation. REPORT TO CONGRESS. Centers for Disease Control and Prevention, National Center for Injury Prevention and Control. (2015).
Thurman, David J., Clinton Alverson, Kathleen A. Dunn, Janet Guerrero, and Joseph E. Sniezek. "Traumatic brain injury in the United States: a public health perspective." *The Journal of head trauma rehabilitation* 14, no. 6 (1999): 602-615.
Traffic statistics for Saudi Ministry of interior https://www.moi.gov.sa/wps/portal/Home/sectors/publicsecurity/traffic/trafficriyadh
Wu X, Hu J, Zhuo L, Fu C, Hui G, Wang Y, Yang W, Teng L, Lu S, Xu G (2008). Epidemiology of traumatic brain injury in eastern China, 2004: a prospective large case study. Journal of Trauma and Acute Care Surgery.