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FULL PAPER

Epidemiology and radiologic findings of patients with traumatic brain injuries in emergency department of Shahid Mohammadi hospital

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Traumatic brain injury (TBI) is a brain injury caused by physical external forces on the head that leads to changes in the brain tissue. Epidemiologic studies help to identify the key opportunities for decreasing burden of TBI, cost-effective prevention and treatment of TBI. This study was conducted to investigate the epidemiology and radiologic findings of patients with traumatic brain injures who referred to emergency department in Iran. In this retrospective descriptive-analytic study, the data of patients (n=267) with TBI admitted to Emergency Department of Shahid Mohammadi hospital of Hormozgan University of Medical Sciences were considered during 2017 year. The administrative dataset of Shahid Mohammadi hospital was used in the current study. Mean of age for patients was 29.87 years and 228 patients (85.00%) were men and 39 patients (15.00%) were women. The most trauma was associated to road accidents (n=203, 67%), 58 cases (21.70%) for falling from heights, 4 cases (1.54%) for struggle and 2 cases (0.7%) for water injury. The data showed that 35 patients (13.10%) were dead due to trauma and 232 patients (86.90%) survived. The results showed that epidural hematoma (EDH) (n=79) and subarachnoid hemorrhage (SAH) (n=71) had most incidence. The results showed a significant relation between age and trauma mechanism (P<0.05), so that 58 patients <18 years of age injured from road accidents, while 133 patients 18-60 years of age injured form road accidents. In conclusion, the most common causes of TBI in Bandar Abbas are accidents that must be reduced by traffic rules and transport safety.

KEYWORDS

Accidents; brain injury; epidural hematoma; Iran; trauma.

Introduction

Traumatic brain injury (TBI) is known as a brain injury created through physical external forces on the head that cause changes in the brain tissue [1, 2]. The TBI is also a major factor for mortalities in all over world and related with long-term sequel in those who survive [3]. It occurs in all the ages, but it is mostly observed in young adults of productive age group, due to road traffic injuries [4]. It commonly occurs due to road traffic injuries (60%), falls (20-25%) and violence (10%) [5]. The TBI is commonly divided as mild, moderate or severe on the basis of Glasgow Coma Scale (GCS) that grades a person's level of consciousness based on verbal, motor and eye-opening reactions to stimuli [6]. The GCS is a clinical tool that has scores ranging from 3 to 15 based upon three components of neurologic

function: 1) eye opening to external stimuli, 2) motor response to stimuli, and 3) verbal response. TBI is commonly subdivided into mild (≥13), moderate (9-12) and severe grade (3-8) by the GCS [7]. The TBI etiology is complicated based on several factors, such as age, race, sex and factors, such as motor vehicle accidents, falls and blunt trauma [2]. It was reported that 10 million people are injured annually by TBI worldwide [8]. it has been reported that traumatic brain injury is "silent epidemic" [9]. It has been estimated that 75-90% of all treated brain injuries are mild depending on expected prevalence of 100-300/100,000 cases based on the WHO task force [10]. Vafaei et al. [11] showed that out of 4320 patients (93%) presented with GCS between 13 and 15, 156 (3.4%) had GCS between 9 and 13, 168 (3.6%) had severe head trauma, with GCS between 1 and 9. It is essential to detect those clinical findings that may relate with their mortality and long-term disability in patients with acute TBI [3]. This study was conducted to investigate the epidemiology and radiologic findings of patients with TBI among patients subjected to Emergency Department of Shahid Mohammadi Hospital of Hormozgan University of Medical Sciences. A retrospective descriptive-analytic study was conducted to determine the epidemiology and radiologic findings of patients with TBI. Our findings can help to identify the key opportunities for decreasing burden of TBI, cost-effective of prevention and treatment of TBI.

Materials and methods

In this retrospective descriptive-analytic study, the data of patients (n=267) with TBI admitted to Emergency Department of Shahid Mohammadi hospital of Hormozgan University of Medical Sciences during 2017 year. The administrative dataset of Shahid Mohammadi hospital was used in the current study. Medical records of patients with TBI were obtained from the Medical Records Department of the hospital. Shahid Mohammadi hospital is a referral teaching hospital in Bandar Abbas city. Bandar Abbas is a crowded city placed in the southern part of the Islamic republic of Iran with a population of about 686000. This hospital adopts patients with TBI. A check list was prepared and included age, gender and mechanism of injury. Types of injuries, GCS score and the relation between variables were also investigated. The criteria were applied with all the patients with TBI subjected to Emergency Department of Shahid Mohammadi Hospital of Hormozgan University of Medical Sciences that had CT scan. Exclusion criteria included the death for other reason exception of TBI, faults in documents and lack of CT scan and GCS.

Statistical analysis

The data were analyzed using SPSS 22.0 software. $P<0.05$ was considered significant. Spearman correlation was used for investigation the relation between variables.

Results

In this study, 310 patients were studied, but 43 patients excluded the study and this study was conducted by 267 patients. Mean of age for patients was 29.87 years and divided into 3 groups: 80 patients <18years (29.90%), 166 patients 18-60 years (62.10%) and 21 patients >60 years (8.00%). In the current study, 228 patients (85.00%) were men and 39 patients (15.00%) were women. 122 patients (45.70%) were married and 145 patients (54.30%) single.

The most trauma was associated with road accidents (n=203, 67%), 58 cases (21.70%) for falling from heights, 4 cases (1.54%) for struggles and 2 cases (0.7%) for water injury. The data showed that 35 patients (13.10%) were dead due to trauma and 232 patients (86.90%) survived. The data for types of TBI are shown in Figure 1. The results showed that epidural hematoma (EDH) (n=79) and

subarachnoid hemorrhage (SAH) (n=71) had the most incidence.

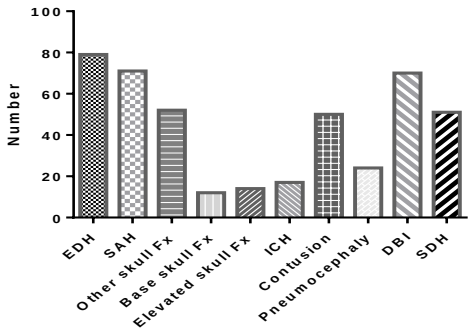

FIGURE 1 Frequency for types of TBI

The results in Table 1 show the relation between sex, marriage status and GCS with types of TBI. The results show a significant relation between sex with EDH (P<0.05), but other TBIs did not show any significant relation. The results showed a significant relation between marriage status with EDH (P<0.05) and SAH (P<0.05). It was observed a significant relation between elevated Fx and contusion with GCS (P<0.05).

The relation between prognosis and GCS is shown in Table 2. The results showed that 28 patients (66.70%) with GCS<8 were dead, while patients with GCS moderate, 7 patients were dead and in patients with GCS, mortalities were zero. The relation between GCS and prognosis was significant (*P*<0.05).

TABLE 1 The relation between sex, marriage status and GCS with types of TBI

	EDH			**SAH**			**Elevated Fx**		
	Positive	Negative	P-value	Positive	Negative	P-value	Positive	Negative	P-value
Male	74 (32.5%)	154 (67.50%)	0.003	58 (25.40%)	170 (74.60%)	0.302	12 (5.30%)	216 (94.70%)	0.972
Female	5 (12.80%)	34 (87.20%)		13 (33.30%)	26 (66.70%)		2 (5.10%)	37 (94.90%)	
Single	56 (38.60%)	89 (61.40%)	0.0001	28 (19.30%)	117 (80.70)	0.003	10 (6.90%)	135 (93.10%)	0.186
Married	23 (18.90%)	99 (81.10%)		43 (35.20%)	79 (64.80%)		4 (3.3%)	118 (96.70%)	
Severe GCS	14 (33.30%)	28 (66.70%)		9 (21.40%)	33 (78.60%)		7 (16.70%)	35 (83.30%)	
Moderate GCS	7 (18.40%)	31 (81.60%)	0.254	16 (42.10%)	22 (57.90%)	0.060	1 (2.60%)	37 (97.40%)	0.001
Mild GCS	58 (31%)	129 (69%)		46 (24.60%)	141 (75.40%)		6 (3.20%)	181 (96.80%)	
	Contusion			Pneumocephaly			**SDH**		
	Positive	Negative	P-value	Positive	Negative	P-value	Positive	Negative	P-value
Male	44 (19.30%)	184 (80.70%)	0.563	22 (9.60%)	206 (90.40%)	0.563	62 (27.20%)	166 (72.80%)	0.381
Female	6 (15.40%)	33 (84.60%)		2 (5.10%)	37 (94.90%)		8 (20.50%)	31 (79.50%)	
Single	29 (20.00%)	116 (80.00%)	0.561	12 (8.30%)	133 (91.70%)	0.657	34 (23.40%)	111 (76.60%)	0.262
Married	21 (17.20%)	101 (82.20%)		12 (9.80%)	110 (90.20%)		36 (29.50%)	86 (70.50%)	
Severe GCS	5 (11.90%)	37 (88.10%)		2 (4.80%)	40 (95.20%)		8 (19.00%)	34 (81.00%)	
Moderate GCS	1 (2.60%)	37 (97.40%)	0.005	7 (18.40%)	31 (81.60%)	0.072	9 (23.70%)	29 (76.30%)	0.432
Mild GCS	44 (23.50%)	143 (76.50%)		15 (8.00%)	172 (92.00%)		53 (28.30%)	134 (71.70%)	

TABLE 2 The relation between prognosis and GCS

	Death	**Survive**	**Total**
GCS (3-8)	28 (66.70%)	14 (33.30)	42 (100.00%)
GCS (9-12)	7 (18.40%)	31 (81.60%)	38 (100.00%)
GCS (13-15)	0 (0.00%)	187 (100.00%)	187 (100.00%)
Total	35 (13.10%)	232 (86.90%)	267 (100.00%)

The results for relation between trauma mechanism and age are shown in Table 3. The results showed a significant relation between age and trauma mechanism (P<0.05). The results showed that 58 patients <18 years of age injured from road accident, while 133 patients 18-60 years of age injured form road accident.

TABLE 3 The relation between age and mechanism

	Road accident	Falling	Struggle	Water vehicles	Total
<18	58 (72.50%)	19 (23.80%)	3 (3.80%)	0 (0.00%)	80 (100.00%)
18-60	133 (80.10%)	31 (18.70%)	1 (0.60%)	1 (0.60%)	166 (100.00%)
>60	12 (57.10%)	8 (38.10%)	0 (0.00%)	1 (4.80%)	21 (100.00%)
Total	203 (76.00%)	58 (21.70%)	4 (1.50%)	2 (0.70%)	267 (100.00)

Discussion

Mean of age for patients was 29.87 years, so that 80 patients <18years (29.90%), 166 patients 18-60 years (62.10%) and 21 patients >60 years (8.00%). Similarly, Shelke et al. [4] showed that most number of head injury cases (42.70) were in younger age (21-30 years), and lowest injures were observed for higher than 60 years (2.35%). Park et al. [12] reported a mean age of 49.7 years (range, 18-90 years) for patients with TBI. Major difference between our findings and others might be attributed to culture differences and an age for utilization of car and vehicles. Another study reported age mean of 33 years of age [11]. They also reported that six hundred and thirty (13.5%) of the affected patients were elderly (<60 year olds) and 804 (17.3%) were less than 20 years old [11]. A study in Taiwan showed that highest incidence of TBI moved to the 20–29 years of age that is similar to our study and it may show the transformation of Asian countries into a more Western-like environment [13]. In sum, the most injures were observed in young people that could be attributed to road accidents, because driving license is given for people above 18 in Iran.

In the current study, 228 patients (85.00%) were men and 39 patients (15.00%) were women. The results are similar to those reported by Aghakhani et al. [14]. Similar results were also reported for Colorado [15]. Similar results were also reported by Vafaei et al. [11] for Iran. A reason why age and gender influence the outcome of head trauma is associated with protective effect of estrogen and progesterone in female or severity of trauma in male [16].

The most trauma was associated with road accidents (n=203, 67%), 58 cases (21.70%) for falling from height, 4 cases (1.54%) for struggles and 2 cases (0.7%) for water injury. Similar to our findings, Vafaei et al. [11] showed that motor vehicle accident, fall from heights and assault are the main mechanisms of head trauma. Similar results were reported by previous studies [17, 18]. The patients have a higher exposure to risk situations such as driving at high speed without the use of safety belts or riding motorcycles without a helmet, making them more vulnerable to head injuries. Similarly, road accidents are considered as primary cause in Greece and Canada [19, 20]. Thus, the increased use of safety helmets through legislation and education can decrease mortality.

The data showed that 35 patients (13.10%) were dead due to trauma and 232 patients (86.90%) survived. Similarly, it was reported that 16% of mortality was associated with TBI [21]. The proportion is very large that must be controlled.

The results showed that epidural hematoma (EDH) (n=79) and subarachnoid hemorrhage (SAH) (n=71) had most incidence. EDH is defined as blood collection between the skull inner bone layer and the external sheet of the dura [22, 23] and has mostly a biconvex shape [23, 24], while SAH can be secondary to a direct or indirect head trauma; in this latter case, it may be the only

sign of TBI [23]. Conversely, it was reported that diffuse and localized edema (47.54%), depressed fracture (9.68%), Sub arachnoid hemorrhage (7.5%), EDH (5.34%), SDH (5.05%) had most incidence. Other study reported that highest number of patients were having scalp lacerations (40.4%) followed by contusion (8.8%), EDH (3.2%), SDH (4.2%) and depressed fracture (3%) [25]. It was reported that the presence of subarachnoid hemorrhage in TBI as a powerful factor was associated with poor outcome [26].

The results showed that 28 patients (66.70%) with GCS<8 were dead, while patients with GCS moderate 7 patients were dead and in patients with GCS, mortality was zero. A study showed mortality rate of 100%, 82.2%, 41.8% for each respective GCS group was GCS 3, 4-5, 6-8, whereas those under GCS 5 never showed any favorable outcome, those over GCS 6 (two each from GCS 6, 7, 8) showed a portion of 10.9% [12]. The results showed that 58 patients <18 years of age were injured from road accident, while 133 patients 18-60 years of age were injured form road accident. Previous studies have reported of the relationship between old age and high mortality [27, 28]. Our hospital yielded results similar to the mentioned studies. In contrast to our findings, mortality rate was 38.2% in the patients under the age of 29 years and 82.5% mortality rate was observed in patients over [12]. Also, for aging brains have less neurotropic factors secreted after brain injuries compared with the younger brains, with subsequent regenerative capacity decrement. This is why the older age patients tend to have higher mortality rate [12].

Conclusion

This study was conducted to investigate the epidemiology and radiologic findings of patients with TBI in Iran. Our results showed that the most common causes of TBI in Bandar Abbas are accidents that must be reduced by traffic rules and transport safety. A National Registry for TBI is recommended that is to be established by the national Ministry of Health, so that the etiological pattern of TBI in the world can be known.

Ethics approval

All experimental procedure were approved by the Ethical Committee of Shahid Mohammadi Hospital of Hormozgan University of Medical Sciences, Bandar Abbas, Iran.

Author contributions

All authors contributed toward data analysis, drafting and revising the paper and agreed to be responsible for all the aspects of this work.

Disclosure

The authors report no conflicts of interest in this work.

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References

[1] D. Najem, K. Rennie, M. Ribecco-Lutkiewicz, D. Ly, J. Haukenfrers, Q. Liu, *Biochem. Cell Biol.,* **2018**, *96*, 391-406.
[2] A.J. Gardner, R. Zafonte, *Handb Clin. Neurol.,* **2016**, *138*, 207–223.
[3] R.F. Balzano, T. Popolizio, R. Izzo, M. Perri, A.M. Pennelli, B. Al-Badayneh, G. Guglielmi, *Curr. Radiol. Rep.,* **2020**, *8*, 17-26.

[4] S.L. Shelke, A.D. Subhedar, M.S. Bava, *Indian J. Basic Appl. Med. Res.,* **2016**, *1*, 242-253.
[5] G. Gururaj, *Neurol. Res.,* **2002**, *24*, 24-28.
[6] Y. Anzai, S. Minoshima, *Imag. Med.,* **2011**, *3*, 153-165.
[7] C.A. Mutch, J.F. Talbott, A. Gean, *Neurosurg. Clin. N Am.,* **2016**, Oct, *27*, 409-439.
[8] A.A. Hyder, C.A. Wunderlich, P. Puvanachandra, G. Gururaj, O.C. Kobusingye, *NeuroRehabil.,* **2007**, *22*, 341-353.
[9] M. Goldstein, *Ann. Neurol.,* **1990**, *27*, 327.
[10] L. Holm, J.D. Cassidy, L.J. Carroll, J. Borg, *J. Rehabil. Med.,* **2005**, *37*, 137-141.
[11] R. Vafaei, A. Vafaei, M.M. Forouzanfar, S. Asadollahi, P. Kashani, K. Heidari, A. Ashrafi Hafez, S.M. Hosseini Zijoud, *Wulfenia J.,* **2013**, *9*, 257-263.
[12] J. Park, S. Kim, Y. Lim, N. You, Y. Ahn, H. Choi, J. Cho, *Kor. J. Neurotrauma,* **2014**, *10*, 112-118.
[13] W.T. Chiu, C.Y. Kuo, C.C. Hung, M. Chen, *Am. J. Publ. Health,* **2000**, *90*, 793-796.
[14] N. Aghakhani, M. Azami, M. Jasemi, M. Khoshsima, S. Eghtedar, N. Rahbar, *Iran. Red Crescent Med. J.,* **2013**, *15*, 173-174.
[15] B. Gabella, R.E. Hoffman, W.W. Marine, L. Stallones, *Ann. Epidemiol.,* **1997**, *7*, 207-212.
[16] C.L. Robertson, A. Puskar, G.E. Hoffman, A.Z. Murphy, M. Saraswati, G. Fiskum, *Exp. Neurol.*, **2006**, *197*, 235-243.
[17] A.P. Bricolo, L.M. Pasut, *Neurosurg.*, **1984**, *14*, 8-12.
[18] A. Divanoglou, R. Levi, *Spinal Cord*, **2009**, *47*, 796-801.
[19] G.E. Pickett, M. Campos-Benitez, J.L. Keller, N. Duggal, *Spine*, **2006**, *31*, 799-805.
[20] M. Penden, K. Mcgee, G. Sharma, *Geneva*, **2002**, World Health Organization.
[21] R.M. Stewart, J.G. Myers, D.L. Dent, P. Ermis, G.A. Gray, R. Villarreal, *J. Trauma Acute Care Surg.*, **2003**, *54*, 66-71.
[22] A.D. Schweitzer, S.N. Niogi, C.T. Whitlow, A.J. Tsiouris, *Radiograph,* **2019**, *39*, 1571-1595.
[23] C.A. Mutch, J.F. Talbott, A. Gean, *Neurosurg. Clin. N Am.,* **2016**, *27*, 409-439.
[24] V. Lolli, M. Pezzullo, I. Delpierre, N. Sadeghi, *Br. J. Radiol.,* **2016**, *89*, 20150849.
[25] G.H. Yatoo, A. Tabish, *J. Trauma Manag. Outcomes,* **2008**, *2*, 5-18.
[26] Vikrant Kanagaraju, V.B. Arunkumar, B. Devanand, B. Maheshchander, *IOSR J. Dent. Med. Sci.,* **2016**, *15*, 108-113.
[27] Z. Kotwica, J. Brzeziński, *Acta Neurochir (Wien)*, **1993**, *121*, 95-99.
[28] J.E. Jr Wilberger, M. Harris, D.L. Diamond, *J. Neurosurg.,* **1991**, *74*, 212-218.

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