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A Comprehensive Analysis of Dispatching of Traumatic Brain Injuries in the Fifth Period at the RAJAIE Hospital in Ghachsaran

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ABSTRACT

Introduction: increasing car accidents in young group and head-stroke mechanisms in developing country is are the main cause of brain lesions and injuries related to trauma, so that traumatic severe brain lesions and injuries and uncontrollable hemorrhage are the major cause of mortality and morbidity due to trauma. Statistical analysis and factors along with main injuries can give us useful information in the field of injury management, patient dispatching management, proper scheduling, and patients dispatching to appropriate centers.

Materials & Methods: This research is a retrospective descriptive study with trend method in which data such as age, sex, mechanism of injury, severity of injuries, the kind of lesion, dispatching indications, patient accepting

hospital, dispatching physician were extracted and analyzed by SPSS software in a five-year period from 2009-2013 using the files of patients referred to emergency department of Shahid Rajayi hospital of Gachsaran due to brain trauma.

Results: From total 760 patients, 455 People (% 9.67) were male, and 215 (%1.32) were female. The highest rate of dispatching has been related to the year 2012 with 213 (%3.18) People. The most prevalent age group was 20 to 45 years old with 308 people dispatched. The most common type of traumatic mechanisms was due to bikes and cars injuries (%79.7) and then other various factors such as: falling from height (%16.9) and dispute and contention (%3.4). 66.9 percent of these injuries were slight. There was significant relationship between distribution of lesions severity resulted from trauma and the kind of injury mechanism ($p < 0.0001$).

Conclusion: according to the fact that brain trauma injuries are more prevalent in patients within young age group and these injuries may be duplicated due to patients transmission and dispatching on a long and high-risk way, so some measures should be taken to provide required medical facilities and equipment's and human forces for urban area hospitals, in order to reduce injuries due to brain trauma which involves mostly the young people who consist the most active potential forces of are our society.

KEYWORDS: brain damage, emergency patients, head trauma, traffic accidents

INTRODUCTION

Remarkable statistics of patients dispatching including traffic accidents and presented statistics of brain death patients by neurosurgeons show that lack of physician professional centers is currently one of the most acute problems of health in the world that results to sudden loss of life and inaccessibility to on time critical care services enhances this issue [1,2]. Traffic accidents are the second common cause of death in Iran [3]. Also, trauma is the most common cause of death in ages 1-44 and the third prevalent cause of death without considering age [4-6]. Trauma is a mechanism that different body systems are affected by it based on its severity [7]. Head trauma is one of the most important factors of death in ages under 40 and includes a considerable percent of death resulted from trauma in young people, and brain damage is the main cause of death in more than 50 to 70 percent of cases [8]. Traffic accidents, invasion, and downfall are the main three factors of head trauma in different societies [9]. A research conducted on epidemiologic investigation of driving accidents leading to death in Hamedan province showed that most of victims of accidents in this research have been in age group 21 to 30 years old and most of them were pedestrians (45.1%) and in half of them, the place of trauma has been restricted to head area (50.2%) [10]. Every year 52000 people die in U.S.A due to head trauma and also 80000-90000 people given suffer severe effects and become disabled [11,12]. Inter-hospital transmission is one of the very important components of emergency services in the reference system of a country, so that a scientific protocol has been defined for it in most of the advanced countries of the world [13]. Inter-hospital transmission is the patient dispatching from a hospital center to another one for some services including consultation, admission, paraclinical services and/or certain services

requiring special conditions such as patient's preference, lack of Diagnostic and therapeutic facilities and/or the need for certain therapeutic facilities [14-16]. Referral system provides and manages the individual's access to health system services through a directed path and defined levels of services [17]. One of the problems of patients dispatching is that 95 percent of physicians who dispatch patients to other therapeutic centers are general physician and had no training on acute illness field (e.g. trauma) and this issue reflects the importance of emergencies training for general physicians as the first line of treatment of emergency patients [18]. Every year, at different times in many areas of the world, a large amount of patients die or undergo irreversible and irreparable implications due to lack of on-time services providing and/or lack of access to specialized services or equipment shortages and delays in transferring patients resulting from lack of proper planning in the field of providing specialists and conforming the number of hospital beds and hospital equipment's with the needs of a region [19, 20]. Some of most important causes of patients dispatching in order of frequency are: lack of professional physician in city and unavailable equipment's needed for neurosurgery [21,22]. Therefore, for achieving greater equity in access to services in this field, a system should be developed for comprehensive and continuous monitoring of health system resources allocation such as employed neurosurgeon physicians and critical care beds in providing diagnostic, therapeutic and care services both in terms of quantity and quality [23]. Patients dispatching due to lack of therapeutic facilities leads to intellectual and emotional tension and patient's dissatisfaction and high costs to transport patients for both patient and relevant insurer [24]. The number of dispatched cases due to lack of neurosurgeons in Sheykh's research have been 209 during the years 1995-1999 [25]. In Mohammadi's study, all the cases led to dispatching to out of the province on a 3- month period in emergency department of Imam Reza hospital in Bojnord were studied and showed that the lack of specialist and subspecialist physicians is one of the important factors of inter-hospital transmission of patients [26].

So, the refer system should be specified in a manner that treatment team in lower levels if are not able to recognize or treat the patients then dispatch them after completing the referral process to higher levels which have experienced staff with higher levels of education and medicine and able to provide more specialized services on a broader scale using more advanced technology [20]. Head trauma is one of the most important problems of city society and according to the increasing trend of Gachsaran development and increasing use of various vehicles specially bikes we see more driving accidents. Thus, regarding to the fact that no exact and complete research about accidents resulting to head trauma has been yet conducted, this research is done to define the frequency of kinds of injuries and number of dispatching the head traumas, mechanism and severity of injury resulted from trauma, and besides representation of statistics shows a reflection of the cares taken in recent years in Shahid Rajayi hospital of Gachsaran for better and more effective scheduling.

MATERIALS AND METHODS

This research is a retrospective descriptive study with trend method in which data such as age, sex, mechanism of injury, severity of injuries, the kind of lesion, dispatching indications, patient accepting hospital and dispatching physician were extracted from the files of patients referred to emergency department of Shahid Rajayi hospital of Gachsaran due to brain trauma in a five-year period from 2009-2013 using ICD-10 (Note 1) was used to classify the

patients and register data. Based on ICD-10, the mechanism of head injury resulted from accident is divided into 4 categories: traffic accidents (bike accident, car accident), falling, disputing and the other accidents (sport accidents). The severity of head trauma is divided into 3 groups slight (13-15), intermediate (9-12), and severe (3-8) based on GCS (Note 2) which is determined at the entrance to emergency department of hospital. All obtained data entered the SPSS software and the frequency and prevalence rate of dispatch causes were measured.

FINDINGS

The research results showed that of total 670 patients dispatched due to brain damage resulted from accidents, 455 patients (67.9%) were male and 215 patients (32.1%) were female. The frequency distribution of age group of the patients dispatched is shown in Table 1.

Table-1: Frequency distribution of age group of the patients dispatched

Age group	Relative frequency	Relative frequency percent	The actual frequency percentage
0-5 years' old	36	5.373	5.373
6-10 years old	47	7.014	7.014
11-20 years' old	226	33.731	33.731
21-45 years' old	165	24.262	24.262
46-60 years' old	113	16.865	16.865
61 or more	83	12.388	12.388
Total	670	100.0	100.0

The most type of the damage caused is related to head fracture in 345 patients (51.5%), and the lowest type is related to brain edema in 46 patients (6.9%). Also, the other kinds of trauma are shown in Table 2

Table-2: Frequency distribution of the damage caused in patients dispatched due to head trauma

Kind of trauma	frequency	Absolute frequency Percent	Relative frequency percent	Cumulative frequency percent
Head fracture	345	51.5	51.5	51.5
Contusion	140	20.9	20.9	72.4
Subarachnoid bleeding	69	10.3	10.3	82.7
Bleeding	70	10.4	10.4	93.1
Edema	46	6.9	6.9	100.0
Total	670	100.0	100.0	

The cities where the patients of our study were dispatched to, are as follows: Shiraz, Yasouj, Ahvaz, Genaveh, Isfahan, and Tehran which their statistics are provided in Table 3. Totally 31.8% of dispatches were inside the province and 68.2% of patients were dispatched to outside the province within 5 past years of dispatches of head injuries. According to the statistics, the most requested destination of dispatch is related to Shiraz hospitals with the frequency of 52.1% (Table 3).

Table-3: Frequency of patients dispatched based on destination of dispatch

	Dispatch frequency	dispatch Percent	Relative frequency percent	Aggregation frequency percent
Shiraz	349	52.1	52.1	52.1
Yasouj	213	31.8	31.8	83.9
Ahvaz	32	4.8	4.8	88.7
Genaveh	21	3.1	3.1	91.8
Isfahan	41	6.1	6.1	97.9
Tehran	14	2.1	2.1	100.0
Total	670	100.0	100.0	

The frequency of patients dispatched based on the year of dispatch are shown in Table 4. The most frequency of dispatch is related to the year 2012 the main reason of which is the downtime of CT scan device for doing scan of brain in brain trauma patients (Table 4).

Table-4: Frequency of patients dispatched based on the year of dispatch

	Number of Dispatches	Dispatch Percent	Relative frequency percent	Cumulative frequency percent
2009	160	23.9	23.9	23.9
2010	132	19.7	19.7	43.6
2011	107	16.0	16.0	59.6
2012	213	31.8	31.8	91.3
2013	58	8.7	8.7	100.0
Total	670	100.0	100.0	

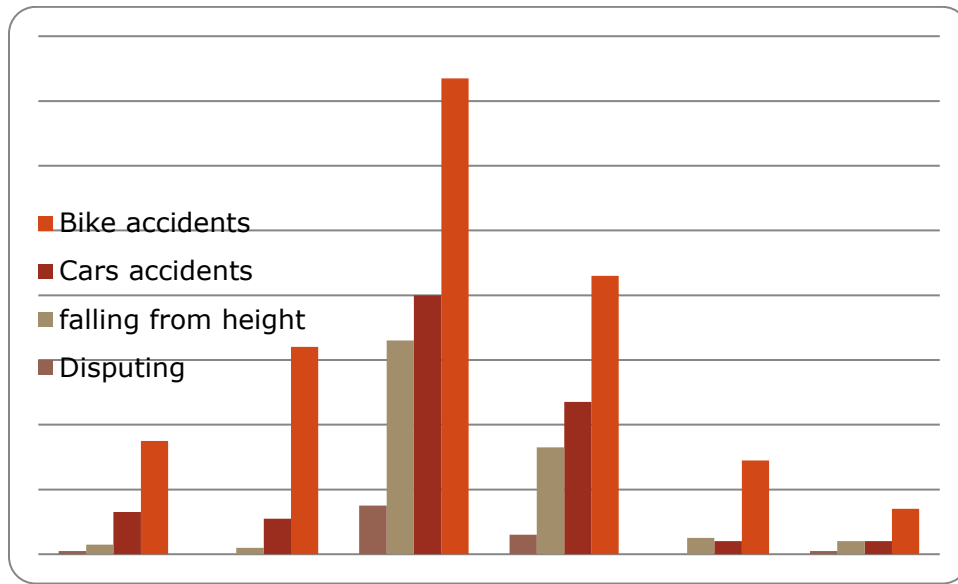
Various causes of dispatches and intra-hospital transmissions in the 5 years of our study are shown in Table 5.

Table-5: Frequency of dispatch cause of head trauma patients

Cause of dispatch	frequency	frequency Percent	Cumulative frequency percent
Lack or absence of neurosurgeon	321	47.9	47.9
Absence or failure of CT scan device	50	7.5	55.4
Absence of ICU bed for neurosurgery	121	18.1	73.4
Lack of enough equipment's and facilities	124	18.5	91.9
patient's or its attendant's request	54	8.1	100.0

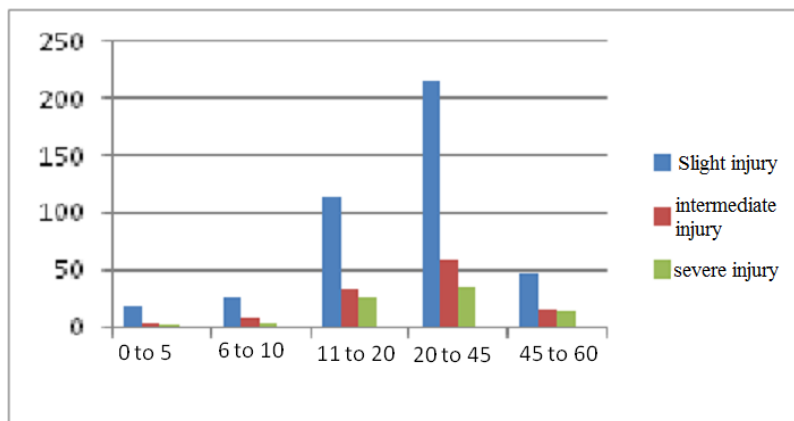
Traffic accidents Including bike or car with the rate of 79.7% and then falling from height with % 16.9 and disputing and shooting with %3.4 were the most important causes of head trauma. These factors show differences in age groups. Traffic accidents had an increasing trend from 5 to 45 years old and at the range of 20-45 reached to maximum level and then had a decreasing trend. Falling from height was most prevalent in age group 20-45, and the most prevalence of disputing was in age group 20-4 (Figure 1).

Figure-1: Frequency distribution based on damage mechanisms in different age groups



Slight injuries had the most severity of injuries frequency based on GCS 448 patients (66.9%), and severe injuries had the lowest frequency rate with 89 patients (13.3%). The most age group affected was 20-45 years old and the lowest was 0-5 (Figure 2).

Figure-2: Frequency distribution based on the severity of injury in different age groups



Based on the results of Spearman correlation coefficient, there was no significant statistical correlation between severity and mechanism of injury, while there was a significant and positive correlation between mechanism of injury and kind of lesion ($r=0.025$, Sig.(2-tailed) = 0.522).

Also, there was a significant and positive correlation between kind of lesion and severity of injury ($r=0.042$, Sig. (2-tailed) =0.275). So, that, whatever the severity of injury increases, the kind of lesion created would be more dangerous and requires a harder treatment. the results of Spearman correlation coefficient indicate that there was the

highest and positive correlation between the kinds of lesion and the severity of injury, and there lowest and positive correlation was between kind of lesion and mechanism of injury and this correlation was statistically significant, meaning that whatever the mechanism of injury is worse, the lesion created is more (Table 6).

Table-6: The rate of Spearman correlation between variables

Correlations				
		kind of lesion	severity of injury	mechanism of injury
kind of lesion	Pearson Correlation	1	0.042	0.025
	Sig. (2-tailed)		0.275	0.522
severity of injury	Pearson Correlation	0.042	1	0.101**
	Sig. (2-tailed)	0.275		0.009
mechanism of injury	Pearson Correlation	0.025	0.101**	1
	Sig. (2-tailed)	0.522	0.009	
** Correlation is significant at the 0.01 level (2-tailed).				

Discussion

Based on research findings during 5 years, 760 cases of patients with head trauma due to accidents were requested to dispatch from Shahid Rajayi hospital of Gachsaran because of lack or absence of neurosurgeons. So, all the patients requiring neurosurgery had to be dispatched and itself caused imposition of heavy costs and more complications. The other causes included: Lack of specialized and sub-specialized equipment's and facilities for diagnosis and treatment of neurosurgery cases, Absence or failure of CT scan device, Absence of ICU bed for neurosurgery and in some cases patient's or its attendant's request for dispatch because of low quality of services provided [14].

In this research, severity of injury based on GCS had the highest correlation with the kind of lesion resulted from accident categorized according to ICD-10, so that by the increase of severity of injury from slight to intermediate and severe, the lesions created would become worse (e.g. epidural and subdural bleeding) and required longer treatment and receiving more professional services in centers equipped with neurosurgery ICU bed. Because these people have a low level of consciousness, the dispatch process will be faced many problems due to the time spent to coordinate with the accepting hospital and mountainous and dangerous ways in the roads leading to this city and long distance with more specialized hospital centers. On the other hand, the head trauma patients require fast treatment to avoid more bleeding or brain death, so the rate of dispatches to other hospital centers should be reduced and the rate of death due to brain injuries should reach to the minimum level by providing expert human forces and

neurosurgeon and supplying therapeutic facilities commensurate with their work and setting up ICUs of neurosurgery for patients who need intensive cares after surgery. The results of Mohammadi's [26] and Sheikh [25] research also indicate that the most cause of patients dispatching was related to lack of specialist and subspecialist particularly in neurosurgery and cognitional services and therapeutic procedures and the results of these studies correlate with our research findings. Correlation between mechanism of trauma and kind of lesion is statistically significant but this correlation was very low ($r=0.025$), because mechanism of trauma by bike or car, falling or disputing have little effect on the kind of lesion and based on the severity of injury caused by any kind of mechanism of injury, it may have more brain trauma, so that the results of Amain's [27] research correlate with our research findings. Considering that the request of dispatch and Inter-hospital transmission for getting admission requires sending detailed history to the headquarters of guidance and patients dispatch, it makes some delay in cognitional and therapeutic procedures and in giving services to patients. This issue not only affects the patient's residence time in hospital through intervention on the process of illness, but puts the patients' life at risk. Also, patients dispatch would have a lot of costs including the cost of patient's and its relatives' residence in other therapeutic centers, costs of patients' transmission and costs of coordination for getting admission from other centers. Moreover, since the results of our research that traffic accidents including bike or car with the rate of 79.7%, then falling from height with %16.9 and disputing and shooting with 3.4% are the most important factors of creating head trauma, it indicates that the proportion of traffic accidents causing head injury in our society and the similar societies are more than others because of inappropriate and unsafe use of vehicles, particularly motorcycles, not standard roads and vehicles and not using safety equipment's and helmets. While, the studies in U.S.A Gordon [28] and Europe [29,30] showed that the traffic accidents which have been the most important factor of head trauma in the past, have decreased over the past few years because of recent efforts by improving the standard of roads, using safety belt and helmet, manufacturing cars with high security, laws of speed limiting and holding educational plans.

CONCLUSION AND SUGGESTIONS

The rate of head trauma in Gachsaran is high and the mean age of the injured patients is low. Also, traffic accidents are the most important factor of head trauma. These results can be used for improving and developing implementation of preventive programs in Gachsaran. It is also necessary to evaluate the method and the speed of patients' transmission therapeutic centers and processes of treatment. Therefore, considering expressed problems, the following strategies are provided to reduce the rate of patients dispatch to out of the province:

- 1) The enforcement of new rules emulating the successes of other countries in reducing traffic injuries is implemented.
- 2) Applying the in tariffs of medical services in deprived areas to prevent the accumulation of neurosurgeons in major cities for more income which surplus their needs and cause the patients dispatch to major cities to access these physicians. These deprivation indices should be determined in such a way that the surgeons' share of hospitalization services and surgical procedures offered in the less developed areas has a significant difference with large and developed cities.

- 3) The minimum medical and diagnostic and therapeutic equipment's and facilities expected for neurology specialty are provided in medical centers possessing the rank of that field.

Since the present study has been conducted using the previously registered data in archived files of Shahid Rajayi hospital, so it is recommended that another research with longer duration and in wider level i.e. in all deprived provinces is conducted.

COMPETING INTERESTS STATEMENT

The authors declare that there is no conflict of interests regarding the publication of this paper.

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