Asian Journal of Medicine and Health

16(3): 1-6, 2019; Article no.AJMAH.51566
ISSN: 2456-8414

Evaluation of Trauma Scores, Clinical Outcomes and Hospital Costs of Patients Presenting with Traffic Accidents

Dilek Atik[1*], Ramazan Unal[2], Burce Serra Kockan[2], Bensu Bulut[2], Hilmi Kaya[2], Ramazan Guven[2] and Basar Cander[2]

[1]Department of Emergency Medicine, Yozgat Bozok University, Yozgat, Turkey.
[2]Department of Emergency Medicine, Health Sciences University, Kanuni Sultan Suleyman Research and Training Hospital, Istanbul, Turkey.

Authors' contributions

This work was carried out in collaboration among all authors. Authors DA and RU designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Authors BB, BSK and HK managed the analyses of the study. Authors BC and RG managed the literature searches. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/AJMAH/2019/v16i330144
Editor(s):
(1) Dr. Nicolas Padilla-Raygoza, Professor, Department of Nursing and Obstetrics, Division of Health Sciences and Engineering, Campus Celaya-Salvatierra, University of Guanajuato, Mexico.
Reviewers:
(1) Nssr Murthy, Dr. Rajendra Prasad Central Agricultural University, India.
(2) Glele Ahanhanzo Yolaine, University of Abomey-Calavi, Benin.
(3) Ahmet Shala, Universiteti i Prishtinës, Kosovo.
Complete Peer review History: https://sdiarticle4.com/review-history/51566

Original Research Article

Received 26 June 2019
Accepted 13 September 2019
Published 21 September 2019

ABSTRACT

Background: Traffic accidents have been a bleeding wound due to developing technology and increasing number of vehicles. Improvement in socio-economic level has led to an increase in number of vehicles and traffic accidents with injury and death increase accordingly. High costs appear by tests and treatments as well as further health problems and loss of labour power in traffic accidents. The aim of this study was to evaluate the trauma scores, clinical outcomes and hospital cost of patients presenting to the emergency department with road traffic accidents.
Methods: Patients information; hospital automation system, forensic records and patient files were recorded. Cost information was received in hospital automation system. Hospital costs include examinations and treatments that have been performed since the first visit of the patients.

**Corresponding author: E-mail: dr.dilekgok82@hotmail.com;*

According to the data obtained from the patients files, GCS (Glasgow Coma Scale), AIS(Abbreviated Injury Scale) and ISS(Injury Severity Score) scores of each patient were calculated separately. All variables were tested for conformity to normal distribution, Kolmogorov Smirnov test and compliance with parametric test criteria. The data obtained by the study carried out within the scope of clinical research are statistically nonparametric. For this reason, Kruskal-Wallis H tests were used for statistical evaluation of associated variables according to dependency status. Spearman rank correlation in non-parametric data and Pearson correlation in parametric data were used as correlation methods. The results were evaluated for a significance level of $P < .05$.

Results: The average cost of traffic accidents was found to be 247.38 Turkish Lira.The average cost of motor vehicle accidents was 246.53 Turkish Lira.The average cost of extra vehicular traffic accident was 235.3 Turkish Lira. Cost average was 265.9 Turkish Lira.The effect of clinical outcomes on the cost was found statistically significant. There was a statistically significant effect of GCS, AIS, ISS trauma scores on the cost. AIS and ISS and the cost was moderately significant and a positive correlation was found.

Conclusion: Frequency of the traffic accidents, higher hospitalization rates and higher medical expenses have made the traffic accidents a significant public health problem economically We believe that community education should be increased in order to reduce traffic accidents in terms of health as well as the national economy.

Keywords: Cost analysis; traffic accidents; gloscow coma score; AIS score; ISS score.

1. INTRODUCTION

Traffic accidents have become a bleeding wound of Turkish society with the developing technology and the increasing number of vehicles in the 21st century. Today, the more the socio-economic level increases, the more the number of vehicles and traffic accidents resulting in injury and death increase. Traffic is the state and movement of pedestrians, animals and vehicles on the road. Traffic accidents are accidents resulting in death, injury and harm, where one or more vehicles moving on the road are involved [1]. There is an increase in morbidity and mortality due to accident. Traffic accidents are one of the important social problems in Turkey which is very severe in terms of morbidity and mortality and where tens of thousands of people are injured and thousands of people die every year [2,3]. Car accidents take first place in developed and developing countries in terms of trauma [4]. Traffic accidents cause a very high cost since the first admission to the hospital due to examination and treatment, health problems that may occur later, and loss of labor. Several scoring systems have been developed to assess the severity of trauma. Trauma scores are ımportant ın clınıcal follow-up and treatment procedures of trauma patıents. Some of these scores are GCS,AIS, ISS. Glasgow Coma Scale (GCS) among the physiological scores and Abbreviated Injury Scale (AIS) and Injury Severity Score (ISS) among anatomic trauma scores are some of the scoring systems. Glasgow Coma Scale is used for the evaluation of impaired consciousness. It is scored according to the eye opening and quality of motor and verbal responses. Other scores, AIS and ISS, which were defined in 1969, were revised in 1990. They were developed to rate the severity of anatomical injury in blunt traumas. In AIS, body regions are classified according to the width of the injured area. To calculate an ISS, the worst AIS scores in each region are determined and the score of the three most severely injured body regions are squared [5]. The aim of this study was to evaluate the trauma scores, clinical outcomes and hospital cost of patients presenting to the emergency department with road traffic accidents.

2. MATERIALS AND METHODS

2.1 Patients Data

This study is conducted retrospectively in patients presented with traffic accident in Istanbul Sağlık Bilimleri University Kanuni Sultan Suleyman Training and Research Hospital Emergency Medicine Clinic. The forms to be used were prepared before starting the study. Patients information; hospital automation system, forensic records and patient files were recorded. According to the data obtained from the patients files, GCS, AIS and ISS scores of each patient were calculated separately. Cost information was received in hospital automation system. Hospital costs include examinations and treatments that have been performed since the first visit of the

patients. Patients were divided into three according to the type of traffic accident.

2.2 Ethical Statement

This study is conducted retrospectively in patients presented with traffic accident in Istanbul Sağlık Bilimleri University Kanuni Sultan Suleyman Training and Research Hospital Emergency Medicine Clinic between 01.11.2018-28.02.2019 with the approval of Kanuni Sultan Süleyman Training and Research Hospital Ethics Committee by the protocol numbered 2019/11/174.

2.3 Scores Used

2.3.1 GCS

Glasgow Coma Scale consists of three parameters: motor response, eye response and verbal response. Motor response is scored between 1-6, eye response is scored between 1-4 and verbal response is scored between 1-5. The total score from the three responses shows the GCS [6].

2.3.2 AIS

It indicates the level of injury according to anatomical regions. Anatomical regions are divided into head-neck, face, thorax, abdominal-pelvic organs, extremities and the outer surface of the body. It is graded between 1 (minor injuries) and 6 (fatal injuries).

2.3.3 ISS

It is calculated as the sum of the squares of the three most severely injured body regions according to AIS scores. Iss score above 75 incompatible with life.

2.4 Statistical Analysis

Statistical Package for the Social Sciences (SPSS) 20.0 was used for the analysis. All variables were tested for conformity to normal distribution, Kolmogorov Smirnov test and compliance with parametric test criteria. The data obtained by the study carried out within the scope of clinical research are statistically nonparametric. For this reason, Kruskal-Wallis H tests were used for statistical evaluation of associated variables (nominal or ordinal) according to dependency status. Spearman rank correlation in non-parametric data and Pearson correlation in parametric data were used as correlation methods. The GCS score for statistical analysis was divided into five. The average cost calculation was taken according to traffic accident types. Kruskal Wallis-H test was performed to detect the statistical significance of traffic accident patterns, clinical outcomes and GCS, AIS, ISS trauma scores on the cost. The results were evaluated for a significance level of $P < .05$.

3. RESULTS

651 patients were enrolled into the present study. The patients enrolled into the study included 457 males (70.2%) and 194 females (29.8%) with an age average of 33.89±14.3. The patterns of traffic accidents were intra-vehicle traffic accident (IVTA) by 31.2% (n=204), extravehicular traffic accident(EVTA) by 50.5% (n=329), motorcycle accident (MA) by 18.1% (n=118) [Fig. 1]. Injured body site of the patients were lower limb by 45.3% (n=259), upper limb by 35.9% (n=234), head by 30.7% (n=200) and face by 19% (n=124), respectively [Fig. 2]. GCS, AIS and ISS scores were grouped for statistical calculations. GCS scores of the patients were GCS 15 by 98.6% (n=542), GCS 13-14 by 0.8% (n=5), GCS 10-12 by 0.3% (n=2), GCS 6-9 by 0.2% (n=1), GCS 5-3 by 0.2% (n=1). Evaluation of patient outcomes revealed discharge in a healthy state by 89.1% (n=580), admission to the clinic by 8.6% (n=56), admission to intensive care unit by 2% (n=13) and exitus by 3% (n=2). The average cost of traffic accidents was found to be 247.38 tl (min: 15 Turkish Lira, max: 1926 Turkish Lira). The average cost of motor vehicle accidents was 246.53tl (min: 16 tl, max: 1565tl). The average cost of extra vehicular traffic accident (EVTA) was 235.3 tl (min: 15 Turkish Lira.) (IVTA) cost average was 265.9 Turkish Lira.(min: 16, max: 1509 Türkish Lira).

Mean cost of traffic accidents was found 247,38 Turkish Lira. The effect of traffic accident pattern on the cost was not statistically significant (P=.192). The effect of clinical outcomes on the cost was found statistically significant (P=.000) [Table 1]. There was a statistically significant effect of GCS, AIS, ISS trauma scores on the cost (P=.025, p=.000, P=.000) [Table 1]. A correlation test was performed in the present study to detect a significant conformity between traffic accident patterns, clinical outcomes, trauma scores and cost. There was not any significant association between traffic accident patterns and cost (P=.080).The association

between clinical outcomes and cost was weakly significant (*P*=.000) [Table 2]. A positively weak association was found between the cost and GCS (*P*=.004). The association between anatomic scores including AIS and ISS and the cost was moderately significant and a positive correlation was found (*P*=.000 and *P*=.000) [Table 2].

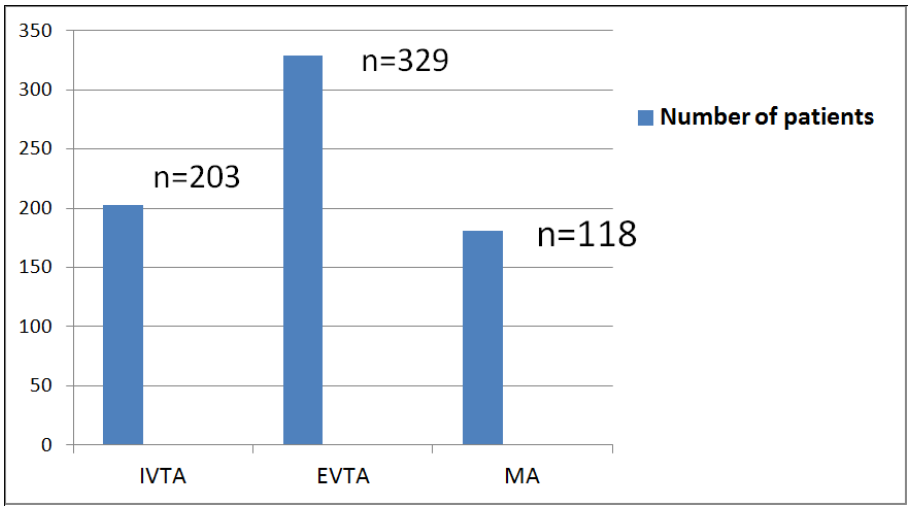

Fig. 1. Number of patients who have had a traffic accident by type of accident
(Abbreviations: IVTA: intra-vehicle traffic accident, EVTA: extravehicular traffic accident, MA: motorcycle accident)

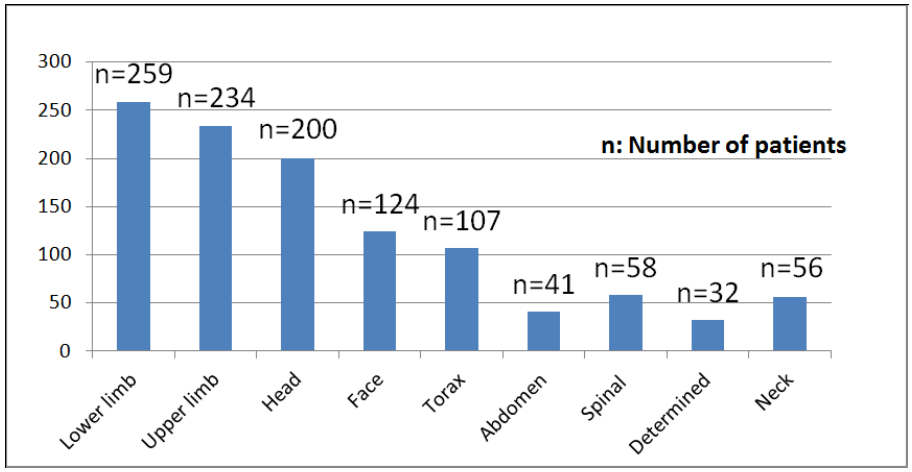

Fig. 2. Number of patients by injured body site

Table 1. Kruskal-wallis h test results on the cost

Type of variable	Kruskal-Wallis H test values		
	χ^2	*df*	*p*
TA Pattern	3.303	2	.192[b]
Clinic	20.809	3	.000[a]
GCS	11.134	4	.025[a]
AIS Group	145.767	5	.000[a]
ISS Group	110.954	8	.000[a]

[a]: Significant at 0.05 level (p<0.05); [b]: Not significant.
(GCS): Glasgow Coma Scale, (AIS): Abbreviated Injury Scale, (ISS): Injury Severity Score

Table 2. Correlation of the cost with trauma scores, clinic and traffic accident pattern

Correlations			GCS	AIS	ISS	Clinical status	Cost
Spearman's rho	TA Pattern	Cor. Coef.	-0.056	-0.094	-0.080	-0.113	-0.069
		Sig.	.155	.017	.042	.004	.080
		N	651	651	651	651	651
	Cost	Cor. Coef.	0.111	0.527	0.484	.158	
		Sig.	.004	.000	.000	.000	
		N	651	651	651	651	

(GCS): Glasgow Coma Scale, (AIS): Abbreviated Injury Scale, (ISS): Injury Severity Score

4. DISCUSSION

Traffic accidents are one of the main causes of death among young population under the age of 50 in Turkey [7]. Traffic accidents, the deaths and injuries they create, are increasingly concentrated in developing countries [8]. For all age groups, traffic accidents are responsible for approximately 1.35 million deaths and serious injuries. Each year, with a global death rate of about 18 people for 100,000 population [9]. When the traffic accidents were evaluated in terms of gender: In our study, male rate was found to be high, similar to previous studies [10,11]. Considering the types of traffic accidents, in a study in the literature, accidents occurred inside the vehicle were reported to be higher than the accidents occurred outside the vehicle, which was not compatible with the present study [12]. In a study on trauma, traffic accident case rates were reported to be high and AIS score was used according to the injured regions. In this study, which had similar results with our study, upper and lower extremity injuries were found to be high [13]. According to the World Health Organization 2013 data, the number of people who died and injured due to traffic accidents is 1.24 million and 20-50 million, respectively. Besides the negative effects on individuals, traffic accidents lead to dramatic costs for developing countries [14]. As seen in all over the world, so is in Turkey, road traffic accidents are among the ones that leads to death. The fact that road transportation is dense and its being one of the leading cause of deaths in traffic accidents are evaluated as a significant cost element wit respect to national economy [15]. In Turkey, 1,296,636 accidents occurred in 2012 and a total of Türkish Lira 19,540,305.00 was spent on medical care [16]. In traffic accidents, examination and treatment costs vary depending on the severity of injuries. When we evaluated the effect of traffic accidents on cost, no significant difference was found between the examination and treatment of traffic accident types. This shows that the differences in traffic accident types have no effect on the cost. However, the cost increases as the AIS and ISS scores, which vary according to the injury sites, increase. Final clinical results affect the cost which increases according to the examination and treatment required and recovery process in injuries caused by traffic accidents.

5. CONCLUSION

Traffic accidents usually cause multi-traumas and costs of the tests and treatment services are detected higher. The association and correlation between trauma scores and cost were evaluated; and costs increase by increase in numeric data of the trauma scores. An increase in costs were detected according to the clinical progress of the patients. Frequency of the traffic accidents, higher hospitalization rates and higher medical expenses have made the traffic accidents a significant public health problem economically We believe that community education should be increased in order to reduce traffic accidents in terms of health as well as the national economy.

CONSENT

As per international standard or university standard written patient consent has been collected and preserved by the author(s).

ETHICAL APPROVAL

This study is conducted retrospectively in patients presented with traffic accident in Istanbul Sağlık Bilimleri University Kanuni Sultan Suleyman Training and Research Hospital Emergency Medicine Clinic between 01.11.2018-28.02.2019 with the approval of Kanuni Sultan Süleyman Training and Research Hospital Ethics Committee by the protocol numbered 2019/11/174.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Polat O. Adli Travmatolojide Trafik Kazalarına Bakış. Adli Tıp Bülteni 1996;1: 18-25.
2. Tintinally JE. Emergency medicine a comrehensive study guide Internatıonally edition, McGraw-Hill Companies 4th ed American College of Emergency Physicians. 1996;1127-1128.
3. Türkiye İstatistik Yıllığı TC. Başbakanlık devlet istatistik enstitüsü yayin numarasi 2895 Devlet İstatistik Enstitüsü Matbaası Ankara. 2004;203-24.
4. Soysal Z, Çakalır C. Adli Tıp İstanbul Universitesi Cerrahpaşa Tıp Fakültesi Yayınları Rektörlük No: 4165. Fakülte No:224. İstanbul. 1991;595.
5. Kalaycıoglu N, Kaplan ME, Unsel M. Prognostic factors and scoring systems in ICU. Yoğun Bakım Dergisi. 2006;6(3):147-159.
6. Teasdale G, Jennett B. Assessment of coma and impaired consciousness. A practical scale. Lancet. 1974;2:81-4.
7. Sharma BR, Harish D, Sharma V, Vij K, Road-traffic accidents-a demographic and topografic analysis. Med Sci Law. 2001; 41:266-74.
8. Symons J, Howard E, Sweeny K, Kumnick M, Sheehan P. Reduced road traffic injuries for young people: A preliminary investment analysis. Journal of Adolescent Health. 2019;65:34-S43.
9. IHME. Global burden of disease study 2016 (GBD 2016) data resources. Seattle, WA: Institute for Health Metrics and Evaluation; 2015. Available:http://ghdx.healthdata.org/gbd-2016. (Accessed April 5, 2018)
10. Sozluer EM, Yıldırım C, Senol V, Unalan D, Nacar M, Gunay O. Risk factors ın traffic accidents. Turkish Journal of Trauma and Emergency Surgery. 2000;4 (6):237-240.
11. Dogan S, Acar N, Cevik AA, Ozakın E, KayaFB, Arslantaş D. The relationship between blood alcohol concentration and ınjury severity in patients admitted to the hospital emergency department after a Motor Vehicle Accident. Eurasian J Emerg Med. 2016;15:121-5.
12. Sungur I, Akdur R, Piyal B. Analysis of traffic accidents in Turkey. Ankara Med 2014;14(3):114–124.
13. Al-Kuwaiti A, Hefny AF, Bellou A, Eid HO, Abu-Zidan FM. Epidemiology of head injury in the United Arab Emirates. Turkish Journal of Trauma and Emergency Surgery. 2012;18(3):213-218
14. World Health Organization. Global status report on road safety: Supporting A Decade of Action, World Health Organization, Geneva; 2013b.
15. Ozturk O, Eken H, Er C. Motorlu Taşıt satişlarinin trafik kazalari üzerine olan etkileri. Süleyman Demirel Üniversitesi Tıp Fakültesi Dergisi. 2006;13(4):12-15.
16. Ozen E, Genc E, Kaya Z. Estimation of the costs of traffic accidents in Turkey: An evaluation in terms of the insurance and financial system. Journal of Yasar University. 2014;9(33): 5649-5673.

Peer-review history:
The peer review history for this paper can be accessed here:
https://sdiarticle4.com/review-history/51566