J Surg Med. 2020;4(11):994-997.
DOI: 10.28982/josam.780138

Research article
Araştırma makalesi

Journal of Surgery and Medicine
e-ISSN=2602-2079

Mortality analysis of hospitalized trauma patients in the intensive care unit

Yoğun bakım ünitesinde yatan travma hastalarının mortalite analizi

Mehmet Duran [1], Öznur Uludağ [1]

[1] Department of Anesthesiology and Reanimation, Adiyaman University Medical School, Adiyaman, Turkey

ORCID ID of the author(s)

MD: 0000-0001-7568-3537
ÖU: 0000-0002-6017-5836

Corresponding author / Sorumlu yazar:
Mehmet Duran
Address / Adres: Adıyaman Üniversitesi Tıp Fakültesi, Anesteziyoloji ve Reanimasyon Anabilim Dalı, 02100 Adıyaman, Türkiye
E-mail: md021979@hotmail.com

Ethics Committee Approval: Approval was obtained from Adıyaman University Medicine Faculty Ethics Committee (3/23/2016-2016/2-21). All procedures in this study involving human participants were performed in accordance with the 1964 Helsinki Declaration and its later amendments.
Etik Kurul Onayı: Adıyaman Üniversitesi Tıp Fakültesi Etik Kurulu'ndan onay alındı (23.03.2016-2016/2-21). İnsan katılımcıların katıldığı çalışmalardaki tüm prosedürler, 1964 Helsinki Deklarasyonu ve daha sonra yapılan değişiklikler uyarınca gerçekleştirilmiştir.

Conflict of Interest: No conflict of interest was declared by the authors.
Çıkar Çatışması: Yazarlar çıkar çatışması bildirmemişlerdir.

Financial Disclosure: The authors declared that this study has received no financial support.
Finansal Destek: Yazarlar bu çalışma için finansal destek almadıklarını beyan etmişlerdir.

Published: 11/29/2020
Yayın Tarihi: 29.11.2020

Abstract

Aim: Trauma accounts for around five million deaths a year and constitutes a serious threat to public health globally. We examined the characteristics of patients admitted to the intensive care unit (ICU) due to trauma in 2015 and investigated the mortality rate and affecting factors.

Methods**:** In this retrospective cohort study, the data of 101 trauma patients who were followed up at the general ICU in Adıyaman University Training and Research Hospital between January 2015 and December 2015 were analyzed. Patients' demographic data, regions and causes of trauma, hospitalization durations, Glasgow Coma Scale (GCS) scores, whether blood products were transfused, mechanical ventilation support, operations, and duration of stay in ICU were noted. We then divided the patients into two groups as survivors and non-survivors and examined the mortality rates and the effective factors.

Results: Mortality rates of the patients were 15.8%. The mean age of the patients included in the study was 30.73 (25.188) years. Among all, there were 71 males and 30 females. The most common causes of trauma were in-vehicle traffic accidents (33.7%), falls (28.7%) and extravehicular traffic accidents (24.8%). The patients were often admitted to the ICU because of head trauma. The ICU length of stay was significantly higher in the non-survivor group compared to the discharged group (12.81 (23.49) vs. 3.78 (2.84) days, $P<0.001$), along with the duration of mechanical ventilation (2.49 (8.85) vs. 0.74 (1.30), $P<0.001$). GCS scores at admission were significantly lower in the non-survivor group (5.88 (3.12) vs. 11.98 (2.70), $P<0.001$).

Conclusion: Direct exposure to trauma as a pedestrian, duration of mechanic ventilation, and low GCS scores during admission increase mortality in patients admitted to the ICU due to trauma.

Keywords: Intensive care unit, Mortality, Trauma

Öz

Amaç: Travma nedeni yılda yaklaşık beş milyon kişi ölmektedir ve bu durum küresel olarak halk sağlığı için ciddi bir tehdittir. Bu çalışmada 2015 yılı travma nedeniyle yoğun bakım ünitesine kabul edilen hastaların genel özelikleri incelenmiş olup mortalite oranı ve mortaliteye etki eden nedenleri inceledik.

Yöntemler: Çalışmamızda retrospektif kohort yöntemi kullanıldı. Adıyaman Üniversitesi Eğitim ve Araştırma Hastanesi'nde Ocak 2015-Aralık 2015 tarihleri arasında genel YBÜ'de takip edilen 101 travma hastasının verileri retrospektif olarak incelendi. Hastaların demografik verileri, travma nedenleri, travma bölgeleri, yatış süreleri, Glasgow Koma Skoru (GKS), Kan transfüzyon yapılıp yapılmadığı, Mekanik Ventilasyon Desteği, ameliyat geçirip geçirmediği, YBÜ kalış süresi kaydedilmiştir. Daha sonra hastalar yoğun bakım sonuçlarına göre sağ kalan ve ölen hastalar olarak iki gruba ayrılarak mortalite oranları ve mortaliteye etki eden faktörler incelenmeye alındı.

Bulgular: Hastaların mortalite oranları %15.8 olarak tespit edildi. Çalışmaya alınan hastaların yaş ortalaması 30,73 (25,188) yıl idi. Hastaların 71 erkek, 30 kadındı. Travmanın en sık nedenleri araç içi trafik kazaları (%33.7), düşme (28.7) ve araç dışı trafik kazaları (%24,8) idi. Hastalar en sık kafa travması nedeniyle YBÜ yatırılmıştır. YBÜ kalış süresi; ex olan grupta taburcu olan gruba göre istatiksel olarak anlamlı bir şekilde fazlaydı (12,81 (23,49) ve 3,78 (2,84) gün, $P<0,001$). Mekanik ventilasyon süresi ex grubunda istatiksel olarak daha uzun (2,49 (8,85) ve 0,74 (1,30), $P<0,001$). YBÜ yatışındaki GKS ex grubunda istatistiksel olarak anlamlı düşük bulunmuştur (5,88 (3,12) ve 11,98 (2,70), $P<0,001$).

Sonuç: Travmaya bağlı YBÜ'ne yatan hastalarda, yaya olarak travmaya direk maruziyet, mekanik ventilasyon süresi uzunluğu ve hastaneye kabul sırasında GKS puanı düşüklüğü mortalitesi artırmaktadır.

Anahtar kelimeler: Yoğun bakım ünitesi, Mortalite, Travma

How to cite/Atıf için: Duran M, Uludağ Ö. Mortality analysis of hospitalized trauma patients in the intensive care unit. J Surg Med. 2020;4(11):994-997.

Introduction

The development of technology and an increase in individual armament, accidents, and violence have caused a significant increase in morbidity and mortality attributable to traumatic injuries. These injuries have become a serious public health concern as they place an economic burden and lead to disability [1,2]. One person dies of injury every six seconds around the world, which amounts to approximately 14,000 people a day and to 5 million people a year. These figures are higher than the number of deaths due to HIV, tuberculosis, and malaria, as well as the number of maternal deaths. It is expected to increase to the 7th rank in 2030 while death due to traffic accidents ranked 9th across the world in 2012 [3-5]. Even though car drivers are always at risk of injury or death, there are significant differences in mortality rates in different driving categories. Pedestrians and drivers of two-wheeled vehicles are at high risk. Especially riding a motorcycle has a bad reputation [6,7]. Intensive care units are multidisciplinary structures struggling with life-threatening diseases, where airway support, mechanical ventilation, current treatment modalities, effective administration of drugs and monitoring techniques are provided for survival [8]. Since trauma is a problem that increases mortality and morbidity significantly, these patients are usually followed up in intensive care units (ICU) [9].

We aimed to investigate the mortality rates of trauma patients hospitalized in ICU and the affecting factors.

Materials and methods

Approval was obtained from Adıyaman University Medicine Faculty Ethics Committee (23.03.2016-2016/2-21). The data of 101 trauma patients who were followed up at the general ICU in Adıyaman University Training and Research Hospital between January and December 2015 were analyzed retrospectively. We divided the patients into two groups as survivors and non-survivors. Patients' demographic data, causes and regions of trauma, hospitalization durations, Glasgow Coma Scores (GCS), whether blood and products were transfused, mechanical ventilation support and duration, operations, duration of stay in ICU, mortality and the affecting factors were examined.

Statistical analysis

Descriptive statistics of all trauma patients were performed using SPSS Inc., Chicago, IL, USA (SPSS v15.0) program. The numerical data were expressed as median (interquartile range) and categorical data as percentages. These patients were divided into two groups as survivors and non-survivors. Chi-square and Independent sample t tests were used for comparing categorical and numerical data, respectively. Multivariate logistic regression analysis was performed for significant data (cause of trauma, duration of stay in ICU, trauma site, mechanical ventilation time, GCS, blood transfusion) as indicated by univariate analysis to determine independent risk factors affecting mortality. *P*-value <0.05 was considered statistically significant.

Results

A total of 124 (11%) out of 1120 patients admitted to the ICU of our hospital were hospitalized due to trauma between January and December 2015. Full data of 101 of these patients were obtained. Among all, 84.2% (n=85) were discharged while 15.8% (n=16) died. Descriptive statistics of the study are presented in Table 1. The mean ages of the discharged and dying patient groups were similar (P=0.929). The most common cause of trauma was in-vehicle traffic accidents in the discharged group (36.5%), and extravehicular (56%) accidents among non-survivors.

Duration of stay in the ICU was 3.87 (2.84) days in the discharged group and 12.81 (23.49) days among non-survivors (P<0.001). Head trauma (36.5%) was the most common trauma site in the discharged group, while multiple traumas and head-thoracic traumas were the most common sites in the dying group. The duration of mechanical ventilation was significantly longer among non-survivors (P<0.001). GCS values during hospitalization in the ICU were 11.98 (2.70) and 5.88 (3.12) (3-13) in survivors and non-survivors, respectively (P<0.001). Multiple regression analysis was performed for variables associated with death. Significant variables included mechanical ventilation, cause of trauma and Glasgow coma scale score. The Glasgow coma scale score was the most effective (Table 2).

Table 1: Descriptive statistics

	Total	Discharge (n=85)	Death (n=16)	*P*-value
Age (year)	30.73(25.1)	30.64(25.33)	31.25(25.25)	0.929
Gender (F/M)	30/71	23/62	7/9	0.233
Cause of trauma				0.008*
In-vehicle	34(33.7%)	31 (36.5%)	3(18.8%)	
Extravehicular	25(24.8%)	16 (18.8%)	9(56.3%)	
Motorcycle	10(9.9%)	8 (9.4%)	2(12.5%)	
Direct head trauma	2(2%)	1 (1.2%)	1(6.3%)	
Falling from height	29(28.7%)	28 (32.9%)	1(6.3%)	
Exposure to explosive substance	1(1%)	1 (1.2%)	0	
Duration of stay in ICU (days)	5.21(10.02)	3.78(2.8417)	12.81(23.49)	<0.001*
Trauma site				0.013*
Head trauma	35(34.7%)	31(36.5%)	4(25%)	
Thorax trauma	3(3%)	3(3.5%)	0	
Abdominal trauma	7(6.9%)	7(8.2%)	0	
Extremity trauma	5(5%)	5(5.9%)	0	
Head-Thorax Trauma	20(19.8%)	14(16.5%)	6(37.5%)	
Head- Extremity trauma	17(16.8%)	17(20%)	0	
Multiple trauma	14(13.9%)	8(9.4%)	6(37.5%)	
Duration of mechanical ventilation (days)	2.49(8.85)	0.74(1.30)	11.75(20.11)	<0.001*
GCS	11.01(3.54)	11.98(2.70)	5.88(3.12)	<0.001*
Undergoing a surgery	45(44.6%)	39 (45.9%)	6 (37.5%)	0.594
Blood transfusion	53(52.5%)	40 (47.1%)	13 (81.3%)	0.014*

Table 2: Results of multiple regression analysis of variables related to death

	Beta	OR (95% CI)	*P*-value
Mechanical ventilation	0.421	1.524 (1.064 – 2.183)	0.022*
Cause of trauma	-1.099	0.333 (0.116 – 0.957)	0.041*
Glasgow coma scale	-0.659	0.517 (0.360 – 0.744)	<0.001*

*P<0.05

Discussion

The age group most exposed to trauma was children and young adults. Mortality increased in patients with multiple and head and thoracic traumas, and in patients who received blood transfusions. Trauma-related mortality is directly affected by exposure to trauma as a pedestrian, duration of mechanical ventilation and GCS scores during hospital admission.

The development of technology and an increase in individual armament, accidents, and violence have significantly increased morbidity and mortality attributable to traumatic

injuries. High mortality in traumas and the development of post-traumatic physical and psychosocial disorders significantly affect the quality of life and these patients should, therefore, be followed up in the ICU [9-11].

Data of the Turkish Statistical Institute in 2015 showed that external injuries and poisoning rank fifth among death causes [11,12]. Of the 1120 patients followed up in our intensive care unit during this period, 124 were traumatic (11%). In the USA, 15% of stays in ICU constitute major traumas [13]. In a study in Turkey, this rate ranged from 10 to 22% [14,15].

Early detection and good management of these patients having a substantial risk of death can provide positive results. In the recent three decades, the mortality of these patients has decreased by 15-45% due to improvements in structural and personnel conditions. Although the chance of survival of seriously injured patients has increased continuously in recent years, the trauma-related mortality rates increased by 22.8% while the population of US increased by 9.7% from 2000 to 2010 [16-18]. In Turkey, Kara et al. [14] found the mortality rate to be 19.4% and Ünlü et al. [15] reported it as 35.8%. However, we found it as low as 15.8%. The reason is that our hospital is the only center in the province where all trauma patients, including mild, moderate, and severe patients, are admitted. We consider that this has an impact on our results.

Trauma studies conducted so far in Turkey have found that the average age was within the range of 31 to 44 years [14,15,20,21]. The average age ranged between 33 and 37 years in studies conducted in different countries [23]. The results of our study showed that the mean age of the trauma patients was 30.7 years. In accordance with the literature, the trauma rates were higher among young patients.

Among all, 70.3% (n = 71) of the traumatized patients were male in our study. Rüden et al. [16] reported a male dominance over females in trauma. Durdu et al. [23] found a high rate of male gender, similar to our results, which are consistent with the literature. We consider that the reason male gender is higher in number than females is that men take a more active role in daily life than women and they spend more time in risky environments.

The most common causes of trauma are in-vehicle traffic accidents, falls, pedestrians, motorcycle accidents and sharp object injuries [15,24-27]. In our study, the most common causes were in-vehicle traffic accidents (33.7%), falls (28.7%) and extravehicular traffic accidents (24.8%). Özkayın et al. [26] indicated that the rate of injuries arising from motorcycle accidents increased from 2002 to 2007. The reason we found a low rate of injuries due to motorcycle accidents may be associated with the low rates of motorcycle use in our region.

Christopher et al. [4] reported that mortality rates dependent on traffic-related injuries increased in low- and middle-income countries. The literature shows that pedestrians were more likely to encounter traffic-related injuries, followed by car users and motorcycle riders, while deaths due to traffic-related injuries reduced in high-income countries [4,7,8]. The high mortality rate of motorcycle riders results from increased trauma severity and insufficient use of protective equipment. Wearing a helmet is highly beneficial to both the motorcycle riders and the community. The literature reported the protective effect of motorcycle helmets, which not only reduces mortality but also traumatic brain injury, duration of stay in the hospital and hospital charge [24,25]. In our study, the mortalities consisted of the extravehicular traffic accidents (56.3%), in-vehicle traffic accident (18.8%) and motor accident (12.5%). We think that high mortality in extravehicular traffic accidents is due to elevated trauma severity. The highest mortality rate was seen in patients with multiple and head - thoracic traumas. When mortality is evaluated in terms of whether the patient underwent operations, it is seen that surgery has no effect on mortality. However, we found that the need for blood transfusion was high in non-survivors. These results indicate that the patients who died were exposed to major traumas and needed a blood transfusion.

The regions exposed to trauma are divided into four, including the head, chest, abdomen, and extremities. Injuries to more than two sites were considered multiple traumas. Ünlü et al. [15] reported that the head, extremities, and thorax were the most injured sites during traumas. Trauma-related injuries vary regionally. Consistent with the literature, we found that patients were frequently admitted to ICU due to head trauma (34,7%).

Many scoring systems are used to measure the severity of trauma and estimate mortality [5,11]. Studies indicate that low GCS in trauma is important in predicting mortality and the best predictive power would be 5.5 [1,6]. In similar studies, Mpe et al. [27] reported that GCS values of 4 or less at admission to the intensive care unit were poor prognosis. Our mean GCS scores in the surviving group was higher, similar to the reports in the literature. Low GCS values were correlated with the severity of trauma and are accompanied by the need for mechanical ventilation. Our study revealed that dying patients received mechanical ventilation support for a longer period. Mechanical ventilation support and its increased duration are risk factors for mortality in trauma patients, as is the case with GCS scores. Related literature reported that the mortality rate was about 50% in patients receiving mechanical ventilatory support [1,8,28]. Increased duration of mechanical ventilation leads to the prolonged hospital stay. In our study, the duration of stay in the hospital was 3.78 (2.84) in the discharged group and 12.8 (23.49) among non-survivors.

Limitations

The limitations of our study include its retrospective and single-centered nature, and sparse number of cases. Failure to access the trauma scores of the patients at admission also weakens our results.

Conclusion

Direct exposure to trauma as a pedestrian, duration of mechanic ventilation, blood transfusion and low GCS scores at admission increase mortality in patients admitted to ICU due to trauma.

References

1. Jennett B. Epidemiology of head injury. J Neurol Neurosurg Psychiatry. 1996;362–9.
2. Guven C, Kafadar H. Evaluation of extremity vascular injuries and treatment approaches. Niger J Clin Pract. 2020 Sep;23(9):1221-8. doi: 10.4103/njcp.njcp_656_18. PMID: 32913160.
3. WHO. Injuries and violence: the facts 2014
4. Christopher P, Murray JL. GBD 2013 Mortality and Causes of Death Collaborators. Global, regional, and national age–sex specific all-cause and cause-specific mortality for 240 causes of death, 1990–2013: a systematic analysis for the Global Burden of Disease Study 2013. Lancet. 2015:10;385(9963):117–71.
5. Murray CJL, Ortblad KF, Guinovart C, Lim SS, Wolock TM, Roberts DA, et al. Articles Global, regional , and national incidence and mortality for HIV, tuberculosis ,and malaria during 1990 – 2013: a systematic analysis for the Global Burden of Disease Study 2013. Lancet. 2014;6736(14):1–66.

6. Colburn TN, Meyer DR. Sports Injury or Trauma? Injuries of the competetion off-road motorcyclist. Injury. 2003;34:207-14.
7. Yan-Hong L, Rahim Y, Wei L, Gui-Xiang S, Yan Y, De Ding Z, et al. Pattern of traffic injuries in Shangai :implications for control. Injury Control and Safety Promotion. 2006;13:217-25.
8. Morgan GE. Clinical Anesthesiology. 4th ed. McGraw-Hill Medical; 2005
9. Hefny AF, Idris K, Eid HO, Abu-Zidan FM. Factors affecting mortality of critical care trauma patients. African Health Sciences. 2013;13:731-5.
10. Dur A, Koçak S, Cander B, Sönmez E, Civelek C. Factors affecting mortality in patients with multitrauma which were treated in intensive care unit. Dicle Medical Journal. 2013;40:177-82.
11. Banerjee M, Bouillon B, Shafizadeh S, Paffrath T, Lefering R, Wafaisade A, et al. Epidemiology of extremity injuries in multiple trauma patients. Injury. 2013;10:15-21.
12. Türkiye İstatistik Kurumu, Ölüm Nedeni İstatistikler, 2016 Sayı: 24572 27 Nisan 2017
13. Podoll AS, Kozar R, Holcomb JB, Finkel KW. Incidence and Outcome of Early Acute Kidney Injury in Critically-Ill Trauma Patients. Plos One. 2013;8:77376
14. Kara İ, Altınsoy S, Gök U, Onur A, Sarıbapıççı R. Bir Numune Hastanesi Genel Yoğun Bakım Ünitesinde Travma Hastalarının Mortalite Analizi. Türk Yoğun Bakım Derneği Dergisi. 2015;13:68-74.
15. Ünlü AR, Ülger F, Dilek A, Barış S, MuratN, Sarıhasan B. Yoğun Bakımda İzlenen Travma Hastalarında "Revize Travma Skoru" ve "Travma ve Yaralanma Şiddeti Skoru''nun Prognoz ile İlişkisinin Değerlendirilmesi. Türk Anest Rean Der Dergisi. 2012;40:128-35.
16. Rüden CV, Woltmann A, Röse M, Wurm S, Rüger M, Hierholzer C, et al. Outcome after severe multiple trauma: a retrospective analysis. J Trauma Manag Outcomes 2013;7:4.
17. Dresing K. Recommended guidelines for diagnostics and therapy in trauma surgery. Eur J Trauma. 2002; 27:137–50.
18. Barie PS, Hydo LJ, Fischer E. A prospective comparison of two multiple organ dysfunction/failure scoring systems for prediction of mortality in critical surgical illness. J Trauma. 1994;37:660–6.
19. Rhee P, Joseph B, Pandit V, et al. Increasing trauma deaths in the United States. Ann Surg. 2014;260:13-21.
20. Akoğlu H, Denizbaşı A, Ünlüer E, Güneysel Ö, Onur Ö. Marmara Üniversitesi Hastanesi Acil Servisine Başvuran Travma Hastalarının Demografik Özellikleri. Marmara Medical Journal. 2005;18;113-22.
21. Varol O, Eren ŞH, Oğuztürk H, Korkmaz İ, Beydilli İ. Acil servise trafik kazası sonucu başvuran hastaların incelenmesi. CÜ Tıp Fakültesi Derg. 2006;28:55-60.
22. Guenther S, Waydhas C, Ose C, Nast-Kolb D. Quality of multiple trauma care in 33 German and Swiss trauma centers during a 5-year period: regular versus on-call service. J Trauma. 2003;54:972–8.
23. Durdu T, Kavalci C, Yilmaz MS, Karakilic ME, Arslan ED, Ceyhan ME. Analysis of Trauma Cases Admitted to the Emergency Department. J Clin Anal Med 2013;
24. Çırak B, Güven MB, Işık S, Kıymaz N, Demir Ö. Acil servise başvuran travma hastaları ile ilgili epidemiyolojik bir çalışma. Ulusal Travma Derg. 1999;5(3):157-9.
25. Köksal Ö, Çevik Ş, Akköse Aydın Ş, Özdemir F. Acil servise başvuran travma hastalarında rutin testlerin gerekliliğinin analizi. Ulus Travma Acil Cerrahi Derg. 2012;18(1):23-30.
26. Ozkayin N, Kaan E, Aktuglu K. The state and importance of motorcycle injuries in progression with trauma etiologies. Medical Science and Discovery. 2016;3:219-24.
27. Mpe MJ, Mathekga K, Mzileni MO. The outcome of neuro-trauma. A 1 year retrospective study in an intensive care unit. In Critical Care BioMed Central. 2001 March;5(1):1-2.
28. Kuo SCH, Kuo PJ, Rau CS, Chen YC, Hsieh HY, Hsieh CH. The protective effect of helmet use in motorcycle and bicycle accidents: a propensity score-matched study based on a trauma registry system. BMC Public Health. 2017 Aug 7;17(1):639. doi: 10.1186/s12889-017-4649-1.

This paper has been checked for language accuracy by JOSAM editors.
The National Library of Medicine (NLM) citation style guide has been used in this paper.