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Evaluation of Mortality in Height-Experiencing Falls in Patients with Height and Traffic Accidents

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Abstract

Aim: To evaluate the factors influencing mortality in patients admitted to the emergency department due to falls from height and traffic accidents, based on injury patterns and clinical characteristics.

Materials and Methods: This retrospective analysis included 2348 trauma patients who experienced traffic accidents or falls from a height. The demographic and clinical characteristics of the patients were examined. Factors affecting mortality were evaluated using statistical methods.

Results: Among the traumas, 90.3% were due to traffic accidents and 9.7% to falls from a height. Patients who fell from a height were found to have a lower Glasgow Coma scale (GCS) score (p=0.002). Hospitalization and mortality rates were higher in patients who fell from heights (p=0.001 and p=0.038, respectively). Mortality was significantly higher in patients with injuries to three or more organs and in those with intracranial injuries (p=0.001 and p=0.001, respectively).

Conclusion: Mortality is higher in patients who fall from height than in those who are involved in traffic accidents. Parameters directly associated with mortality include craniocerebral, multiorgan, and low GCS scores.

Keywords: Traffic accident, fall from height, mortality, trauma

Introduction

Trauma patients comprise a significant portion of emergency department presentations. Traumas range from low-energy to high-energy injuries (1). Traffic accidents are the most common type of trauma, followed by falls from height (2). Several factors affect the mortality of patients with high-energy trauma (3). Based on the mechanism of injury, the presence of head injuries and intra-abdominal hemorrhage is a critical, life-threatening condition (4). Falls from a height and road accidents are classified as high-energy traumas. The clinical management of these patients should be considered as multi-trauma patients, in accordance with trauma guidelines. This is because the patient's history may not provide sufficient clinical information for the physician. Consequently, a comprehensive systemic examination is necessary for these patients. Pathologies that could lead to mortality should be promptly identified and diagnosed, followed by immediate initiation of treatment (5).

In this study, we aimed to evaluate the factors affecting the mortality of patients presenting to the emergency department due to falls from height and traffic accidents, based on the injury patterns and clinical characteristics.

Materials and Methods

The study was conducted in the emergency department of a tertiary care hospital, which serves as a regional center for trauma patients, handling all trauma cases in the area. The

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emergency department evaluates approximately 800 patients daily, including an average of 150 patients with general trauma. This study retrospectively assessed patients who presented to the emergency department due to falls from a height and traffic accidents between January 1, 2020, and December 30, 2021. Ethical approval for our research was secured from the Atatürk University Faculty of Medicine Research Ethics Committee (decision number: B.30.2.ATA.0.01.00/185, date: 15.04.2021).

Patients included in the study were those who had fallen from a height or were involved in vehicular traffic accidents, such as passengers, drivers, or pedestrians. Excluded from the study were pregnant and breastfeeding women, patients with trauma mechanisms other than falls from height or traffic accidents, and those with incomplete medical records.

Patients were evaluated using the hospital's automation system and were subsequently reviewed in patient files. Screening was conducted using the hospital's automation system with the International Classification of Diseases codes. The screening codes included W19, R29.6, V39.4, V39.5, V39.6, V39.9, V79.9, V86.0, V86.1, V86.2, V86.3, V69.4, V69.5, V69.6, V69.9, V79.6, V79.4, V79.5, V49.4, V49.5, V49.6, V59.4, V59.5, V59.9, V87, V82.1, V82.9, Z04.1, V85.0, V85.1, V85.2, V85.3, and V81.1. Subsequently, the medical records of these patients were reviewed, and patients with incomplete data were excluded from the study.

Patients were categorized into two groups: those involved in traffic accidents and those who fell from a height. The following parameters were evaluated: age, sex, type of injury, whether the patient was a pedestrian or vehicle occupant for those involved in a traffic accident, initial Glasgow Coma scale (GCS) score upon presentation, time of presentation, injury locations, clinical pathologies identified, and mortality status. The GCS scores were categorized into five groups: 3, 4-6, 7-10, 11-14, and 15. Age groups were categorized as follows: 0-5, 6-18, 19-30, 31-45, 46-60, and 61. Injury locations were assessed in regions such as the head and neck, lower extremity, upper extremity, abdomen, thorax, face, pelvis, multiple trauma areas, and back scapula. Diagnoses included head trauma, upper extremity fractures, vascular injuries, lower extremity fractures, vascular injuries, intra-abdominal injuries, rib fractures, contusions, hemopneumothorax, vertebral fractures, injuries involving three or more organs, facial bone fractures, and other pathologies, such as cuts, ecchymosis, dermabrasions, hematomas, and lacerations.

Statistical Analysis

Data analysis was performed using IBM SPSS version 24. Normal variables are expressed as means, standard deviations, percentages, and numbers. The Kolmogorov-Smirnov test was used to check for normal distribution. The independent-samples t-test was used to compare normally distributed variables between the two groups, whereas the Mann-Whitney U test was used to compare non-normally distributed variables. Pearson's chi-square test was used for categorical variables. The statistical significance level was taken as $p<0.05$.

Results

The study included a total of 2.348 patients, of whom 2120 (90.3%) had been involved in traffic accidents and 228 (9.7%) had fallen from a height. The gender distribution showed that 67.7% of patients were male and 32.3% were female. The mean age of the patients was 33.23±18.7 years. Detailed clinical and demographic data are presented in Table 1.

Among the traffic accident injuries, car accidents were the most common (88.9%, with 42.7% of the injuries being pedestrians and 42.6% being drivers. Of the patients who fell from heights, 76.3% fell from heights of 1.1-4 meters, with 81 (35.5%) falling from balconies and 48 (32.2%) from scaffolding. The specific demographic data of the patients are presented in Table 2.

When comparing the clinical and demographic characteristics of patients involved in traffic accidents with those who fell from height, it was found that the latter group had a higher proportion of males (p=0.001). GCS scores were lower in patients who fell from the height (p=0.002). The 0-5 age group was more prevalent among those who fell from height compared to those involved in traffic accidents (p=0.035). In terms of injury regions, multi-trauma (32.0%), pelvis (5.7%), and back scapula (14%) injuries were more common in patients who fell from height than in those involved in traffic accidents, and these differences were statistically significant (p=0.001). Head-neck and extremity injuries were more common in traffic accidents (p=0.001). There was a statistically significant difference between the groups with respect to diagnoses based on injury region (p=0.001). Hospitalization and mortality rates were higher in patients who fell from height (p=0.001 and p=0.038, respectively) (Table 3).

Factors affecting mortality showed that patients who died had lower GCS scores (p=0.001). Among patients with multi-trauma, 71.4% had a fatal outcome, indicating a significant association with mortality (p=0.001). Head injuries were noted in 54.3% of deceased patients (p=0.001). In addition, the mortality rate was higher in patients with injuries involving three or more organs (p=0.001). Subarachnoid hemorrhage was the most common intracranial injury among deceased patients (69.7%), whereas liver and multi-organ injuries were the most frequently identified abdominal pathologies (p=0.001) (Table 4).

Table 1. Demographic and clinical characteristics of patients		
		n (%)
Gender	Male	1.590 (67.7)
	Female	758 (32.3)
Age (min-max) (mean)/years	(1-93) 33.23±18.7	
Glasgow Coma scale score	15	2.234 (95.1)
	11-14	29 (1.2)
	7-10	21 (0.9)
	4-6	23 (1.0)
	3	41 (1.7)
Age group	0-5 years	139 (5.9)
	6-18 years	364 (15.5)
	19-30 years	674 (28.7)
	31-45 years	579 (24.7)
	46-60 years	366 (15.6)
	61 years and above	226 (9.6)
Group	Traffic accident	2,120 (90.3)
	Falling from a height	228 (9.7)
Emergency arrival time	00:01-06:00	138 (5.9)
	06:01-12:00	686 (29.2)
	12:01-18:00	909 (38.7)
	18:01-00:00	615 (26.2)
Time of incident	00:01-06:00	208 (8.9)
	06:01-12:00	462 (19.7)
	12:01-18:00	898 (38.2)
	18:01-00:00	782 (33.3)
Injury location	Head-neck	563 (24.0)
	Lower extremity	360 (15.3)
	Upper extremity	438 (18.7)
	Abdomen	80 (3.4)
	Thorax	165 (7.0)
	Facial area	201 (8.6)
	Pelvis	73 (3.1)
	Multi-trauma	296 (12.6)
	Back-scapula	172 (7.3)
Diagnosis	Head trauma	186 (7.9)
	Upper extremity fractures/dislocations, vascular injury	134 (5.7)
	Lower extremity fractures/dislocations, vascular injury	243 (10.3)
	Intra-abdominal injuries	75 (3.2)
	Rib fractures, contusion, and hemopneumothorax	162 (6.9)
	Vertebral fracture	145 (6.2)
	Injury to three or more organs	76 (3.2)
	Facial bone fractures	106 (4.5)
	Cuts, ecchymosis, dermabrasion, hematoma, and lacerations	1214 (51.7)
	Other	8 (0.3)
Patient outcome	Discharge	1.192 (50.8)
	Hospitalization	1.135 (48.3)
	Mortality in the emergency department	21 (0.9)
Mortality	Discharge	2313 (98.5)
	Mortality	35 (1.5)

Table 2. Specific demographic data about the injuries		
Data on traffic accidents		**n (%)**
Vehicle type	Car	1885 (88.9)
	Tractor	49 (2.3)
	Motorbike	58 (2.7)
	Pedestrian	37 (1.7)
	Truck	13 (0.6)
	Other	78 (3.7)
Injured person	Driver	904 (42.6)
	Passenger	905 (42.7)
	Pedestrian	311 (14.7)
Data for falls from height		**n (%)**
Fall height (m)	<1	5 (2.2)
	1.1-4	174 (76.3)
	4.1-9	43 (18.9)
	9.1 and above	6 (2.6)
Fall location	Balcony	81 (35.5)
	Stairs	16 (7.0)
	Tree	18 (7.9)
	Furniture	10 (4.4)
	Roof	47 (20.6)
	Scaffold	48 (21.1)
	Other	7 (3.1)

Discussion

Trauma is the leading cause of death among young people (6). When examining the causes of trauma, traffic accidents are the most common, followed by falls from height and other injuries (2). Among blunt traumas, falls from a height are the most common cause (7). Although traffic accidents are the leading cause of trauma-related mortality, factors such as age, cause of fall, body part, and organ injuries significantly influence morbidity and mortality in patients who fall from height (8,9). Our study revealed a higher mortality rate among patients who fell from height compared with those who were involved in traffic accidents. However, consistent with the literature, traffic accidents were found to be more frequent than falls from a height in general trauma cases.

The mechanism underlying injury is crucial in trauma-related mortality. Studies have shown that patients with craniocerebral and multi-organ injuries have higher mortality rates (10-12). Rastogi et al. (13) reported that 51% of patients with major trauma presented with craniocerebral injuries. Similarly, Turgut et al. (14) identified craniocerebral injuries as the leading cause of death in patients who fell from heights. Our study similarly showed that head-brain injuries significantly affected mortality. When evaluating patients involved in traffic accidents alongside those who have suffered falls from height, we determined that individuals involved in traffic accidents exhibited a higher incidence of craniocerebral injuries. This is likely due to the mechanical impact inside the vehicle.

Regarding mortality among trauma patients, previous studies have indicated that 17.1% of trauma-related hospital deaths are due to trauma (15). Another study found a mortality rate of 1.3% due to traffic accidents (16), whereas falls from height accounted for a mortality rate of 7.1% in another study (17). In the current study, the mortality rate among patients who fell from height was 3.2%, which was higher than that for traffic accidents, which is consistent with the literature.

Another factor affecting trauma-related mortality is the specific mechanism of injury. Higher mortality rates have been reported for falls from heights of 18 meters or more (18). Another study identified a height of 6 meters as a risk factor for increased mortality (19). In traffic accidents, mortality is higher in collisions involving cars and drivers (16). In our study, 20.5% of the patients who suffered falls had fallen from a height of 4 meters or more, and the majority of the patients involved in traffic accidents were drivers. These findings are consistent with those reported in the literature.

Table 3. Comparison of the clinical and demographic characteristics of the study groups				
		Traffic accidents (n=2.120; 100%)	**Falling from a height (n=228; 100%)**	**p value**
Gender	Male	1.413 (66.7)	177 (77.6)	0.001
	Female	707 (33.3)	51 (22.4)	
Glasgow Coma scale score	15	2031 (95.8)	203 (89.0)	0.002
	11-14	18 (0.8)	11 (4.8)	
	7-10	18 (0.8)	3 (1.3)	
	4-6	20 (0.9)	3 (1.3)	
	3	33 (1.6)	8 (3.5)	
Age group	0-5 years	117 (5.5)	22 (9.6)	0.038
	6-18 years	323 (15.2)	41 (18.0)	
	19-30 years	625 (29.5)	49 (21.5)	
	31-45 years	522 (24.6)	57 (25.0)	
	46-60 years	329 (15.5	37 (16.2)	
	61 years and above	204 (9.6)	22 (9.6)	
Emergency arrival time	00:01-06:00	136 (6.4)	2 (0.9)	0.004
	06:01-12:00	621 (29.3)	65 (28.5)	
	12:01-18:00	807 (38.1)	102 (44.7)	
	18:01-00:00	556 (26.2)	59 (25.9)	
Time of incident	00:01-06:00	186 (8.8)	22 (9.6)	0.322
	06:01-12:00	4.228 (20.2)	34 (14.9)	
	12:01-18:00	800 (37.7)	96 (42.1)	
	18:01-00:00	706 (33.3)	76 (33.3)	
Injury location	Head-neck	525 (24.8)	38 (16.7)	0.001
	Lower extremity	329 (15.5)	31 (13.6)	
	Upper extremity	424 (20.0)	14 (6.1)	
	Abdomen	72 (3.4)	8 (3.5)	
	Thorax	146 (6.9)	19 (8.3)	
	Facial area	201 (9.5)	0 (0)	
	Pelvis	60 (2.8)	13 (5.7)	
	Multi-trauma	223 (10.5)	73 (32.0)	
	Back-scapula	140 (6.5)	32 (14.0)	
Diagnosis	Head trauma	153 (7.2)	33 (14.5)	0.001
	Upper extremity fractures/dislocations, vascular injury	120 (5.7)	14 (6.1)	
	Lower extremity fractures/dislocations, vascular injury	203 (9.6)	40 (17.5)	
	Intra-abdominal injuries	64 (3.0)	10 (4.4)	
	Rib fracture, contusion, and hemopneumothorax	136 (6.4)	26 (11.4)	
	Vertebral fracture	103 (4.9)	42 (18.4)	
	Injury to three or more organs	62 (2.9)	14 (6.1)	
	Facial bone fracture	99 (4.7)	7 (3.1)	
	Cuts, ecchymosis, dermabrasion, hematoma, and lacerations	1.178 (55.6)	36 (15.8)	
	Other	2 (0.1)	6 (2.6)	
Patient outcome	Discharge	1.173 (55.3)	19 (8.3)	0.001
	Hospitalization	931 (43.9)	204 (89.9)	
	Mortality in the emergency department	16 (0.8)	5 (2.2)	
Mortality status	Discharge	2.092 (98.7)	221 (96.9)	0.038
	Mortality	28 (1.3)	7 (3.1)	

Table 4. Comparison of the characteristics of the groups according to mortality status				
		Discharge n=2.313 (%)	**Mortality n=35 (%)**	**p value**
Gender	Male	1.562 (67.5)	28 (80.0)	0.079
	Female	751 (32.5)	7 (20.0)	
Glasgow coma scale score	15	2.230 (96.4)	4 (11.4)	0.001
	11-14	26 (1.1)	3 (8.6)	
	7-10	20 (0.9)	1 (2.9)	
	4-6	19 (0.8)	4 (11.4)	
	3	18 (0.8)	23 (65.7)	
Age group	0-5 years	137 (5.9)	2 (5.7)	0.433
	6-18 years	358 (15.5)	6 (17.1)	
	19-30 years	668 (28.9)	6 (17.1)	
	31-45 years	568 (24.6)	11 (31.4)	
	46-60 years	362 (15.79)	4 (11.4)	
	61 years and above	220 (9.5)	6 (17.1)	
Emergency arrival time	00:01-06:00	133 (5.8)	5 (14.3)	0.034
	06:01-12:00	682 (29.5)	4 (11.4)	
	12:01-18:00	893 (38.6)	16 (45.7)	
	18:01-00:00	605 (26.2)	10 (28.6)	
Time of incident	00:01-06:00	204 (8.8)	4 (11.4)	0.456
	06:01-12:00	458 (19.8)	4 (11.4)	
	12:01-18:00	884 (38.2)	12 (34.3)	
	18:01-00:00	767 (33.2)	15 (42.9)	
Injury location	Head-neck	555 (24.0)	8 (22.9)	0.001
	Lower extremity	360 (15.6)	0 (0)	
	Upper extremity	438 (18.9)	0 (0)	
	Abdomen	78 (3.4)	2 (5.7)	
	Thorax	165 (7.1)	0 (0)	
	Facial area	201 (8.7)	0 (0)	
	Pelvis	73 (3.2)	0 (0)	
	Multi-trauma	271 (11.7)	25 (71.4)	
	Back-scapula	172 (7.4)	0 (0)	
Diagnosis	Head trauma	168 (7.3)	19 (54.3)	0.001
	Upper extremity fractures/dislocations, vascular injury	134 (5.8)	0 (0)	
	Lower extremity fractures/dislocations, vascular injury	241 (10.4)	2 (5.7)	
	Intra-abdominal injuries	72 (3.1)	2 (5.7)	
	Rib fracture, contusion, and hemopneumothorax	158 (6.8)	4 (11.4)	
	Vertebral fracture	143 (6.2)	2 (5.7)	
	Injury to three or more organs	70 (3.0)	6 (17.1)	
	Facial bone fracture	106 (4.6)	0 (0)	
	Cuts, ecchymosis, dermabrasion, hematoma, and lacerations	1.214 (52.5)	0 (0)	
	Other	7 (0.3)	0 (0)	
Intracranial diagnosis	Cephalic hematoma	93 (54.3)	0 (0)	0.001
	Subarachnoid hemorrhage	37 (21.6)	16 (69.7)	
	Epidural-subdural bleeding	16 (9.4)	0 (0)	
	Intracranial hemorrhage	3 (1.8)	5 (21.7)	
	Contusion cerebri	21 (12.3)	0 (0)	
	Brain edema-axonal damage	1 (0.6)	2 (8.6)	
Abdominal diagnosis	Liver laceration	37 (51.3)	1 (50.0)	0.001
	Spleen laceration	11 (15.2)	0 (0)	
	Multi-organ injury	17 (23.6)	1 (50.0)	
	Perforation	7 (9.9)	0 (0)	

The GCS is a scoring system used to evaluate trauma patients. Lower GCS scores are associated with higher mortality rates in patients with trauma (20,21). In our study, the mortality rate was higher among patients involved in traffic accidents than among those who fell from a height. Consequently, patients who fell from height tended to have lower GCS scores, indicating an association with higher mortality.

Study Limitations

One limitation of this study is that it was conducted at a single center. In addition, other parameters that might influence mortality were not investigated due to the retrospective nature of the study. Furthermore, demographic data were obtained retrospectively from patient files; therefore, the heights of falls were recorded based on the patients' own statements, potentially affecting data accuracy.

Conclusion

Numerous factors affect mortality in trauma patients. Mortality is higher among patients who have fallen from a height compared to those involved in traffic accidents. Parameters directly associated with mortality include craniocerebral, multiorgan, and low GCS scores.

Ethics

Ethics Committee Approval: Ethical approval for our research was secured from the Atatürk University Faculty of Medicine Research Ethics Committee (decision number: B.30.2.ATA.0.01.00/185, date: 15.04.2021).

Informed Consent: This retrospective study.

Authorship Contributions

Surgical and Medical Practices: A.G., B.K.Ç., Concept: A.G., F.Ç., Design: A.G., B.K.Ç., Data Collection or Processing: A.G., B.K.Ç., Analysis or Interpretation: A.G., F.Ç., Literature Search: A.G., B.K.Ç., Writing: A.G., F.Ç.

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References

1. Herman J, Ameratunga S, Jackson R. Burden of road traffic injuries and related risk factors in low and middle-income Pacific Island countries and territories: a systematic review of the scientific literature (TRIP 5). BMC Public Health. 2012;12:479.
2. Ersoy S, Sonmez BM, Yilmaz F, Kavalci C, Ozturk D, Altinbilek E, et al. Analysis and injury paterns of walnut tree falls in central anatolia of turkey. World J Emerg Surg. 2014;9:42.
3. Parreira JG, Gregorut F, Perlingeiro JA, Solda SC, Assef JC. Análise comparativa entre as lesões encontradas em motociclistas envolvidos em acidentes de trânsito e vítimas de outros mecanismos de trauma fechado [Comparative analysis of injuries observed in motorcycle riders involved in traffic accidents and victims of other blunt trauma mechanisms]. Rev Assoc Med Bras (1992). 2012;58:76-81.
4. Oguztürk H, Turgut K, Turtay MG, Sarihan ME, Gur A, Beydilli I, et al. Apricot tree falls: a study from Malatya, Turkey. Biomedical Research. 2016;27:210-3.
5. Boehm T, Alkadhi H, Schertler T, Baumert B, Roos J, Marincek B, et al. Einsatz der Mehrschicht-Spiral-CT beim traumatologischen Notfall und ihre Auswirkungen auf den Untersuchungs- und Behandlungsalgorithmus [Application of multislice spiral CT (MSCT) in multiple injured patients and its effect on diagnostic and therapeutic algorithms]. Rofo. 2004;176:1734-42.
6. Tortum F, Bayramoğlu A. Can We Predict Mortality in Traffic Accidents in Emergency Department?. Eurasian Journal of Critical Care. 2019;1:1-6.
7. Jain V, Jain S, Dhaon B. A Multi Factorial Analysis of the epidemiology of Injuries from Falls from Heights. Int J Crit Illn Inj Sci. 2014;4:283-7.
8. Içer M, Güloğlu C, Orak M, Ustündağ M. Factors affecting mortality caused by falls from height. Ulus Travma Acil Cerrahi Derg. 2013;19:529-35.
9. Güneytepe Üİ, Aydın ŞA, Gökgöz Ş, Özgüç H, Ocakoğlu G, Aktaş H. Yaşlı Travma Olgularında Mortaliteye Etki Eden Faktörler ve Skorlama Sistemleri. Uludağ Üniversitesi Tıp Fakültesi Dergisi. 2008;34:15-9.
10. Yiğit E, Turtay MG, Çolak C. Examination of Pediatric Trauma Patients Admitted to the Emergency Department. Eurasian J Emerg Med. 2024;23:40-8.
11. Madsen T, Dawson M, Bledsoe J, Bossart P. Serial hematocrit testing does not identify major injuries in trauma patients in an observation unit. Am J Emerg Med. 2010;28:472-6.
12. Snyder CW, Muensterer OJ, Sacco F, Safford SD. Paediatric trauma on the Last Frontier: an 11-year review of injury mechanisms, high-risk injury patterns and outcomes in Alaskan children. Int J Circumpolar Health. 2014;73:25066.
13. Rastogi D, Meena S, Sharma V, Singh GK. Epidemiology of patients admitted to a major trauma centre in northern India. Chin J Traumatol. 2014;17:103-7.
14. Turgut K, Sarihan ME, Colak C, Güven T, Gür A, Gürbüz S. Falls from height: A retrospective analysis. World J Emerg Med. 2018;9:46-50.
15. Ugare GU, Bassey IE, Udosen JE, Ndifon W, Ndoma-Egba R, Asuquo M, et al. Trauma death in a resource constrained setting: mechanisms and contributory factors, the result of analysing 147 cases. Niger J Clin Pract. 2014;17:397-402.
16. Çakmak F, Gür A, Keskin Çelik B. Evaluation of Mortality in Patients Involved In-vehicle and Out-of-vehicle Traffic Accidents. New Trend Med Sci. 2023;4:137-42.
17. Parreira JG, Rondini GZ, Below C, Tanaka GO, Pelluchi JN, Arantes-Perlingeiro J, et al. Trauma mechanism predicts the frequency and the severity of injuries in blunt trauma patients. Rev Col Bras Cir. 2017;44:340-7.
18. Buckman RF Jr, Buckman PD. Vertical deceleration trauma. Principles of management. Surg Clin North Am. 1991;71:331-44.
19. Al B, Yıldırım C, Coban S. Falls from heights in and around the city of Batman. Ulus Travma Acil Cerrahi Derg. 2009;15:141-7.
20. MRC CRASH Trial Collaborators; Perel P, Arango M, Clayton T, Edwards P, Komolafe E, et al. Predicting outcome after traumatic brain injury: practical prognostic models based on large cohort of international patients. BMJ. 2008;336:425-9.
21. González-Robledo J, Martín-González F, Moreno-García M, Sánchez-Barba M, Sánchez-Hernández F. Prognostic factors associated with mortality in patients with severe trauma: from prehospital care to the Intensive Care Unit. Med Intensiva. 2015;39:412-21.