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Original Article

Evaluation of Cases with Stab Wounds Presented to the Emergency Department: A 2-Year Retrospective Analysis

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ABSTRACT

Objective: This study analyzed the demographic and clinical characteristics of patients who were admitted to the emergency department (ED) with stab wounds and compared the Glasgow coma scale (GCS), Revised Trauma Score (RTS), Shock Index (SI), Modified Shock Index (MSI), and Age-Adjusted Shock Index (ASI) between patients who received a blood transfusion and those who did not.

Methods: This retrospective, cross-sectional, single-center study included 308 consecutive patients admitted to the ED due to stab wounds. We assessed patients' demographics and clinical features, trauma scores (GCS and RTS), SIs (SI, MSI, and ASI), the timing of trauma, intervention and blood transfusion need, and clinical outcomes. Data were compared among the groups who received blood transfusions and those who did not.

Results: A total of 308 patients, 288 male (93.5%) and 20 female (6.5%), were included in the study. The mean age was 28.30±11.90 years. 235 (76.3%) cases were admitted due to assaults, 64 (20.8%) traffic accidents, and 9 (2.9%) self-harm. The most common anatomical site of injury was the lower extremity (39%). The soft tissue repairs were done in 173 (56.20%), vascular surgical repair in 22 (7.10%), laparotomy in 22 (7.10%), and tube thoracostomy in 18 (5.80%). The highest number of patients (n=38, 12.3%) were in July and August and (n=153, 49.7%) between 18:01 and 00:00. The mean GCS and RTS values were significantly lower, and mean SI, MSI, and ASI values were higher in patients who received blood transfusions ($p<0.001$ for all comparisons). Finally, elevated SI, ASI, and MSI remained independent predictors of the need for blood transfusion.

Conclusion: The most common anatomical site for stab wounds was extremities and the most common required procedure was soft tissue repairs. In addition, elevated SI, MSI, and ASI were independent predictors for blood transfusion requirement in patients admitted to the ED with stab wounds.

INTRODUCTION

Penetrating injuries occur when an object pierces the skin or enters the body, such as with stabbings or gunshot wounds. Epidemiological data indicate that stabbings are more common than gunshots, but they have a lower mortality rate.[1-4] However, deep stab wounds can result in severe internal organ and vessel damage, leading to hypovolemic shock, peritonitis, and death.[5-7] Therefore, early prediction of trauma patients' prognosis is critical for effective management in the emergency department (ED). Several scoring systems have been developed to predict the prognosis of trauma patients, such as the Shock Index (SI), Modified Shock Index (MSI), and Age-Adjusted Shock Index (ASI).[8,9] The SI is a simple and reliable predictor of active bleeding in trauma patients and can estimate mean blood loss in hemorrhagic and hypovolemic patients. MSI and ASI were derived from the regular SI. MSI, by taking the mean arterial pressure (MAP), provides the evaluation of diastolic blood pressure together with systolic blood pressure (SBP), unlike SI. Aging is associated with a gradual decline in physiological reserve and high mortality. Therefore, ASI, which is calculated by multiplying age by SI, is utilized to evaluate the prognosis of critically ill patients.[9]

This study evaluated the demographic and epidemiological characteristics, clinical outcomes, and treatment strategies of cases who were presented to the ED with stab wounds. It also compared trauma scores such as Glasgow Coma

Scale (GCS) and Revised Trauma Score (RTS), as well as, SI, MSI, and ASI between patient groups who received a blood transfusion and those who did not.

MATERIALS AND METHODS

Ethics Committee Approval and Patient Consent

This study was conducted in accordance with the 1989 Declaration of Helsinki and was approved by the Institutional Review Board (IRB) of Haseki Research and Training Hospital in İstanbul, Turkey (approval no. 2022-52). Patient consent to review their medical records was not required by the IRB, because there were no potentially identifying marks and no patient identifiers in the images or accompanying text.

Study Design and Setting

This retrospective, cross-sectional, observational, and the single-center study included 308 consecutive patients admitted to our ED due to stab wounds between January 2020 and January 2022. Data were collected by searching for W26 and Y28 International Classification of Disease codes in the hospital's automation systems and archives. We assessed patients' demographics (age and sex), vital signs on admission, complaints and symptoms at admission, anatomic site of injury, mechanism of trauma, trauma scoring systems (GCS and RTS), the timing of trauma, intervention and blood transfusion need, and clinical outcomes (discharge, hospitalization, or death). In addition, SI, MSI, and ASI were calculated for each patient.

SI is defined as the heart rate (HR) divided by SBP. The MSI is determined by dividing HR over MAP. Finally, the ASI is calculated by multiplying the regular SI by age.

The patients were divided into two groups based on whether they received blood transfusions or not. Group I included patients who received blood transfusions, and Group II included patients those who did not. Demographics, clinical characteristics, anatomic site of injury, mechanism of trauma, the timing of injuries, trauma scores, and SIs (SI, MSI, and ASI) were compared among the groups.

Study Population and Sampling

All cases meeting the eligibility criteria were included to prevent selection bias. We enrolled a total of 481 patients admitted to the ED after penetrating injuries between January 2020 and January 2022. Of these patients, 65 were excluded because of a lack of information. In addition, 108 gunshot wounds were excluded from the study. The remaining 308 patients were included in the analysis. The flow chart shows the patient-selection process (Figure 1).

Statistical Analysis

All data analyses were conducted using SPSS statistical software (version 21.0 for Windows; SPSS Inc., Chicago, IL, USA). Categorical variables were expressed as numbers of patients (n) and percentages (%). Numerical data were expressed as mean, standard deviation, and median values. Intragroup analyses were conducted using the student t-test for normally distributed data and the Mann–Whitney U-test for non-normally distributed data, as appropriate. Independent variables predicting blood transfusion (SI, MSI, and ASI) were analyzed using multivariate logistic regression analysis. The threshold for statistical significance was defined as $p<0.05$.

RESULTS

Table 1 presents the demographic characteristics of the patients in this study. A total of 308 patients, 288 male (93.5%) and 20 female (6.5%), were included in the study. The mean age was 28.30±11.90 years (range: 3–80 years). Of the patients, 230 (74.7%) were Turkish citizens, while 79 (25.3%) were foreign nationals. A total of 170 (55.2%) patients were transported to the ED by ambulance, whereas 138 (44.8%) patients were admitted as outpatients. 235

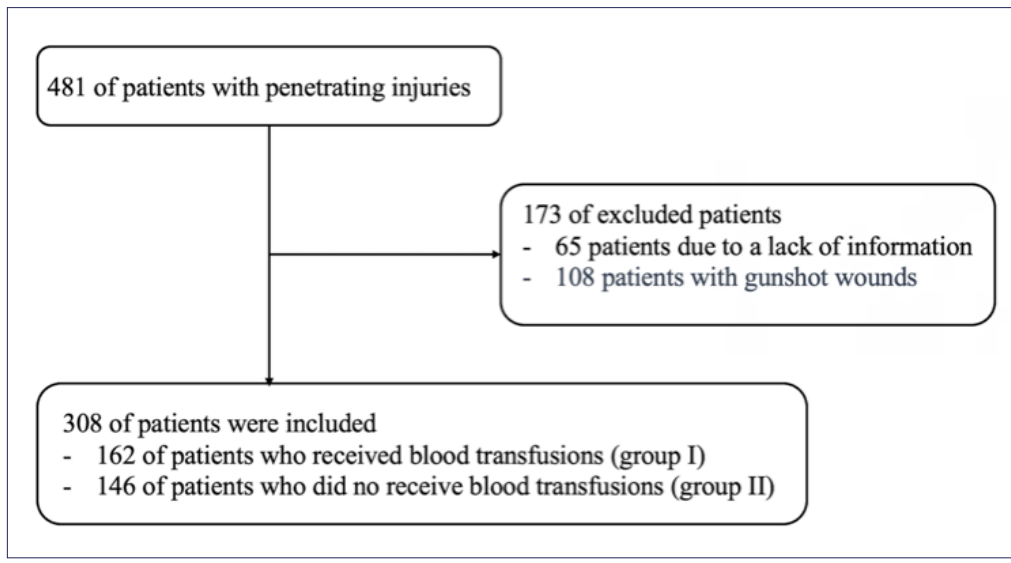

Figure 1. Flowchart.

Table 1. Demographic and clinical characteristics of stab-injured patients

Characteristics	n (%)
Sex	
Male	288 (93.5)
Female	20 (6.5)
Nationality	
Turkey	230 (74.7)
Syria	39 (12.7)
Pakistan	14 (4.5)
Azerbaijan	6 (1.9)
Uzbekistan	2 (0.69)
Turkmenistan	2 (0.6)
Russia	1 (0.3)
Libya	1 (0.3)
Sierra Leone	1 (0.3)
Transport to hospital	
Ambulance	170 (55.2)
Outpatients	138 (44.8)
Trauma mechanism	
Assault	235 (76.3)
Traffic accident	64 (20.8)
Self-harm	9 (2.9)
Age distribution (years)	
0–17 (juvenile)	45 (14.6)
18–64 (adults)	260 (84.4)
≥65 (elderly)	3 (1.0)

Data were given as n (%).

(76.3%) cases were admitted to the ED due to assaults, 64 (20.8%) traffic accidents, and 9 (2.9%) self-harm.

Figures 2 and 3 illustrate the timing of trauma. The months with the most patient admissions (n=38, 12.3%) were July and August, while the lowest number of admissions (n=12, 3.9%) was in April. In addition, 153 (49.7%) patients were admitted to the ED with stab wounds between 6:01 PM and 12:00 AM.

The most common anatomical site of injury was the lower extremity, with 39% of cases. This was followed by the abdomen (33.10%), upper extremity (30.50%), thorax (23.40%), and head-neck (14.00%), respectively. In addition, the examination of 22 patients with thoracic penetrating wounds revealed additional injuries in other anatomical sites. Furthermore, 14 patients with abdominal penetrating wounds, 31 with head–neck trauma, 41 with upper-extremity injuries, and 43 with lower-extremity injuries also had additional injuries (Table 2).

An analysis of clinical outcome revealed that 49% (n=151) of the patients were discharged from the ED, 38.9% (n=120) were treated in isolated wards, 5 (1.6%) were in the intensive care unit (ICU), and 2 (0.6%) were followed up in the ED. Furthermore, 17 (5.5%) patients were transferred to another hospital for further treatment. Among

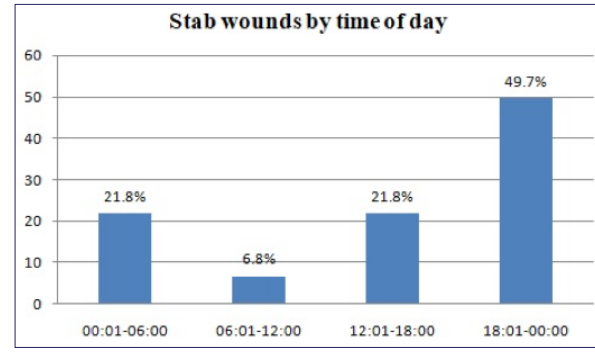

Figure 2. Distribution of cases with stab wounds by time of day.

those transferred, 7 patients required thoracic surgery, 7 patients required pediatric surgery, and 3 patients required ICU. In addition, 2 (0.6%) patients died in the ED, 1.6% (n=5) of the patients died in ICU, 3.6% (n=11) refused treatment and left the hospital from the ED, and 7.5% (n=23) refused treatment when they were treated in the ward. The average length of stay was 3.03±2.65 h in the ED and 3.93±2.36 days in the ward. Of these, 78 (25.40%) patients were followed up in general surgery, 31 (10.10%) in cardiovascular surgery, 3 (0.60%) in neurosurgery, 3 (0.60%) in orthopedics, 2 (0.60%) in urology, 1 (0.30%) in otolaryngology, 1 (0.30%) in thoracic surgery, and 1 (0.30%) in the cardiology service, as illustrated in Figure 4.

Of the surgical procedures performed, the soft tissue repairs were done in 173 (56.20%), vascular surgical repair in 22 (7.10%), laparotomy in 22 (7.10%), tube thoracostomy in 18 (5.80%), tendon repair in 6 (2.00%), laparoscopy in 3 (1.00%), and thoracotomy in 3 (1.00%), and other surgical interventions in 2 (0.60%) (Table 3). Out of the remaining 59 patients, 17 (5.5%) were transferred to another hospital, 2 (0.6%) died in the ED, and 11 (3.6%) refused treatment and left the hospital from the ED, resulting in no intervention. In addition, 29 (9.4%) patients did not require any additional surgical intervention.

Table 4 presents a comprehensive comparison of demographic characteristics, trauma scores, and shock indices between Group I and Group II patients. The mean GCS and RTS values of Group I patients were 14.84±1.16 and 11.84±1.15, respectively. In addition, the mean GCS and RTS values of Group II patients were 12.30±4.93 and 9.56±4.47, respectively. Statistical analysis revealed that

Figure 3. Distribution of cases with stab wounds by months.

Table 2. Anatomical site of the injury in cases with stab wounds

Anatomical site of injury	n (%)	Isolated injuries	Additional injuries
Lower extremities	120 (39.0)		
Skin-subcutaneous incision	112 (36.3)	77	43
Vascular	6 (2.0)		
Tendon	2 (0.6)		
Bone	1 (0.3)		
Nerve	1 (0.3)		
Multiple	1 (0.3)		
Abdomen/pelvis	102 (33.1)	57	45
Penetrating injury	79 (25.6)	48	31
Nonpenetrating injury	23 (7.4)		
Stomach/intestine	11 (3.6)	9	14
Liver	8 (2.6)		
Diaphragm	4 (1.3)		
Spleen	3 (1.0)		
Vascular	2 (0.6)		
Multiple	7 (2.3)		
Upper extremities	94 (30.5)		
Skin-subcutaneous incision	63 (20.5)	53	41
Vascular	20 (6.5)		
Tendon	9 (3.0)		
Bone	2 (0.6)		
Nerve	1 (0.3)		
Amputation	1 (0.3)		
Multiple	5 (1.6)		
Thorax	72 (23.4)	21	51
Penetrating injury	39 (12.7)	10	29
Nonpenetrating injury	33 (10.7)		
Pneumothorax	26 (8.4)	11	22
Hemothorax	17 (5.5)		
Rib fracture	1 (0.3)		
Cardiac injury	1 (0.3)		
Medulla spinalis	1 (0.3)		
Multiple	12 (3.9)		
Head/face/neck	43 (14.0)		
Skin-subcutaneous incision	27 (8.8)	12	31
Bone	3 (1.0)		
Brain	1 (0.3)		
Multiple	5 (1.6)		

Data were given as n (%).

the mean GCS and RTS values were significantly lower in Group I when compared to Group II ($p<0.001$ for all comparisons). Moreover, mean SI, MSI, and ASI values were found to be significantly higher in Group I than Group II ($p<0.001$ for all comparisons).

The multivariate logistic regression analysis demonstrated that elevated SI (odds ratio [OR]: 13.606, 95% confidence interval [CI]: 1.958–94.531; p=0.008), ASI (OR: 1.061, 95% CI: 1.019–1.105; p=0.004), and MSI (OR: 4.842, CI: 1.237–18.950; p=0.023) remained independent predictors of blood transfusion requirement (Table 5).

DISCUSSION

The primary objective of this study was to identify and early predict high-risk patients for mortality and blood transfusions among those admitted to the ED with stab wounds. The key findings were as follows: first, most stab wound patients in the ED were male and aged 18–64 and second, the assault was the leading cause of admission, followed by accidental injuries and self-harm. Third, patients who received blood transfusions had lower mean GCS and RTS values and higher mean SI, MSI, and ASI values than

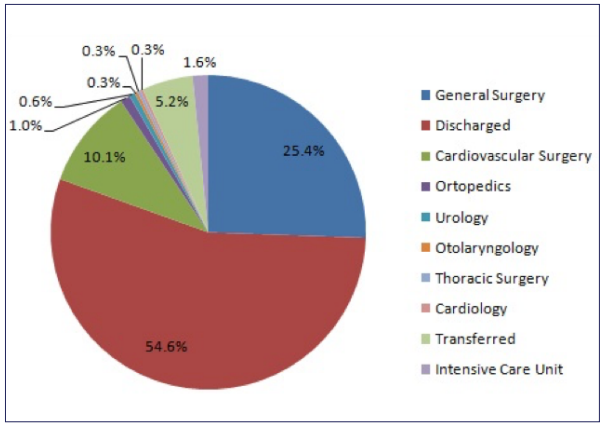

Figure 4. Clinics where patients with stab wounds were hospitalized.

Table 3. Surgical interventions performed for stab wounds

Surgical interventions	n (%)
Soft tissue repairs	173 (56.2)
Vascular surgery	22 (7.1)
Laparotomy	22 (7.1)
Tube thoracostomy	18 (5.8)
Tendon repair	6 (2.0)
Laparoscopy	3 (1.0)
Thoracotomy	3 (1.0)
Other surgeries	2 (0.6)

Data were given as n (%).

those who did not. Finally, elevated SI, ASI, and MSI were independent predictors of the need for blood transfusion according to multivariate logistic regression analysis.

In studies evaluating the demographic characteristics of trauma patients, Güloğlu et al.[10] and Koksal et al.[3] in Turkey and Johannesdottir et al.[5] in Iceland have consistently stated that young males were presented to the ED more frequently due to stab wounds. Similarly, our study found that the majority of patients (93.5%) were male and the mean age was 28.3±11.9 years. Koksal et al.'s study found that 74.6% of trauma patients were transported to the ED by ambulance and 25.4% presented as outpatients.[3] Our study also found that majority of patients, 55.2%, were transported by ambulance while 44.8% presented as outpatients.

A review of the literature on the timing of stab wounds showed inconsistent results. Güloğlu et al. found that the majority of patients were admitted to the ED afternoon (12.00–18.00), while Robinson et al. found that the highest number of admissions occurred during the day (6.00–18.00).[4,10] However, our study yielded different results, with a higher number of admissions in the evening (18.01–24.00). In addition, our results showed that the months of July and August had the highest number of patient admissions to ED with stab wounds, while April had the lowest. The discrepancy in these findings could be attributed to several factors, including regional differences in crime rates, location and accessibility of hospitals, and cultural and societal factors that influence the timing of seeking medical care.[4,10] During summer months and nighttime hours, people are more likely to engage in outdoor activities such as parties and gatherings, which can carry a higher risk of violence. Alcohol or drug con-

Table 4. Comparison of demographic characteristics, trauma scores, and shock indices between patients who received blood transfusion and those who did not

Characteristics	Group I, n (%)	Group II, n (%)			
Sex					
Male	251 (92.6)	23 (100)			
Female	20 (7.4)	0			
Age distributions (years)					
0–17	37 (13.7)	4 (17.4)			
18–64	232 (85.6)	18 (78.3)			
≥65	2 (0.7)	1 (4.3)			
Characteristics	**Mean±SD**	**Minimum–maximum (median)**	**Mean±SD**	**Minimum–maximum (median)**	**P***
GCS	14.84±1.16	3–15 (15)	12.30±4.93	3–15 (15)	<0.001
RTS	11.84±1.15	0–12 (12)	9.56±4.47	0–12 (12)	<0.001
SI	0.79±0.20	0.41–1.85 (0.75)	1.11±0.33	0.70–2.08 (1.075)	<0.001
MSI	1.04±0.28	0.44–2.75 (0.98)	1.44±0.45	0.86–2.67 (1.46)	<0.001
ASI	21.60±8.70	3.70–60.40 (19.8)	35.40±18.60	14.24–72.50 (32.2)	<0.001

*Intragroup analyses were conducted using the Mann–Whitney U-test. Data were given as mean, SD, minimum, maximum, and median. Group I: Patients who received blood transfusion, Group II: Patients who did not received blood transfusion. GCS: Glasgow Coma Scale; RTS: Revised trauma score; SI: Shock index; MSI: Modified SI; ASI: Age-adjusted SI; SD: Standard deviation.

sumption, which can increase aggression and violence, may also be more common during these times. Factors such as reduced visibility and heightened emotions due to fatigue or stress during nighttime hours may further increase the likelihood of violence and injury. Interpreting these statistics and drawing definitive conclusions are difficult. Nevertheless, our findings indicate that there may be seasonal or temporal trends in the incidence of stab wounds. Therefore, health-care workers, policymakers, law enforcement officials, and community leaders should be vigilant about an increased number of cases during the summer months and during the evening hours. Furthermore, it could be beneficial to investigate the underlying causes of these trends and develop strategies to prevent or mitigate the incidence of stab wounds.

The literature on the most commonly affected anatomical sites in stab wounds varies. Studies by Güloğlu et al.[19] and Johannesdottir et al.[5] found the thorax to be the most commonly injured site, while Robinson et al.[4] found head-neck. In contrast, Köksal et al.[3] reported the abdomen to be the most frequently injured, while Pallet et al.[8] observed extremities at 63.9%. Similar to Pallet et al.'s findings, in our results, the extremities (39.0% lower extremity, 30.5% upper extremity) were the most common sites affected in stab wounds. The upper and lower extremities are the most easily accessible parts of the body and are often used to defend against an attacker. In addition, the lower extremities have a larger surface area, making them a more likely target.

Koksal et al. found that 90.14% of the patients had GCS values between 13 and 15, 9.86% of them had values between 8 and 12, and no patients had GCS <8. In addition, 91.55% of the patients had RTS values between 10 and 12 and 8.45% had RTS <10.[3] Furthermore, 25.4% of the patients required blood transfusion. In our study, 97.4% of patients had GCS values between 13 and 15 and RTS values between 10 and 12. Moreover, 2.6% had GCS and RTS values below 8 and 10, respectively. In contrast to Koksal et al.,[3] our study found a low rate of blood transfusions (7.5%) which we believe is due to the high number of extremity injuries.

In their study evaluating pre-hospital SI, Jehan et al.[11] found that patients with SI > 1 had a higher need for blood transfusion. In addition, Sharma et al.'s[12] study of war injuries revealed that both SI and MSI values were significantly higher in patients who received blood transfusions. Moreover, Wang et al.[13] found that MSI was a significant predictor of the need for blood transfusion in trauma patients. However, Zarzaur et al.[14] found that ASI was only effective in predicting the need for massive blood transfusion in patients over 55 years old. Consistent with the literature, mean SI, MSI, and ASI values were found to be significantly higher in patients who received blood transfusion compared to those who did not in our study. Furthermore, SI, ASI, and MSI were identified as independent predictors of the need for blood transfusion according to multivariate regression analyses.

In their study, Koksal et al.[3] found that 71.8% of patients were hospitalized, while Pallett et al.[7] reported a 70.5% ED discharge rate. In our study, 49% of patients were discharged from the ED, likely due to a high number of extremity injuries treatable with simple medical intervention. Furthermore, the primary suture was done in 56.20% of the patients.

Our study has some limitations, such as the small sample size and single-center design. In addition, we were unable to evaluate the relationship between blood transfusion needs and injury type (e.g., extremity, abdomen, and thorax injuries) in patients admitted to the ED with stab wounds. Thus, a larger study involving patients with stab wounds is needed to overcome these issues.

Conclusion

Our findings indicated that the majority of the cases were young adult males aged 18–64 and were predominantly admitted due to interpersonal violence and assault, with peak admissions occurring during the summer months of July and August, and the evening/nighttime. The most common anatomical site for stab wounds was lower extremities and the most common required procedure was soft tissue repairs. In addition, we found that injuries requiring hospitalization were mostly followed up in the general surgery clinic. Finally, elevated SI, MSI, and ASI were found to be independent predictors for blood transfusion requirement in patients admitted to the ED with stab wounds.

Ethics Committee Approval

This study approved by the Haseki Research and Training Hospital Clinical Research Ethics Committee (Date: 25.05.2022, Decision No: 52-2022).

Informed Consent

Retrospective study.

Peer-review

Externally peer-reviewed.

Authorship Contributions

Concept: M.A., H.E., A.A., O.S.; Design: M.A., H.E., A.A., O.S.; Supervision: H.E., O.S.; Fundings: M.A., T.B.U., O.K., O.S.; Materials: M.A., T.B.U., A.A., O.K.; Data: M.A., T.B.U., A.A., O.K.; Analysis: H.E., A.A., O.S.; Literature search: M.A., A.A., O.S.; Writing: M.A., T.B.U., A.A., O.S.; Critical revision: H.E., A.A., O.S.

Conflict of Interest

None declared.

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Acil Servise Delici Kesici Alet Yaralanması ile Başvuran Olguların Değerlendirilmesi: 2-Yıllık Retrospektif Analiz

Amaç: Bu çalışmanın amacı, acil tıp kliniğine başvuran delici-kesici alet yaralanmalarının (DKAY) demografik ve klinik özellikleri ile kan transfüzyonu yapılan ve yapılmayan hasta gruplarında Glasgow Koma Skalası (GKS), Revize Travma Skoru (RTS), şok indeksi (Şİ), modifiye şok indeksi (MŞİ) ve yaşa göre şok indeksi (YŞİ) değerlerini karşılaştırarak analiz etmektir.

Gereç ve Yöntem: Bu retrospektif, kesitsel, tek merkezli çalışmaya DKAY nedeniyle acil tıp kliniğine başvuran ardışık 308 hasta dahil edildi. Bu vakaların demografik ve klinik özellikleri, travma skorlamaları (GKS ve RTS), şok indeksleri (Şİ, MŞİ ve YŞİ), operasyon ve transfüzyon durumları, yaralanma zamanı ve klinik sonlanımları kaydedildi. Veriler kan transfüzyonu yapılan ve yapılmayan vakalar arasında karşılaştırıldı.

Bulgular: Çalışmaya 288 erkek (%93.5) ve 20 kadın (%6.5) toplam 308 hasta alındı. Ortalama yaş 28.30±11.90 idi. 235 (%76.3) olgu darp, 64 (%20.8) trafik kazası ve 9 (%2.9) kendine zarar verme nedeniyle acil servise başvurdu. En yaygın anatomik yaralanma bölgesi alt ekstremiteydi (%39). Yapılan cerrahi işlemlerin 173'üne (%56.20) yumuşak doku onarımı, 22'sine (%7.10) vasküler cerrahi onarım, 22'sine (%7.10) laparotomi, 18'ine (%5.80) tüp torakostomi yapıldı. En fazla hasta sayısı (n=38, %12.3) Temmuz ve Ağustos aylarında ve (n=153, %49.7) 18:01-00:00 saatleri arasında başvurdu. Kan transfüzyonu yapılan hastalarda almayanlara göre ortalama GKS ve RTS değerleri anlamlı olarak daha düşük, ortalama Şİ, MŞİ ve YŞİ değerleri daha yüksekti (tüm karşılaştırmalar için $p<0.001$). Son olarak yüksek Şİ, YŞİ ve MŞİ'nin kan transfüzyonu ihtiyacının bağımsız belirteçleri olduğu bulundu.

Sonuç: DKAY nedeniyle acil servisine başvuran vakalarda en fazla yaralanmanın ekstremite bölgesinden olduğu ve yaralanma sonucu en sık yapılan işlemin primer sütürasyon olduğu gözlemlenmiştir. Ek olarak, yüksek SI, MSI ve ASI, acil servise bıçak yarası ile başvuran hastalarda kan transfüzyonu gereksinimi için önemli belirleyicilerdi.

Anahtar Sözcükler: Delici-kesici alet yaralanması; kan transfüzyonu; modifiye şok indeksi; şok indeksi; travma skorlamaları.