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# Retrospective analysis of penetrating and cutting instrument injury cases from the prehospital emergency medical system perspective

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**Abstract**

This retrospective study aimed to evaluate the efficiency of prehospital assessment and treatment of stab injuries in Ankara, Turkey, utilizing data from the EMS (Emergency Medical Service) Command Centre. Data from the EMS Command Centre of Ankara spanning from January 1, 2019, to December 31, 2023, were retrospectively analyzed. A total of 12,106 individual cases of stab injuries were included in the study. The study focused on analyzing demographic characteristics, incident timing, EMS response times, clinical outcomes, and hospital transfer patterns of stab injury cases. The study found that the majority of stab injury cases occurred in young males (78.3%), with a median age around 30 years. There was no significant difference in the total number of cases between the study years, but significant variations were observed in monthly, seasonal, and daily distributions. Weekdays and late evening hours (16:00-23:59) showed higher incident rates. EMS response times varied significantly across the study period, with trends indicating longer response times over the years. Most patients were transferred to Training and Research Hospitals, and interfacility transfers were common, especially to tertiary care centers. The study also highlighted significant differences in EMS call reasons and clinical outcomes between the study years. This study underscores the critical role of efficient prehospital assessment and timely treatment in improving outcomes for stab injury patients in urban settings like Ankara. The findings emphasize the need for strategies to optimize EMS response times and enhance coordination between emergency services and hospital facilities. Future research should focus on interventions to further enhance the efficiency of prehospital care for trauma patients.

**Keywords:** Prehospital assessment, stab injuries, emergency medical services' response times

## Introduction

Trauma is one of the leading causes of death, particularly among young people, with an estimated 8% of deaths worldwide attributed to trauma [1]. This category of death includes homicides and suicides involving sharp objects or firearms. European statistics from 2008 to 2010 indicate that 2% of all trauma deaths in Europe are due to homicides, with 34% of these being committed with sharp objects [2]. In the United States, approximately 400,000 stab injuries are treated annually [3]. A study by Bieler et al. [4], utilizing data from the German Trauma Registry, reported an incidence of 4.1% for penetrating injuries in 2019.

The time elapsed between the injury and the first medical intervention is crucial for trauma patients, particularly those who are severely injured. Waalwijk et al. [5] reported that longer on-scene times negatively impact patient outcomes. For stab wounds, a swift response and transportation are even more critical for prognosis [6]. Magyar et al. [7] found that reducing prehospital time can improve outcomes for patients with both gunshot and stab wounds, particularly those affecting the torso area.

Prehospital assessment has become increasingly important in evaluating and treating trauma patients with advances in medical practice [8]. As previously noted, shorter on-scene assessment times have been shown to improve outcomes for patients with penetrating stab and gunshot wounds. Therefore, performing swift and precise on-scene prehospital assessment and treatment is vital for the prognosis of these patients. Our study aimed to analyze the efficiency of prehospital assessment and treatment for stab injuries in Ankara, the capital of Türkiye.

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## Material and Methods

### Study Design and Settings

This study was designed as a retrospective analysis involving data collected from the Emergency Medical Service (EMS) Command Centre of Ankara, the capital city of Türkiye. Since this was a retrospective study, we could not evaluate the patients on-site and therefore relied on the data collected by the EMS Command Centre of Ankara. The authors and researchers participating in this study adhered to the Helsinki Declaration while preparing the study protocol. This study was ethically approved by the Institutional Ethics Committee of Ankara Bilkent City Hospital, with the reference number TABED 2-24-298.

We collected data on 12,106 individual cases of stab injuries from the EMS Command Centre of Ankara database for our analysis of prehospital assessment of stab injuries that occurred between January 1, 2019, and December 31, 2023. To conduct our analysis on the efficiency of prehospital assessment for stab injuries, we analyzed and compared patient demographics, incident timing, response times, and other parameters.

### Statistical Analysis

Data analysis was performed using the statistical package program IBM SPSS 27.0 (Armonk, NY: IBM Corp.). While evaluating the study data, in addition to descriptive statistical methods (frequency, percentage, mean, standard deviation, median, quartile separation), the Chi-Square test was used to compare qualitative data. In cases where differences were found in multiple comparisons, post-hoc Bonferroni correction was used. The suitability of the data for normal distribution was evaluated with the Kolmogorov-Smirnov test, skewness-kurtosis and graphical methods (histogram, Q-Q Plot, Stem and Leaf, Boxplot). One-Way Anova test was used to compare normally distributed quantitative data between groups, and post-hoc Tukey test was used in cases where there was a difference. Statistical significance level was accepted as $p<0.05$.

## Results

We categorized a total of 12,106 individual stab injury cases according to the time of the event, response times, demographic factors, and other parameters. We also continued the follow-up process in the Emergency Department to determine the initial clinical care center of arrival and possible interfacility transfers, including the reasons for these transfers, to identify which clinical care centers are handling the most stab injury cases (Table 1).

We did not find any statistically significant differences between the years included in our study. There was no statistically significant increase in any of the years. In 2020, there were the fewest stab injury cases, with 2,187 cases reported that year, while 2022 had the highest number, with 2,663 cases reported that year (Table 1).

Our data showed that the overwhelming majority of patients were male, comprising 78.3% of all stab wound cases over the years. Additionally, 94.6% of all cases involved citizens of the Republic of Türkiye, while the remaining patients were non-citizens (Table 1).

**Table 1.** Characteristics of transports and participants

| | n=12.106 | % |
|---|---|---|
| **Years** | | |
| **2019** | 2.217 | 18.3 |
| **2020** | 2.187 | 18.1 |
| **2021** | 2.452 | 20.3 |
| **2022** | 2.663 | 22.0 |
| **2023** | 2.587 | 21.4 |
| **Months** | | |
| **January** | 817 | 6.7 |
| **February** | 780 | 6.4 |
| **March** | 898 | 7.4 |
| **April** | 955 | 7.9 |
| **May** | 1.115 | 9.2 |
| **June** | 1.234 | 10.2 |
| **July** | 1.356 | 11.2 |
| **August** | 1.201 | 9.9 |
| **September** | 1.050 | 8.7 |
| **October** | 1.020 | 8.4 |
| **November** | 819 | 6.8 |
| **December** | 861 | 7.1 |
| **Seasons** | | |
| **Spring** | 2.968 | 24.5 |
| **Summer** | 3.791 | 31.3 |
| **Autumn** | 2.889 | 23.9 |
| **Winter** | 2.458 | 20.3 |
| **Days of week** | | |
| **Monday** | 1.702 | 14.1 |
| **Tuesday** | 1.645 | 13.6 |
| **Wednesday** | 1.550 | 12.8 |
| **Thursday** | 1.614 | 13.3 |
| **Friday** | 1.702 | 14.1 |
| **Saturday** | 1.892 | 15.6 |
| **Sunday** | 2.001 | 16.5 |
| **Weekdays/weekend** | | |
| **Weekdays** | 8.213 | 67.8 |
| **Weekend** | 3.893 | 32.2 |
| **Time interval** | | |
| **00:00 - 07:59** | 2.427 | 20.0 |
| **08:00 - 15:59** | 3.511 | 29.0 |
| **16:00 - 23:59** | 6.168 | 50.9 |
| **Working hours** | | |
| **In working hours** | 4.458 | 36.8 |
| **Out of working hours** | 7.648 | 63.2 |
| **Gender** | | |
| **Women** | 2.629 | 21.7 |
| **Men** | 9.477 | 78.3 |
| **Age (years)*** | 30.3±14.7 | 28.0 (19.0-39.0) |
| **Nationality** | | |
| **Turkish** | 11.455 | 94.6 |
| **Others** | 651 | 5.4 |

*: Mean±SD / median (min-max)

Despite our initial analysis, which did not reveal a statistically significant difference in the number of cases between the years included in our study, we found statistically significant

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differences in the occurrence rates of cases between specific months across these years. February 2019, March 2023, May 2019, June 2020-2022, August 2020, and September 2020 had a statistically lower ratio of cases compared to the same months in other years. Conversely, February 2020-2023, March 2020, May 2021-2023, June 2023, August 2019-2022, and September 2023 had a statistically higher ratio of cases compared to the same months in other years (Table 2).

**Table 2.** Comparisons of cases and response time by year

| | 2019 (n=2217) | 2020 (n=2187) | 2021 (n=2452) | 2022 (n=2663) | 2023 (n=2587) | P | Difference |
|---|---|---|---|---|---|---|---|
| **Months** | | | | | | | |
| **January** | 145 (6.5%) | 144 (6.6%) | 187 (7.6%) | 171 (6.4%) | 170 (6.6%) | | -- |
| **February** | 128 (5.8%) | 176 (8.0%) | 156 (6.4%) | 169 (6.3%) | 151 (5.8%) | | 2020 vs 2019-2023 |
| **March** | 152 (6.9%) | 194 (8.9%) | 183 (7.5%) | 205 (7.7%) | 164 (6.3%) | | 2020 vs 2023 |
| **April** | 171 (7.7%) | 192 (8.8%) | 171 (7.0%) | 219 (8.2%) | 202 (7.8%) | | -- |
| **May** | 155 (7.0%) | 202 (9.2%) | 238 (9.7%) | 270 (10.1%) | 250 (9.7%) | | 2019 vs 2021-2022-2023 |
| **June** | 228 (10.3%) | 208 (9.5%) | 256 (10.4%) | 230 (8.6%) | 312 (12.1%) | **<0.001**[a] | 2023 vs 2020-2022 |
| **July** | 227 (10.2%) | 268 (12.3%) | 301 (12.3%) | 269 (10.1%) | 291 (11.2%) | | -- |
| **August** | 270 (12.2%) | 158 (7.2%) | 210 (8.6%) | 298 (11.2%) | 265 (10.2%) | | 2020 vs 2019-2022 |
| **September** | 204 (9.2%) | 153 (7.0%) | 182 (7.4%) | 242 (9.1%) | 269 (10.4%) | | 2020 vs 2023 |
| **October** | 208 (9.4%) | 175 (8.0%) | 194 (7.9%) | 244 (9.2%) | 199 (7.7%) | | -- |
| **November** | 157 (7.1%) | 140 (6.4%) | 190 (7.7%) | 179 (6.7%) | 153 (5.9%) | | -- |
| **December** | 172 (7.8%) | 177 (8.1%) | 184 (7.5%) | 167 (6.3%) | 161 (6.2%) | | -- |
| **Seasons** | | | | | | | |
| **Spring** | 478 (21.6%) | 588 (26.9%) | 592 (24.1%) | 694 (26.1%) | 616 (23.8%) | | 2019 vs 2020-2022 |
| **Summer** | 725 (32.7%) | 634 (29.0%) | 767 (31.3%) | 797 (29.9%) | 868 (33.6%) | **<0.001**[a] | 2023 vs 2020-2022 |
| **Autumn** | 569 (25.7%) | 468 (21.4%) | 566 (23.1%) | 665 (25.0%) | 621 (24.0%) | | 2020 vs 2019-2022 |
| **Winter** | 445 (20.1%) | 497 (22.7%) | 527 (21.5%) | 507 (19.0%) | 482 (18.6%) | | 2019 vs 2022-2023 |
| **Days of week** | | | | | | | |
| **Monday** | 327 (14.7%) | 295 (13.5%) | 346 (14.1%) | 374 (14.0%) | 360 (13.9%) | | -- |
| **Tuesday** | 327 (14.7%) | 302 (13.8%) | 368 (15.0%) | 313 (11.8%) | 335 (12.9%) | | 2019 vs 2022 |
| **Wednesday** | 287 (12.9%) | 269 (12.3%) | 325 (13.3%) | 334 (12.5%) | 335 (12.9%) | | -- |
| **Thursday** | 291 (13.1%) | 279 (12.8%) | 315 (12.8%) | 371 (13.9%) | 358 (13.8%) | **0.046**[a] | -- |
| **Friday** | 328 (14.8%) | 305 (13.9%) | 332 (13.5%) | 405 (15.2%) | 332 (12.8%) | | -- |
| **Saturday** | 312 (14.1%) | 360 (16.5%) | 353 (14.4%) | 440 (16.5%) | 427 (16.5%) | | -- |
| **Sunday** | 345 (15.6%) | 377 (17.2%) | 413 (16.8%) | 426 (16.0%) | 440 (17.0%) | | -- |
| **Weekdays/ weekend** | | | | | | | |
| **Weekdays** | 1560 (70.4%) | 1450 (66.3%) | 1686 (68.8%) | 1797 (67.5%) | 1720 (66.5%) | **0.016**[a] | 2019 vs 2020-2023 |
| **Weekend** | 657 (29.6%) | 737 (33.7%) | 766 (31.2%) | 866 (32.5%) | 867 (33.5%) | | |
| **Time interval** | | | | | | | |
| **00:00-07:59** | 395 (17.8%) | 481 (22.0%) | 451 (18.4%) | 547 (20.5%) | 553 (21.4%) | | 2019 vs 2020 |
| **08:00-15:59** | 694 (31.3%) | 629 (28.8%) | 693 (28.3%) | 760 (28.5%) | 735 (28.4%) | **0.002**[a] | -- |
| **16:00-23:59** | 1128 (50.9%) | 1077 (49.2%) | 1308 (53.3%) | 1356 (50.9%) | 1299 (50.2%) | | -- |
| **Call center response time (in seconds)*** | 196.9±222.5 | 290.0±281.6 | 252.3±248.8 | 231.4±234.1 | 267.8±220.9 | **<0.001**[b] | All |
| **Response time of the ambulance unit (in seconds)*** | 34.1±20.2 | 35.6±20.2 | 37.0±21.7 | 37.7±21.8 | 36.8±20.3 | **<0.001**[b] | 2019 vs 2022 |
| **Arrival at scene time (in seconds)*** | 315.7±201.1 | 350.7±225.1 | 353.2±225.8 | 345.3±207.9 | 347.0±204.1 | **<0.001**[b] | 2019 vs others |

a: Chi-Square Test (n / %), b: One-Way Anova Test (Mean±SD)

We also observed statistically significant fluctuations between the seasons of different years. The data indicates that Spring 2019, Summer 2020, Fall 2020, and Winter 2022-23 had statistically lower ratios of cases compared to the same seasons in other years. Conversely, Spring 2020-2022, Summer 2022-2023, Fall 2019-2022, and Winter 2019 had statistically higher ratios of cases (Table 2).

Our data analysis shows that most cases occurred on weekdays, with statistically significant differences observed between weekdays and weekends in the years 2019, 2020, and 2023. We also found a statistically significant difference in the timing of cases arriving at the hospital between 00:00 and 07:59 in 2019 and 2020, with the majority of cases arriving between 16:00 and 23:59 (Table 2).

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Alongside these comparisons and data analyses, we also conducted an analysis of EMS response times. This analysis indicates a statistically significant difference in response times of the EMS Command Center between the years 2019, 2020, 2021, 2022, and 2023. We also found a statistically significant difference in response times at EMS stations between 2019 and 2022. Additionally, we detected a statistically significant difference in transport times to the event scene between 2019 and the other years (Table 2).

Our data analysis did not reveal any significant difference in the arrival ratios during working hours between the years. We also did not find any statistically significant change in the male-to-female ratio among victims of stab injuries. The analysis indicates that the median age for stab injuries was around 30 years, which is considered relatively young. We observed a statistically significant increase in the mean age in 2020, with a mean age of 30.9±15.3 years. Conversely, we found a statistically significant decrease in the mean age in 2022, with a mean age of 29.7±14.3 years (Table 3).

**Table 3.** Comparisons of transport characteristics and cases by year

| | 2019 (n=2217) | 2020 (n=2187) | 2021 (n=2452) | 2022 (n=2663) | 2023 (n=2587) | P | Difference |
|---|---|---|---|---|---|---|---|
| **Working hours** | | | | | | | |
| **In working hours** | 879 (39.6%) | 783 (35.8%) | 900 (36.7%) | 970 (36.4%) | 926 (35.8%) | 0.051[a] | |
| **Out of working hours** | 1338 (60.4%) | 1404 (64.2%) | 1552 (63.3%) | 1693 (63.6%) | 1661 (64.2%) | | -- |
| **Gender** | | | | | | | |
| **Women** | 514 (23.2%) | 504 (23.0%) | 504 (20.6%) | 566 (21.3%) | 541 (20.9%) | 0.080[a] | |
| **Men** | 1703 (76.8%) | 1683 (77.0%) | 1948 (79.4%) | 2097 (78.7%) | 2046 (79.1%) | | -- |
| **Age (years) (Mean±SD)** | 30.8±15.1 | 30.9±15.3 | 30.3±14.3 | 29.7±14.3 | 30.1±14.7 | **0.025**[b] | |
| **Nationality** | | | | | | | |
| **Turkish** | 2126 (95.9%) | 2057 (94.1%) | 2292 (93.5%) | 2524 (94.8%) | 2456 (94.9%) | **0.004**[a] | 2020 vs 2022 |
| **Others** | 91 (4.1%) | 130 (5.9%) | 160 (6.5%) | 139 (5.2%) | 131 (5.1%) | | 2019 vs 2021 |
| **Reason for call** | | | | | | | |
| **Soft tissue injury** | 1110 (50.1%) | 1017 (46.5%) | 1235 (50.4%) | 1423 (53.4%) | 1250 (48.3%) | | |
| **Other accidents** | 470 (21.2%) | 505 (23.1%) | 440 (17.9%) | 447 (16.8%) | 588 (22.7%) | | 2020 vs 2022 |
| **Suicide** | 209 (9.4%) | 182 (8.3%) | 231 (9.4%) | 231 (8.7%) | 289 (11.2%) | | 2020 vs 2021-2022 |
| **Medical** | 178 (8.0%) | 218 (10.0%) | 224 (9.1%) | 258 (9.7%) | 184 (7.1%) | | 2023 vs 2020-2022 |
| **Transport** | 170 (7.7%) | 187 (8.6%) | 232 (9.5%) | 203 (7.6%) | 187 (7.2%) | **<0.001**[a] | 2023 vs 2020-2022 |
| **Work accidents** | 72 (3.2%) | 66 (3.0%) | 74 (3.0%) | 92 (3.5%) | 84 (3.2%) | | 2021 vs 2023 |
| **Traffic accidents** | 6 (0.3%) | 11 (0.5%) | 13 (0.5%) | 6 (0.2%) | 4 (0.2%) | | -- |
| **Fire** | 2 (0.1%) | 1 (0.0%) | 3 (0.1%) | 3 (0.1%) | 1 (0.0%) | | -- |
| **Result** | | | | | | | |
| **Transported to hospital** | 1779 (80.2%) | 1700 (77.7%) | 1889 (77.0%) | 2182 (81.9%) | 2086 (80.6%) | | -- |
| **Patient refused to be transported to a hospital** | 241 (10.9%) | 281 (12.8%) | 316 (12.9%) | 268 (10.1%) | 284 (11.0%) | | 2022 vs 2020-2021 |
| **Interhospital transport** | 170 (7.7%) | 187 (8.6%) | 232 (9.5%) | 203 (7.6%) | 187 (7.2%) | **<0.001**[a] | 2022 vs 2020-2021 |
| **Dead on arrival** | 12 (0.5%) | 5 (0.2%) | 8 (0.3%) | 9 (0.3%) | 19 (0.7%) | | 2021 vs 2023 |
| **On-site treatment** | 15 (0.7%) | 14 (0.6%) | 7 (0.3%) | 1 (0.0%) | 11 (0.4%) | | -- |
| **By receiver hospital (inter-hospital patient transport)** | | | | | | | |
| **Training and research hospitals** | 1122 (63.1%) | 1095 (64.4%) | 1279 (67.7%) | 1345 (61.6%) | 1417 (67.9%) | | 2022 vs 2019-2020-2023 |
| **Public hospitals** | 461 (25.9%) | 416 (24.5%) | 400 (21.2%) | 501 (23.0%) | 387 (18.6%) | **<0.001**[a] | 2019 vs 2021-2023 |
| **University hospitals** | 179 (10.1%) | 167 (9.8%) | 205 (10.9%) | 321 (14.7%) | 264 (12.7%) | | 2023 vs 2019-2020-2022 |
| **Private hospitals** | 17 (1.0%) | 22 (1.3%) | 5 (0.3%) | 15 (0.7%) | 18 (0.9%) | | 2022 vs 2019-2020-2021 |
| **By sender hospital (inter-hospital patient transport)** | | | | | | | |
| **Training and research hospitals** | 21 (12.4%) | 31 (16.6%) | 42 (18.1%) | 32 (15.8%) | 38 (20.3%) | | 2020 vs 2021 |
| **Public hospitals** | 147 (86.5%) | 152 (81.3%) | 187 (80.6%) | 166 (81.8%) | 144 (77.0%) | 0.212[a] | -- |
| **University hospitals** | 2 (1.2%) | 0 (0.0%) | 0 (0.0%) | 0 (0.0%) | 1 (0.5%) | | -- |
| **Private hospitals** | 0 (0.0%) | 4 (2.1%) | 3 (1.3%) | 5 (2.5%) | 4 (2.1%) | | -- |

a: Chi-Square Test (n / %), b: One-Way Anova Test (Mean±SD)

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Our data shows that an overwhelming majority of the cases involved Turkish citizens. However, we found a statistically significant difference between 2019 and 2022 in the ratio of Turkish citizens to non-citizens among stab injury cases. In 2019, 95.9% of all cases involved Turkish citizens, while in 2022, this figure was notably lower at 93.5% (Table 3).

We also assessed the reasons for EMS calls. Our data analysis suggests a statistically significant difference between 2020 and 2022 in cases initially classified as soft tissue traumas in EMS calls. In 2020, 46.5% of all stab injuries were evaluated as soft tissue traumas initially, while in 2022, this figure was 53.4%. There was also a statistically significant difference in the proportion of cases initially recorded as other accidents between the years 2020, 2021, and 2022. Suicides as a cause for EMS calls involving stab injuries constituted a significant portion of the database. We found a statistically significant difference in the ratio of these calls between the years 2020, 2022, and 2023. Additionally, EMS calls for interfacility transfers of patients requiring advanced clinical care also showed statistically significant differences between the years 2021 and 2023 (Table 3).

The clinical outcomes for stab injury cases were also tracked in our database. We found that most patients were transported to a hospital by EMS. The proportion of cases transferred to a hospital via EMS showed a statistically significant difference between the years 2022, 2020, and 2021. In 2022, 81.9% of cases were transferred to a hospital, compared to 77.0% in both 2020 and 2021. Our data analysis indicates that the proportion of patients who refused hospital transfer varied significantly between the years 2022, 2021, and 2020. In 2022, the refusal rate was the lowest at 10.1%, while in 2021 and 2020, it was higher at 12.8% and 12.9%, respectively. As previously mentioned, interfacility transport is also provided by EMS. We observed a statistically significant difference in interfacility transport between the years 2021 and 2023, with 2021 showing the highest ratio at 9.5% and 2023 the lowest at 7.2% of all cases in those years. We found no statistically significant difference in the proportion of cases recorded as exitus on scene across the years. However, there was a statistically significant difference in the proportion of cases treated on site, with 2019 having the highest ratio at 0.7%, and 2020, 2022, and 2023 showing lower ratios at 0.6%, 0.3%, and 0.4%, respectively (Table 3).

Our data reveals a statistically significant difference in the ratios of cases transferred to various types of clinical care centers across the years. For Training and Research Hospitals, there were significant differences in the ratios of stab injury patients, with 2019 having the lowest ratio and 2021 and 2023 having the highest ratios compared to other years. For State Hospitals, the data indicates a statistically significant difference between the years 2023, 2019, 2020, and 2021. University Hospital data analysis also shows a statistically significant difference between the years 2022, 2019, 2020, and 2021. Additionally, for Private Hospitals, our data analysis demonstrates a statistically significant difference between the years 2020 and 2021 (Table 3).

For some patients, the initial clinical center of arrival was not equipped to adequately treat their injuries, leading to referrals to advanced clinical centers. We analyzed these secondary transfers and found statistically significant differences among different types of clinical centers. Our data analysis indicates that for Training and Research Hospitals, there is a statistically significant difference between the years 2020 and 2023. Similarly, for University Hospitals, a statistically significant difference was observed between the years 2020 and 2023 (Table 4).

**Table 4.** Referral characteristics

| | 2019 (n=2217) | 2020 (n=2187) | 2021 (n=2452) | 2022 (n=2663) | 2023 (n=2587) | P | Difference |
|---|---|---|---|---|---|---|---|
| **Referring hospital** | | | | | | | |
| **Training and research hospitals** | 158 (92.9%) | 165 (88.2%) | 211 (90.9%) | 185 (91.1%) | 182 (97.3%) | **0.012**[a] | 2020 vs 2023 |
| **Public hospitals** | 2 (1.2%) | 1 (0.5%) | 0 (0.0%) | 0 (0.0%) | 0 (0.0%) | | -- |
| **University hospitals** | 10 (5.9%) | 21 (11.2%) | 21 (9.1%) | 16 (7.9%) | 5 (2.7%) | | 2020 vs 2023 |
| **Private hospitals** | 0 (0.0%) | 0 (0.0%) | 0 (0.0%) | 2 (1.0%) | 0 (0.0%) | | -- |
| **Reason for inter-hospital transport** | | | | | | | |
| **Need for specialist physician care** | 156 (91.8%) | 160 (85.6%) | 200 (86.2%) | 165 (81.3%) | 150 (80.2%) | **0.024**[a] | 2019 vs 2022-2023 |
| **Need for intensive care** | 1 (0.6%) | 6 (3.2%) | 13 (5.6%) | 18 (8.9%) | 14 (7.5%) | | 2019 vs 2022-2023 |
| **Need for advanced medical equipment** | 6 (3.5%) | 7 (3.7%) | 9 (3.9%) | 11 (5.4%) | 15 (8.0%) | | -- |
| **No available beds in the hospital** | 6 (3.5%) | 9 (4.8%) | 8 (3.4%) | 7 (3.4%) | 7 (3.7%) | | -- |
| **Patient's own demand for transport** | 1 (0.6%) | 4 (2.1%) | 0 (0.0%) | 1 (0.5%) | 0 (0.0%) | | -- |
| **Need for amputation/replantation** | 0 (0.0%) | 1 (0.5%) | 2 (0.9%) | 1 (0.5%) | 1 (0.5%) | | -- |

a: Chi-Square Test (n / %), b: One-Way Anova Test (Mean±SD)

We also analyzed data on patients who required referrals to other clinical care centers, focusing on the reasons for the referrals and the differences in these reasons between years. We found a statistically significant difference in referrals to centers with advanced care specialists between the years 2019, 2022, and 2023. Additionally, there was a statistically significant difference in referrals for the need of an intensive care unit across the years 2019, 2022, and 2023. However, we did not find

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any statistically significant differences for other referral reasons between the years (Table 4).

Alongside all these comparisons and data analyses, we also conducted an analysis of EMS response time data. This analysis revealed a statistically significant difference in response times of the EMS Command Center between the years 2019, 2020, 2021, 2022, and 2023. Additionally, for EMS station response times, we found a statistically significant difference between the years 2019 and 2022. For transport times to the event scene, we detected a statistically significant difference between 2019 and the other years (Table 4).

## Discussion

Trauma is one of the leading causes of death worldwide, with an estimated 4.7 million deaths annually [9]. Trauma can be classified into intentional and unintentional injuries [10]. Injuries resulting from penetrating mechanisms, such as stab wounds or gunshot wounds, can fall into either category depending on the context. Regardless, stab wounds represent a significant concern for healthcare systems globally, and prehospital assessment of these injuries is becoming increasingly important for their treatment and evaluation [11].

Our data analysis indicates that the majority of stab injury victims in our study are young males, with males comprising 78.3% of the patients. This finding is consistent with a study by Bieler et al. [4], which reported that 83.8% of patients were male. Additionally, we observed a younger median age among patients across the years, aligning with the results of the aforementioned studies.

We found that more stab wound cases were admitted to the hospital during weekdays, with 70.4% of the cases occurring on weekdays in 2019. Although this ratio is lower in 2022 and 2023, stab wounds still predominantly occur on weekdays. A study by Nair et al. [12] reported a shift in the occurrence of stab injuries from weekends to weekdays. Similarly, Maxwell et al. [13] found that 58% of stab injuries were admitted during weekdays, which aligns with our study results.

Our data analysis shows that most injuries occurred between 16:00 and 23:59. We also observed statistically significant differences between the years for injuries occurring between 00:00 and 07:59. The study by Nair et al. [12] also notes that most cases occur between 18:00 and 06:00, which is consistent with our findings.

Our data reports no statistically significant difference in the number of cases between the years. A study by Funder et al. [14] reported an increase in the incidence of stab wounds, whereas Johannesdottir et al. [15] did not observe such an increase. These findings are similar to the results of our study.

Our data analysis shows that most patients were transferred to Training and Research Hospitals from the event scene. Additionally, a significant majority of referrals were also made to these hospitals. This suggests a heavy burden on these advanced care centers, potentially increasing their workload. Zaidi et al. [16] also reported a similar issue, noting an increased workload in tertiary care centers due to referrals.

Our analysis also includes EMS response times for both the command center and ambulance stations. We found a statistically significant difference between years, with a trend toward longer response and transport times over time. This is concerning, as prehospital response and assessment times are directly related to mortality, according to a study by Nasser et al. [17].

## Conclusion

This study underscores the importance of efficient prehospital care in managing stab injuries, particularly in urban settings like Ankara. The majority of cases involved young males, with incidents peaking during late evenings and weekdays. While the total number of cases remained stable over the years, increasing EMS response times raise concerns about potential impacts on patient outcomes. The findings highlight the need for strategies to optimize prehospital response and enhance coordination between emergency services and hospitals.

**Conflict of Interests**
*The authors declare that there is no conflict of interest in the study.*

**Financial Disclosure**
*The authors declare that they have received no financial support for the study.*

**Ethical Approval**
*The authors and researchers participating in this study have adhered to the Helsinki Declaration while preparing the study protocol. This study was ethically approved by the institutional ethics of committee of Ankara Bilkent City Hospital, with the reference number of TABED 2-24-298.*

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