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Contents

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Original Article

Evaluation of murder cases in Tokat province in Türkiye: Analysis of 4 years data

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Abstract

Aim: Homicide-related death cases are one of the most important study topics among forensic medical autopsy applications. In our study, the murders and the reasons for the murders in Tokat province, the sociodemographic characteristics of the victims were examined and discussed with the literature, aiming to reveal the region-specific characteristics.

Materials and Methods: This study was conducted by retrospectively examining the postmortem examination and autopsy reports and forensic investigation files conducted by the Gaziosmanpaşa University Faculty of Medicine, Department of Forensic Medicine and Tokat Forensic Medicine Branch Directorate between January 2014 and January 2018, and a total of 52 cases were evaluated in terms of age, gender, cause of murder, place of occurrence, cause of death, distribution of murder cases by months and years, and the method used.

Results: In our study, the origin of death of a total of 52 cases between 2014-2018 was determined as homicide, and 41 of the cases were male (78.85%) and 11 were female (21.15%). In our study group, the average age of males was 43.34 (SD±15.88), while this number was 38.27 (SD±18.44) for females, and the cases were between the ages of 15-77. It was observed that there was a remarkable increase in homicide cases in 2017 compared to other years, and when evaluated according to months, homicides were committed most frequently in March, firearms were the most common method of homicide, followed by sharp objects, and there was an equal distribution between the origins of homicide.

Conclusion: When the murder cases seen in the Tokat province in the four years mentioned are evaluated by taking into account the sociocultural characteristics of the region, it is seen that the increase in individual armament and land and pasture disputes related to agriculture and animal husbandry, which are the main sources of income of the region, have an effect on the methods and reasons for murder used.

Keywords: Autopsy, murder, homicide

INTRODUCTION

Murder is the act of intentionally ending a person's life [1]. Murders, which have been a serious social problem since the existence of humanity, are one of the most important subjects of study in forensic medicine worldwide. As a result of murder, not only the victim but also the victim's family and society are killed, and the resulting ripple effect spreads fear and uncertainty throughout society [2]. Thus, murder becomes a public health problem that causes serious material and moral losses in societies [3,4].

This social and tragic problem, which is seen too frequently, requires in-depth examination. In our study, it was aimed to investigate the murder cases whose autopsies were performed in Tokat Province, to evaluate their sociodemographic characteristics and to discuss them with the literature.

In this study, in which we investigated murder cases from different aspects, parameters such as time of murde, crime scene, age of the victim, gender of the victim, method of committing the murder and type of weapon used were examined.

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It was aimed to contribute to the literature by examining these parameters.

MATERIAL AND METHOD

The postmortem examination and autopsy reports of murder cases conducted between 2014 and 2018 at the Tokat Gaziosmanpaşa University Faculty of Medicine, Department of Forensic Medicine and the Tokat Forensic Medicine Branch Directorate were retrospectively examined.

The ethics committee approval required for this study was obtained from Tokat Gaziosmanpaşa University Non-Invasive Clinical Research Ethics Committee (15.08.2024 - 2024/11).

The cases evaluated as murder were examined in terms of the month and year the incident occurred, the age and gender of the victim, the method of murder, the scene of the crime, the cause of death and the reason for the murder.

RESULTS

In our study, the cause of death of a total of 52 cases between 2014-2018 was determined to be homicide, 41 of the cases were male (78.85%), 11 were female (21.15%), the mean age of males was 43.34 (SD±15.88) and females was 38.27 (SD±18.44), and all cases were between the ages of 15-77. The number of cases by gender is shown in Figure 1 and the mean age is shown in Figure 2.

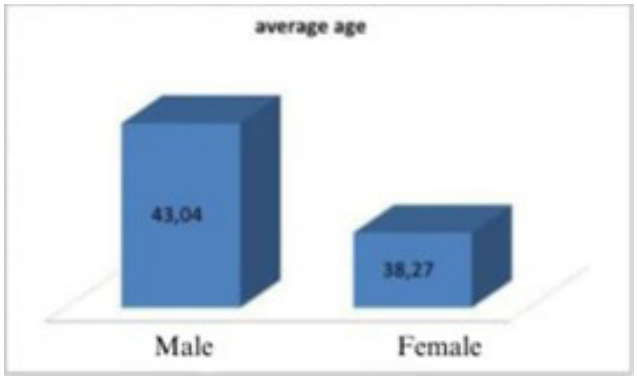

Figure 1. Average age of the cases

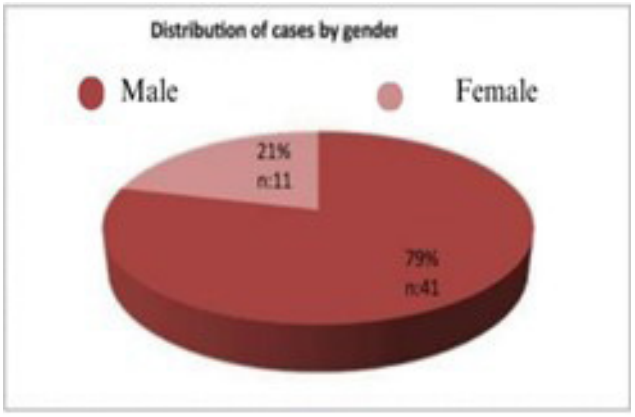

Figure 2. Distribution of the cases by gender

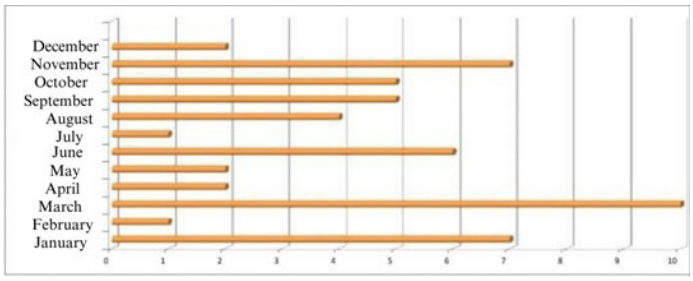

Figure 3. Distribution of number of cases by month

In 2017, there was a notable increase in murder cases compared to other years, and when the frequency of occurrence was evaluated by month, it was determined that the most common murders were committed in March. The distribution by month in which the incident occurred is shown in Figure 3.

In our study, it was determined that firearms were used as the method of murder in 36 (69.2%) of the murder cases, piercing-cutting tools were used in 14 (26.9) and 2 cases were killed by beating. The murder methods used are shown in Figure 4.

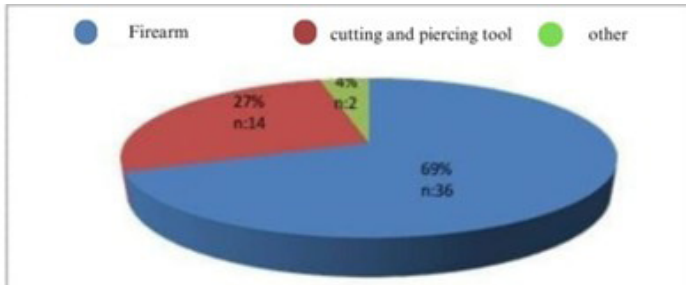

Figure 4. Murder method used

When evaluated according to the crime scene, it was determined that 38 (73%) of the murders were committed in the city center, 14 (27%) in rural areas, and autopsies were performed on all 52 victims. The distribution of cases according to the crime scene is shown in Figure 5.

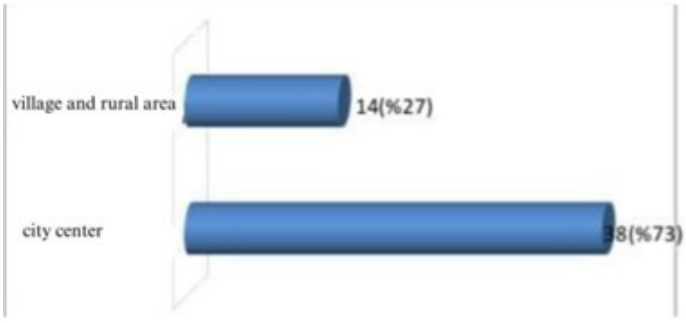

Figure 5. Distribution of cases by scene

When the victims in our study were evaluated in terms of cause of death; it was seen that 11 cases (21.1%) died due to intracranial injuries, 6 cases (11.5%) died due to internal organ damage, 12 cases (23%) died due to major vascular injuries and internal-external bleeding, and 23 cases (44.2%) died due to both internal organ damage and internal-external bleeding. The distribution of cases according to causes of death is shown in Figure 6.

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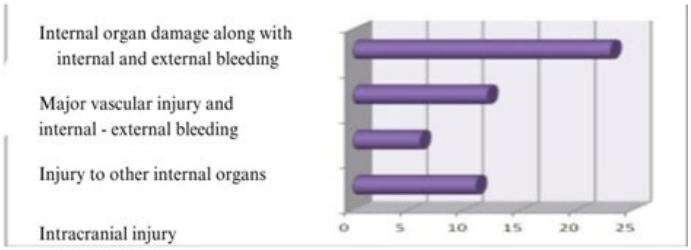

Figure 6. Distribution of deaths by causes

When the reasons for murder were evaluated, although the reasons for murder could not be determined for 13 cases, the main reasons for murder that could be determined were domestic violence, debts, land disputes, blood feuds, etc., and the distribution of cases according to the reasons for murder is shown in Figure 7.

Figure 7. Distribution of homicide according to identifiable causes

DISCUSSION

Murders, which are the most severe form of violence, are the most serious crimes committed against a person and they cause individual and social anger in our country as well as all over the world [5,6].

In a report on violence prepared in Geneva in 2014, it was stated that 475 thousand people were murdered worldwide in 2012 and that the incidence of murder was higher in underdeveloped countries, and that murders were the third leading cause of death for men aged 15-44 [7]. Although violence and murder rates have decreased from 2000 to 2012, this issue is still widespread and serious [8,9].

In our study, it was determined that male victims were approximately 4 times more than female victims, and this rate was found to be consistent with general literature information [10,11]. Although femicides are also seen quite frequently in our country, the reason why this rate is higher in men can be attributed to the fact that men are more active in social life and are more likely to be in environments where they can be attacked due to their more aggressive nature.

Each year, 200,000 of the murders worldwide are committed against young people between the ages of 15 and 19, which corresponds to 43% of all murders committed in a year [11]. While individuals between the ages of 15 and 19 constituted 7.6% of our study group, the most common age group was the 30-39 age group with a rate of 23%, the mean age of males was 43.34 (SD±15.88) and females was 38.27 (SD±18.44), and the mean age of the victims was higher than the averages found worldwide. Although the mean age was higher than the value found in the literature, our study found that both women and men were murdered during the age periods when they were active in society and socially productive.

In our study group, the most frequent murder cases were seen in March 2017, and when the incidents were evaluated according to the seasons, it was determined that the most murders were committed in the fall and the least in the winter, although there was no significant difference between them. In a study conducted by Yavuz and his colleagues on murders committed against taxi drivers, it was determined that the most frequent murders were committed in the spring and the least in the winter [12]. It was thought that the fact that murder cases were less common in the winter and more common in warm weather was due to reasons such as the slowdown of social life in the winter and the fact that people spend more time at home.

In our study, it was determined that firearms were the most common method of murder with a rate of 69.2%, while Özgün Ünal and his colleagues' study on femicides found that firearms were the most common method of murder with a rate of 50.1% [13]. We see firearm injuries as the most common method of murder not only in our country but also worldwide, so much so that approximately one in every two murders worldwide is committed with firearms, followed by murders committed with sharp objects [7]. It was thought that this was due to the high lethality of firearms, their ease of use for the attacker, and the fact that they leave the victim more defenseless against the attack compared to other methods.

When the murder cases in our study were evaluated according to the crime scene, it was seen that 38 (73%) of the cases were killed in the city center and 14 (27%) in rural areas. In the study conducted by Soumah and his colleagues in Dakar, it was reported that 50.6% of the victims were killed in the suburbs of the city center of Dakar and 29.3% in rural areas. In studies conducted worldwide, it was reported that most murders were committed in low-income countries and settlements with low economies [14-16].

When the cause of death of the deceased in our study was evaluated; it was seen that 11 cases (21.1%) died due to intracranial injuries, 6 cases (11.5%) due to internal organ damage, 12 cases (23%) due to major vascular injuries and internal-external bleeding, and 23 cases (44.2%) due to both internal organ damage and internal-external bleeding. The study conducted by Soumah et al. in Dakar also reported that the most common cause of death was due to bleeding [14].

When the reasons for murder were evaluated, it was determined that 7 cases were killed due to domestic violence, debt disputes and land disputes. It was determined that 6 of the cases were killed due to blood feuds and 12 due to other reasons, but the reason for murder could not be determined for 13 cases. In the study conducted by Geleri and Demirbilek in Istanbul, it was reported that the most common reasons for murder were arguments,

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domestic violence, problematic sexual relationships and money-related arguments [17]. In a study conducted by Swart et al. on adolescent murders in South Africa, the main reasons for murder were arguments, theft, self-defense and sexual assault. (SWART) The fact that land-pasture disputes were at the top of the list with other reasons in our study can be explained by the fact that the main source of income in our province is agriculture and animal husbandry.

CONCLUSION

Murders, which are as old as human history, are a public health problem that takes away the most basic and important right of a person, the right to life, affects not only the victim but also the victim's family and society, and causes fear, insecurity, material and moral losses in society. It is predicted that they can be prevented by increasing the respect people have for each other's rights. Increasing educational activities for human rights and removing publications in the press that encourage violence can be presented among the suggestions that will contribute to the solution.

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 ethics committee approval required for this study was obtained from Tokat Gaziosmanpaşa University Non-Invasive Clinical Research Ethics Committee (15.08.2024 - 2024/11).

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Original Article

Evaluation of the cases referred to İnönü University Department of Forensic Medicine between 2012-2015 for the determination of a fixed scar on the face

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Abstract

Aim: Our study deals with the evaluation of Fixed Scars on face (FSF) and its forensic, medical and biopsychosocial implications of facial injuries. It is emphasized that the Turkish Penal Code defines FSF as an aggravating factor of the penalty.
Materials and Methods: A retrospective study was conducted based on the examinations performed for forensic medical evaluation at Malatya İnönü University.
Results: Facial injuries were analyzed in 42 cases between 2012 and 2015; the causes of injury included traffic accidents (54.8%), injury resulting from effective action (31%), explosive and firearm injuries. It was found that the most common injuries were in the forehead region (71.4%) and hyperpigmented or depressed scars were more likely to cause a positive FSF.
Conclusion: The rate of FSF was found to be 26.2% and blunt traumas were reported to cause more prominent FSF such as hyperpigmented lesions. In the study, the necessity of standardization in forensic reports was emphasized and it was stated that such studies should be increased in the literature.

Keywords: Fixed scar on face, forensic medicine, Turkish penal code

INTRODUCTION

The face region has an important place in daily communication and social life for humans, who are a social element. It is defined as the document in the foreground of status and role in society and the focal point of communication between people [1-3]. Marks due to obvious scar tissue that attract attention at first glance due to injuries in the facial area can also cause many biopsychosocial problems in interpersonal communication within social relations [4-6].

Articles 87 and 89 of the Turkish Penal Code (TPC) include injuries related to the face region. The fact that the act of injury has a fixed scar on the face (FSF) has been accepted as one of the aggravating factors of the crime and it has been stated that the amount of punishment to be given to the person will be increased [7]. According to the "Guide to Evaluation of Injury Crimes Defined in the Turkish Penal Code in terms of Forensic Medicine", when assessing FSF, it is important whether the mark resulting from the injury in the face region is noticeable and permanent rather than the forensic/medical severity of the trauma [8]. Again, in the same guide, the definition of the facial region is made as "the area between the scalp border on the top (including the area in front of the imaginary line connecting both ears from the top in people with permanent hair loss or severe hair loss) when looking at the person from the front and sides, the points where the imaginary straight lines descending from the ear helix intersect with both

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clavicles, including the front surfaces of the ears on the sides, and the lines starting from the fossa jugularis below and following the clavicles to the sides".

To assess whether an injury to the facial area results in a permanent disability, the necessary healing time (for scar tissue healing) must have passed. Therefore, for a scar tissue located within the boundaries of the face to be evaluated in terms of permanent disability, medical treatment and legal precedents indicate that at least 6 months must have passed since the injury. Additionally, even if this period has passed, if the physician believes that healing has not yet fully completed and changes in the scar tissue are still on going, a longer wait [9,10].

The aim of this study was to retrospectively evaluate the files of cases with facial injuries referred by judicial authorities to the Department of Forensic Medicine, Faculty of Medicine, Malatya İnönü University, for examination and preparation of a final report.

MATERIAL AND METHOD

In the study, the files of cases referred by the judicial authorities to the Forensic Medicine Department of Inonu University Faculty of Medicine in Malatya for the preparation of final reports between 2012 and 2015 were retrospectively examined. Cases with facial injuries were included in the study. If the cases had not yet passed 6 months since the incident at the time of their initial examination, they were called back for re-examination after 6 months and evaluated for FSF. The examinations were conducted with the assistance of two physician associate and one faculty member."

The cases were evaluated in terms of age, gender, cause of injury (traffic accident, assault, burn, gunshot wound, stabbing or cutting injury, explosive device injury), location of the injury on the face (forehead, ear, eye, zygoma, nose, chin), characteristics of the wound (level with the skin, depressed, raised, same color as the skin (normopigmented), lighter than the skin (hypopigmented), darker than the skin (hyperpigmented)), the time elapsed between the incident and the examination, and whether the injury constitutes a FSF.

Ethics committee approval for our study was obtained from the İnönü University Health Sciences Non-Interventional Clinical Research Ethics Committee with the decision numbered 7463.

RESULTS

In our study, 39 (92.9%) of the patients were male and 3 (7.1%) were female. The mean age was 37.9±12.6 years (17-74 years). Traffic accidents accounted for 23 cases (54.8%), injury resulting from effective action for 13 cases (31.0%), explosive and gunshot wounds for 2 cases each (4.8%), and burns and sharps injuries for 1 case each (2.4%).

Regarding the localization of the wound on the face, 30 cases (71.4%) were on the forehead, 3 cases (7.1%) each on the eyelid and zygoma, 2 cases (4.8%) each on the ear and nose, and 1 case (2.4%) each on the chin and lip. 21 cases (50.0%) healed without scarring. When the wound characteristics were examined; according to the skin level, it was seen that 12 cases (28.6%) were sunken compared to the skin, 4 cases (9.5%) were raised from the skin at the same level with the skin and 1 case (2.4%) had tissue loss. According to skin color, 12 cases (28.6%) were hyperpigmented, 5 cases (11.9%) were hypopigmented, 3 cases (7.1%) were normopigmented and 1 case (2.4%) had tissue loss.

When the time elapsed between the injury and the examination was analyzed, it was observed that 12 cases (28.6%) had an 8-month delay, 11 cases (26.2%) had a 6-month delay, 8 cases (19.0%) had a 7-month delay, 6 cases (14.3%) had a 9-month delay, 1 case (2.4%) had a 10-month delay, and 4 cases (9.5%) had a delay of 12 months or more.

Injuries with fixed facial scars were observed in 11 cases (26.2%). When the incidents of the injuries with fixed facial scars were analyzed, it was seen that 7 cases (16.7%) were traffic accidents, 1 case (2.4%) each were burn, beating, gunshot wound and sharp piercing instrument injuries. Regarding the characteristics of the wounds that were fixed scars on the face, it was observed that they were at the same level as the skin with tissue loss in 1 case each (2.4%), depressed from the skin in 5 cases (11.9%), and raised from the skin in 4 cases (9.5%) according to the skin level. In addition, according to skin color, it was hypopigmented with tissue loss in 1 case each (2.4%) and hyperpigmented in 9 cases. Regarding the localization of the wounds, 7 cases (16.7%) had wounds on the forehead and 1 case (2.4%) each had wounds on the ear, nose, lip and zygoma (Table 1).

Table 1. Characteristics of cases and wounds with facial fixed scars

Sex	Age	Event type	Location relative to skin	Relative to skin color	Wound localization
Male	33	Beating	Loss of tissue	Loss of tissue	Ear
Male	54	Burned	Depressed	Hypopigmente	Frontal
Male	27	Traffic accident	Elevated	Hyperpigmented	Nose
Male	45	Traffic accident	Flush with the skin	Hyperpigmented	Frontal
Female	32	Firearm	Elevated	Hyperpigmented	Lips
Male	34	Traffic accident	Depressed	Hyperpigmented	Frontal
Male	52	Traffic accident	Depressed	Hyperpigmented	Frontal
Male	47	Traffic accident	Elevated	Hyperpigmented	Zygoma
Male	30	Traffic accident	Depressed	Hyperpigmented	Temporal
Male	26	Traffic accident	Elevated	Hyperpigmented	Frontal

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DISCUSSION

It is known that scarring as a result of facial injuries and the fact that this scar is noticeable by others at first glance cause many biopsychosocial problems. In addition, the concept of FSF is defined in the Turkish Penal Code and is shown among the qualifying factors that increasing the penalty. Therefore, the opinions reported in terms of fixed facial scarring are of great importance.

The mean age of the patients included in our study was 37.9±12.6 years (17-74 years). In previous studies, the mean age was found to be compatible with our study [11,12]. When the gender distribution of the cases in our study was analyzed; 39 (92.9%) were male and 3 (7.1%) were female. When various studies conducted in our country with forensic trauma victims who were evaluated with FSF were examined, it was observed that the gender distribution was in parallel with our study [11-13]. This was thought to be due to the fact that males were injured at higher rates than females.

When the causes of injury of the cases we evaluated in the study were examined, it was observed that 23 (54.8%) were traffic accidents, 13 (31.0%) were assault and battery, 2 cases (4.8%) each were explosive and firearm injuries, and 1 case (2.4%) each were burns and sharps injuries. In the literature, it was observed that the number of sharps injuries was close to blunt trauma, although it was observed that there were more admissions after blunt trauma exposure [12,13]. It was thought that this distinction was made because the number of people exposed to blunt trauma was higher compared to other traumas.

When the localizations of the lesions in the cases in our study were examined, it was observed that the most common lesion site was the forehead, followed by the eyelids and cheeks. In studies conducted in the literature, it was observed that the forehead was the most commonly injured area followed by the eyebrows [12-14]. We think that the high number of lesions in the forehead region is due to the anatomical features of the face as well as the difference in the distribution of subcutaneous support tissues in the facial region. When the color and level distributions of the lesions found in our study were examined according to the skin, it was observed that they were compatible with the literature [13,14].

In our study, the rate of FSF positivity was 26.2%. It was observed that blunt traumas resulted in a higher incidence of fixed scars on face (FSF). Hyperpigmented lesions and skin depressed lesions were found to cause more FSF positivity. It was observed that injuries in the forehead region caused more FSF positivity. In previous studies, it was observed that exposure to blunt trauma and hyperpigmented scar tissue caused more FSF positivity [11-15]. It was thought that irregular wound lips after blunt trauma exposure affected healing and caused more positivity. In addition, it was thought that hyperpigmented lesions attracted more attention and caused FSF positivity.

CONCLUSION

In our study, blunt traumas, hyperpigmented lesions and skin depressed lesions were found to cause more FSF positivity. Injuries in the forehead region were found to be more likely to cause a positive FSF. Since facial fixed trace is an important argument in terms of increasing the penalty, it is very important to ensure standardization in the reports. Such studies are important as they will ensure standardization and reduce the contradiction between reports. We believe that such studies should be increased in the literature.

It was presented at the 1st International TURAZ (Türkiye-Azerbaijan) Forensic Medicine and Pathology Congresson 13-16 October 2016 in Baki/Azerbaijan.

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

Financial Disclosure
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Ethical Approval
Ethics committee approval for our study was obtained from the İnönü University Health Sciences Non-Interventional Clinical Research Ethics Committee with the decision numbered 7463.

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We respectfully commemorate Dr. Nusret AYAZ, who lost his life in the 6 February 2023 Malatya Earthquake and contributed to this article.

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Original Article

A 10-year journey of toxicology publications in emergency departments: A bibliometric analysis

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Abstract

Aim: Poisoning is often diagnosed and treated in emergency departments. An analysis of the directions of publications and their scope makes it possible to assess the direction of research in selected areas of emergency department activities. Our study aimed to analyze toxicological studies worldwide involving emergency departments and show directions for research in toxicology in emergency medicine.
Materials and Methods: We analyzed the original articles in the field of toxicology by searching the Scopus database between 2014 and 2023 and bibliometric analysis was performed.
Results: 270 original articles were analyzed. There has been an increase of more than 100% in the total number of publications on an annual basis. The most significant number of studies has been performed in Turkey, followed by the USA. Regarding the number of citations per publication, Sweden ranked first with 133 citations, followed by Poland with 76 and Switzerland with 69 citations. The terms 'neurotoxicity', 'carboxyhemoglobin' and 'addiction' have gained popularity.
Conclusion: A bibliometric analysis of research in emergency department toxicology makes it possible to identify general research directions and interests. More bibliographic unity can be achieved by publishing articles in general medical journals with international participation.

Keywords: Toxicology, emergency department, bibliometrics, Scopus

INTRODUCTION

Poisonings are critical conditions that can seriously threaten human life and require a careful approach by physicians. According to Centers for Disease Control and Prevention (CDC) data, the mortality rate reaches 30 per 100.000 population [1,2]. Poisoning can be encountered in every aspect of life, whether at work or in social life. It may occur by accidental or intentional exposure to legal or illegal substances. These situations usually require first intervention in emergency services, and these interventions are of vital importance. Mortality and morbidity rates varying depending on the substance ingested increase the importance of emergency department approaches [3]. The diversity of toxicology cases increases with the renewed medical knowledge, which reveals that emergency physicians need to follow updated information and methods. Therefore, literature contributions in the field of toxicology are extremely valuable. Our methods to objectively evaluate these contributions include h-index and journal impact factor.

Bibliometrics is a method that objectively and quantitatively analyses criteria such as the number of citations, h-index and journal impact factor of scientific studies [4]. This is an essential tool for determining the areas where fewer scientific studies have been conducted in research fields, determining current trends and scientific effects, and comparing the standards of researchers [5,6]. In addition, bibliometric analysis provides the opportunity to evaluate the reliability, quality and impact of articles and can highlight articles that contribute more to science [7]. In addition to assessing the articles' reliability, quality and effect, keeping up

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to date with emerging technological developments and drugs is essential. From this perspective, bibliometrics also contributes to the visibility of scientific innovations.

New drugs and chemicals, combined with the development of technology, make it necessary for physicians to stay updated in toxicology. Our study aimed to analyze toxicological studies worldwide concerning emergency departments and show directions for research in toxicology in emergency medicine.

MATERIAL AND METHOD

Articles related to toxicology were analysed online in the Scopus (www.scopus.com) database. Although different search tools offer different possibilities, the Scopus search engine stands out in this field because it offers citation analysis, citation relationships between different institutions and groups, and a wide publication network [8-10]. It has a larger search network than Web of Science and more reliable than Google Scholar [9]. Therefore, it was also our choice. Ethical approval was obtained by the Ethics Committee of Etlik City Hospital with the decision number 14/08/2024. The screening process was completed on 21.08.2024.

The search was performed using the following keywords: 'Emergency Medicine' OR "Emergency Department" OR "Emergency Service" AND "Toxicology" OR "Poisoning" OR "Overdose" OR "Intoxication" OR "Drug Misuse". Keywords were identified using the MeSH (Medical Subject Headings) database. Only original articles with full text available (free or paid) were included in the study. After eliminating the excluded articles, the remaining articles were listed. Since the Scopus index allows a maximum of 2000 articles to be listed, the articles were ranked according to the number of citations. The articles that contributed the most to science and received the most citations were evaluated.

Titles such as article title, total number of citations, annual average number of citations, journal name, impact factor of the journal, year of publication, number of authors, author names, h-index of the authors, disciplines contributing to the article, institutions and countries to which the authors are affiliated, research topic, keywords of the article, funding status and funding institutions were analysed. For articles with authors from different countries or institutions, the country and institution of the first author were recorded. The impact factor and h-index of the journals were obtained from Thomson Reuters Journal Citation Reports (JCR). Analyses were performed using VOSviewer 1.6.20, Online Analysis Platform Bibliometrix (http://bibliometrix.com). As a result of this analysis, prominent authors, journals, institutions/countries, clustered networks, co-cited references/authors and strongest keywords and citation bursts were mapped.

Inclusion Criteria:

1. To be published in Science Citation Index-Expanded (SCIE) and Social Science Citation Index (SSCI) journals with Web of Science Thomson Reuters indexes.
2. Original article.
3. To be one of the articles that appear when searched with keywords ('Emergency Medicine' OR 'Emergency Department' OR 'Emergency Services' AND 'Toxicology' OR 'Poisoning' OR 'Overdose' OR 'Intoxication').
4. To be written in English language.
5. To be published between 2014 and 2023.

Exclusion Criteria:

1. Types other than original articles: meeting abstract, review article, editorial material, letter, proceeding paper, book chapters, early access, note, correction, book review, reprint, discussion, correction-edition, news item, biographical item, retracted publications, meeting, data paper, book, item about an individual, software review.
2. Articles focusing on research areas other than emergency medicine and poisoning.

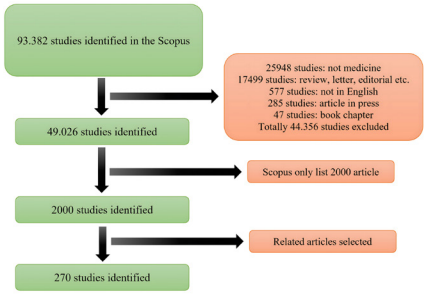
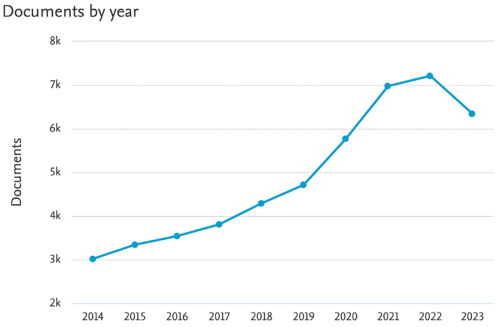


Figure 1. Flowchart

RESULTS

In the data, which included a total of 1454 authors from 70 different journals listed; it was determined that an average of 6 researchers contributed to each article and the international participation rate was 12%. The most cited article received 390 citations, while the average citation rate of the articles was 53.

When we examined the distribution of 49,026 articles by years, a continuous upward trend in the number of publications was observed. When we compare the years 2014 and 2023, it was seen that there was an increase of more than 100% in the total number of publications on an annual basis (Graph 1).



Graph 1. Number of publications by year

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The top 10 journals in which the selected articles were published are listed in Figure 2. The American Journal of Emergency Medicine (Impact Factor (IF) 2.7) ranked first with 52 publications, while the Journal of Emergency Medicine (IF 1.2) ranked second with 30 publications. In the association network analysis based on co-citations between journals, Annals of Emergency Medicine (IF 5.0) had the strongest association, followed by Clinical Toxicology (IF 3.0) (Figure 3).

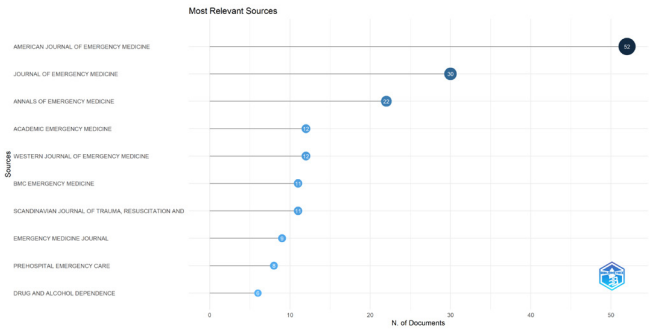

Figure 2. List of journals with the most articles

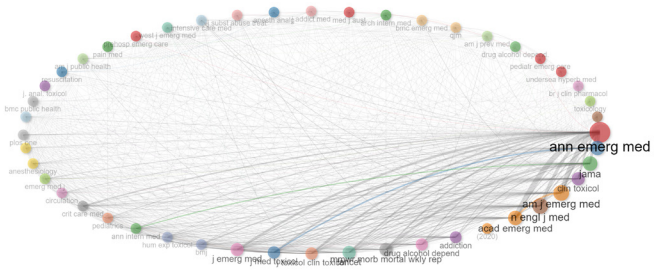

Figure 3. Relationship of journals via bibliographic coupling

According to the bibliographic association network analysis between countries, it was observed that the USA has the strongest network. While close relationships were found especially among European countries, it was understood that the USA formed a wide network of interaction beyond geographical borders. It was also observed that Turkey has more common relations with countries such as South Korea and Taiwan (Figure 4).

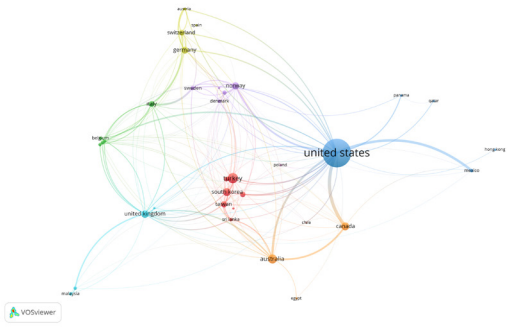

Figure 4. Bibliographic coupling of countries

When the average number of citations per publication was analysed, Sweden ranked first with 133 citations, followed by Poland with 76 citations and Switzerland with 69 citations (Figure 5). When the single country publication (SCP) and multiple country publication (MCP) status of the countries of the corresponding authors were analysed, it was found that most countries were SCP dominant (Figure 6).

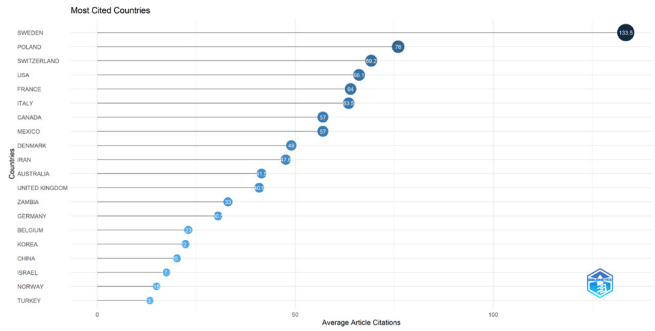

Figure 5. Countries with the most citations per article

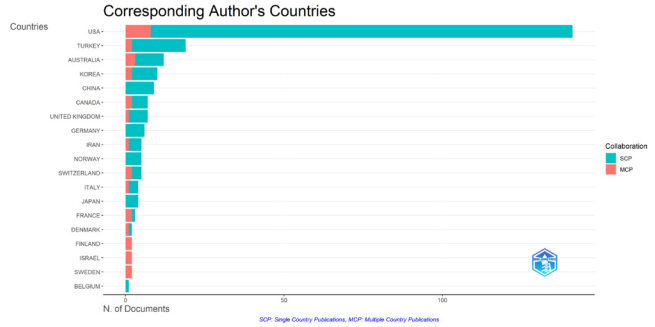

Figure 6. Publication graph of the corresponding author's countries

Among the authors with the most articles, Cole J. B. ranked first with 9 articles. He was followed by Klein L. R. and Martel M. L. with 6 articles, while Weiner S. G. and D'Onofrio G. ranked third with 5 articles. Bebarta V. S. , Boudreau S. M. , Brekke M. , Driver B. E. , and Graudins A. were observed to be important contributors with 4 articles each. In the analysis of the authors with the most publications by years, a significant decrease was observed after 2020. Looking at the countries of the top 10 authors, 8 were from the USA, 1 from Norway and 1 from Australia (Figure 7). It was determined that 3 of the US authors worked in the same clinic.

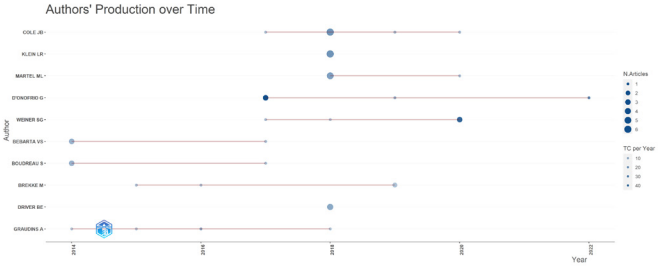

Figure 7. Authors' production over time

When the co-occurrence of keywords and their change over the years were analysed, it was observed that the terms

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'neurotoxicity', 'carboxyhemoglobin' and 'addiction' have gained popularity recently (Figure 8A).

According to the factorial analysis of keywords, a large pool of toxicity words was concentrated in the centre. In addition, word associations such as 'addiction' and 'substance use' and the terms 'drugs', 'opioids', 'benzodiazepines' and 'emergency service' were frequently used together and these areas were found to be particularly current and hot topics (Figure 8B).

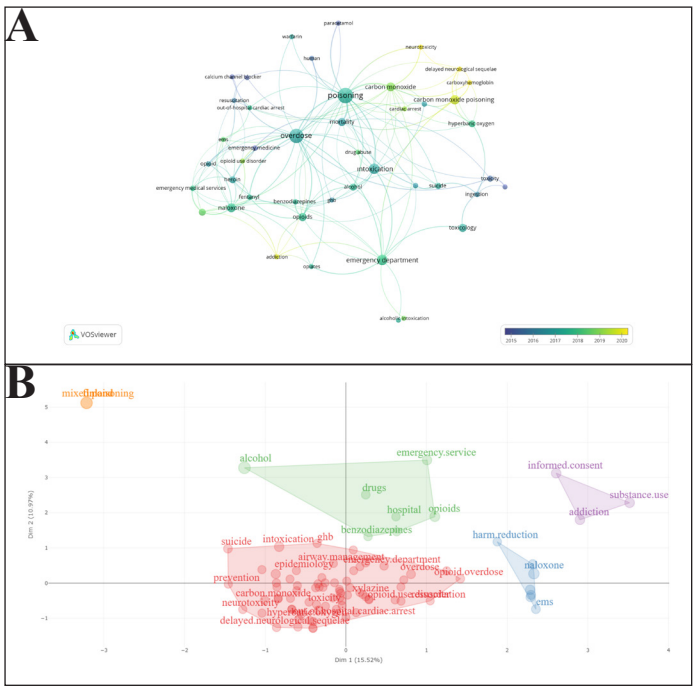

Figure 8. A. Network map of most used keywords organized by years; **B.** Factorial analysis of the most frequently used words

DISCUSSION

Our analysis provides some insights into research in the field of toxicology over the last decade. We completed our review with 270 articles accessed from Scopus that fulfilled the criteria. Although the literature includes regional and country-based studies or studies on a specific toxicology field, we could not find enough publications that make a worldwide analysis of all toxicological research and try to shed light on new studies [11-13]. With this inference, our study, which analyses toxicology-based research with a global approach, will contribute to an essential gap in the literature.

Technological and scientific developments cause the literature to grow rapidly [14,15]. With the increasing accessibility of information, more and more contributions are made to the scientific knowledge pool daily. Between 2014 and 2023, total publications in Scopus showed an annual increase. In our study, when we compared 2014 with 2023, we found that the number of publications increased by more than 100%. Zyoud et al., who conducted a study on the same subject in a local area, also mentioned that publications increased similarly [11]. Toxicology is a science that addresses a small specialized area of interest, and as a result, it is a slow-progressing science [13,16]. Every development in such a small and specialized field is valuable, and it is important to follow the current publications in the field of toxicology. It is encouraging that the scientific productivity of researchers working in such a small and specialized field has increased by more than 100% over the years.

When we examined the journals with the highest number of articles that play an essential role in this scientific productivity, we found that AJEM 52 (IF 2.7), JEM (IF 1.2) 30, Annals of Emergency Medicine (IF 5.0) 22. When we examined the bibliographic associations formed by the logic of two articles citing a common article, we found that Annals of Emergency Medicine ranked first, followed by Clinical Toxicology (IF 3.0) and JAMA (IF 63.1). We found that the main reason for this difference in the journal lists was the citation network and number of citations by the literature [17]. However, we found that JAMA obtained third place in the bibliometric association with a single article published. The more citations an article receives, the more association and visibility it provides. This is one factor that increases the quality of journals and articles. This is the reason why JAMA has more impact with a single article than 52 articles of AJEM and 30 articles of JEM. All the mentioned journals are field-specific, but JAMA is in the general medical journal category. It is important for field-specific authors who want their publications to be more cited and more visible to turn to general medical journals. This orientation of researchers interested in a specific field, such as toxicology, may bring along a general researcher interest in their field. This situation was also evaluated by Callaham et al. in our study, and it was found that the publications of emergency medicine researchers received more than twice as many citations when they were published in general medical journals other than emergency medicine [18].

When we analyzed the countries, we found the USA superior to the literature. We observed that European countries generally established close relationships with each other [19]. Differently, we found that Turkey was the second country with the highest number of publications after the USA and that it established close bibliometric relationships with Far Eastern countries such as South Korea, Taiwan, Sri Lanka and its neighbour Iran. This situation, which is different from the normal distribution, may be due to the close socio-cultural development levels of the countries and the common interests of toxicology about this. We can evaluate the socio-cultural development levels of countries with the Human Development Index (HDI) report prepared by the World Health Organisation (WHO). When we look at the HDI prepared with 2022 data, the fact that the mentioned countries have close rankings to each other supports this situation [20].

When we evaluate the citation status of countries per article, we see that countries such as the USA, Turkey and Australia, which have the highest number of publications, have been replaced by Sweden, Poland, Switzerland and France, respectively. This is related to the amount of MCP. The fact that the total number of publications in the USA is by far higher causes the citation rate per article to be relatively low. Khelfaoui et al., in their study

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evaluating the self-citations of the leading countries in science, mention that these countries tend to cite themselves and that international participation increases the citation rate [21]. In line with the literature, we observe that as the rate and amount of MCP increases, the citation potential of the countries' publications also increases. One of the reasons for this is that different international researchers increase the capacity and quality of research with their contributions to publications. From this point of view, the global participation of authors is an essential step for recognition and citation.

When we analyzed the keywords, we found that while the use of the words 'paracetamol', 'calcium channel blocker', 'ECMO' was high in the first years, the words 'neurotoxicity', 'carboxyhemoglobin' 'addiction' were used more frequently in recent years in the 10 years of our study. This situation indicates that the areas of interest in toxicity have shifted to different areas over the years. When we look at the factorial analysis of the most frequently used words, we know that the region on the upper right shows us the hottest areas. When we examine the word groups here, we understand that the literature progresses through the words 'addiction', 'substance use', 'informed consent', 'drugs', 'opioids', 'benzodiazepines', 'naloxone', and 'harm reduction'. This result constitutes essential data for further research. The data we obtained show that the literature is mostly centred on drug addiction. We explain this situation with the fact that opioids can be easily prescribed from emergency departments and other clinics with legal regulations in the USA, Canada and many European countries [22,23]. When we analyze the number of articles, citation amounts and journals, we see that these countries are the main countries that constitute the literature [24]. The fact that 8 of the top 10 authors contributing to the most publications originate from the USA and even three are from the same clinic helps to understand the situation. It is difficult for toxicological conditions not on the agenda of the mentioned countries to be cited in the literature, to increase their awareness of bibliographic associations, and to be among the hot areas. This problem stands before us as a task, waiting for a solution on behalf of the future of science and humanity.

Areas that cannot be developed sufficiently because they cannot be reached in the literature or remain undersized have special importance in toxicology. Poisonings may vary regionally due to industry and waste, contact with animals, drugs, eating habits, etc. We know as an important reality that the literature develops with the support of funding. Therefore, as a solution, it is important to support countries with low scores according to development indices such as HDI with special funds. Here, we can take the work of the WHO International Agency for Research on Cancer (IARC) working group on aflatoxin with funding as an example [25]. In this way, significant contributions will be made to developing toxicology literature, a specialized field of study.

Limitations

Since our study was a review of the last 10 years aiming to focus on the current literature, the fact that we could not cover the entire literature may have been a limitation. Another limitation is the restriction of databases to Scopus.

CONCLUSION

A bibliometric analysis of research in emergency department toxicology makes it possible to identify general research directions and interests. We examined the most cited studies, the most frequently discussed topics, and the most prolific authors and journals. More bibliographic unity can be achieved with articles published in general medical journals and international participation in this specialized field.

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
Etlik City Hospital Ethics Committee Date:14.08.2024 Decision No: AEŞH-BADEK-2024-759.

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Original Article

Biosafety at autopsy: Analysis of hepatitis B, hepatitis C, and HIV transmission risks

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Abstract

Aim: This study aimed to demonstrate, through serological testing, that healthcare workers involved in forensic autopsies are at risk for HIV, hepatitis B, and hepatitis C viruses, and to discuss the necessary precautions for infection control in light of the literature.

Materials and Methods: After completion of the forensic autopsy, two separate 5 ml blood samples were taken from the thigh regions of the corpses in gel tubes with yellow caps, with the written consent of the relatives of the deceased. The blood samples were analyzed for HBsAg, anti-HCV, and anti-HIV 1/2 levels using the Roche Cobas E601 device in the microbiology laboratory of the Research and Training Hospital of Gaziosmanpaşa University Faculty of Medicine, employing the electrochemiluminescence method.

Results: The study included 197 cases who underwent autopsy in Tokat and Kayseri provinces. The blood samples collected were analyzed for HBsAg, anti-HCV, and anti-HIV 1/2 levels. In the serological tests performed, HBsAg positivity was detected in 6 cases (3.04%) and anti-HCV positivity in 1 case (0.50%), while anti-HIV 1/2 positivity was not detected in any cases.

Conclusion: A risk assessment should always be carried out before the autopsy. Depending on the emerging risk and the biosafety level determined, protective measures should be taken. In cases where a risk assessment cannot be performed, biosafety principles should be strictly followed, and the bodies should be transferred to appropriate autopsy centers if necessary.

Keywords: Autopsy, biosafety, infection, risk analysis.

INTRODUCTION

Occupational infectious diseases are becoming increasingly important for healthcare workers. These diseases, caused by work-related injuries, can cause significant harm to the individual and their environment [1]. Autopsy rooms, particularly as work environments, are potential sources of contact with infectious agents [2]. Healthcare workers and other personnel performing autopsies are at serious risk of infection from direct contact with blood and body fluids, soft tissue, and bone structures during autopsies or from being in communal areas [2,3]. Many different infectious agents contribute to this risk, especially Human Immunodeficiency Virus (HIV), hepatitis viruses (hepatitis B, C, D, G), Mycobacterium tuberculosis, prions, Bacillus anthracis, Clostridium tetani, meningococcal and streptococcal bacteria, rabies virus, Crimean-Congo hemorrhagic fever virus, and other viral hemorrhagic fever pathogens [2]. The mortality rate of most diseases caused by these pathogens is exceptionally high [4].

Infection can be transmitted through needles used during autopsy, injuries from sharp objects contaminated with blood, contact with infected blood or body fluids on the mucosa, and

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inhalation of airborne particles [2]. To protect against the risk of infection, a risk analysis before the autopsy, the use of personal protective equipment, proper technical equipment in the autopsy room, and correct autopsy techniques are crucial. If the necessary protective measures are not taken during the autopsy, infectious diseases can be transmitted to the staff and, consequently, to the general public. In cases where the diagnosis of an infectious disease is not known prior to the autopsy, the risk of infection increases even further. The seroprevalence of HIV, hepatitis B, and hepatitis C virus infections has been reported to be higher in autopsy cases than in the general population. It has been emphasized that the principles of biosafety in autopsies should be mandatorily applied to protect the health of employees [4].

This study aimed to demonstrate, through serological testing, that healthcare workers involved in forensic autopsy procedures are at risk of contracting HIV, hepatitis B, and hepatitis C viruses, and to discuss the precautions that should be taken to protect against infection, in line with the literature.

MATERIAL AND METHOD

Study Design

Before the start of the study, approval was obtained from the Tokat Gaziosmanpaşa University School of Medicine Ethics Committee (decision number 83116987-027, date: 07.01.2016). Informed consent was obtained from the relatives of the deceased who agreed to participate in the study.

Cases who underwent autopsy between January 2016 and January 2017 in the province of Tokat and Kayseri were randomly selected and prospectively analyzed. The demographic characteristics of individuals who underwent autopsy, including their education level, marital status, known diseases, and drug, alcohol, and cigarette use, as well as their history of surgical procedures, were recorded using information from their families and the hospital's registration system.

Cases whose relatives did not agree to participate in the study, whose deaths were no longer a source of infection, and those who had died more than two weeks prior were not included in the study.

Evaluation of Cases

After the completion of the forensic autopsy, two separate 5 ml blood samples were taken from the thigh regions of the corpses in gel tubes with yellow caps, with the written consent of the relatives of the deceased. The blood samples were analyzed for HBsAg, anti-HCV, and anti-HIV 1/2 levels using the Roche Cobas E601 device in the microbiology laboratory of the Research and Training Hospital of Gaziosmanpaşa University Faculty of Medicine, employing the electrochemiluminescence method. The following reference values were used:

- **HBsAg:** <1 COI negative, ≥1 COI positive
- **Anti-HCV:** <0.9 COI negative, ≥1 COI positive
- **Anti-HIV 1/2:** <0.9 COI negative, ≥1 COI positive

StatisticalAnalysis

Descriptive analyses were performed to determine the general characteristics of the study groups. Data on continuous variables were presented as mean ± standard deviation and median, with minimum and maximum values, while data on categorical variables were given as number (%). The SPSS 22.0 program was used for data analysis, and percentage analyses were carried out. Statistical significance was accepted as $p<0.05$.

RESULTS

The study analyzed 197 cases that underwent forensic autopsies in the province of Tokat. Of these, 151 (76.6%) were male and 46 (23.4%) were female. The mean age of the cases was 44.7 years (SD: 21 years). The youngest case was 1 year old, and the oldest case was 88 years old (Figure 1).

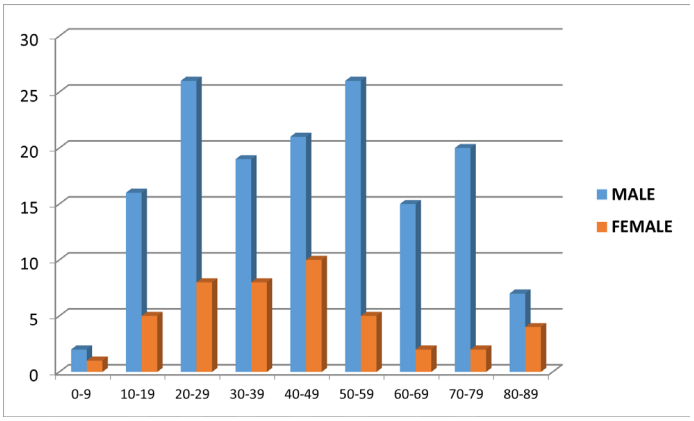

Figure 1. Age distribution by gender

When examining the educational status of the cases, 119 (60.4%) were primary and secondary school graduates, 31 (15.7%) were high school or equivalent graduates, 19 (9.6%) had a university degree, and 28 (14.2%) had no education.

Regarding drug, alcohol, and cigarette use, 12 cases (6.0%) had a history of drug use, 33 cases (16.7%) had a history of frequent alcohol use, and 97 cases (49.2%) had a history of smoking.

When evaluated in terms of surgical history, 41 cases (20.8%) had undergone major surgery, 55 cases (27.9%) had tooth extractions, 14 cases (7.1%) had received blood or blood product transfusions, 10 cases (5.0%) had tattoos on their bodies, and 3 cases (1.5%) were routinely on dialysis.

In terms of living environment and familial infection, 4 cases (2.0%) had hepatitis B carriers in their family. The number of cases with one or more chronic diseases, as indicated by the relatives of the deceased, was 69. When these diseases were classified, 29 (42.0%) had cardiovascular disease, 27 (39.1%) had an endocrine system disease, 12 (17.3%) had a nervous system disease, 10 (14.4%) had a respiratory system disease, 8 (11.5%) had mental and nervous disorders, 6 (8.6%) had malignant diseases, 5 (7.2%) had urinary system diseases, 1 (1.4%) had a hematological disease, and 1 (1.4%) had a gastrointestinal system disease.

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Serological tests revealed HBsAg positivity in six cases (3.04%) and anti-HCV positivity in one case (0.50%), while anti-HIV 1/2 positivity was not detected in any cases. Table 1: The lowest HBsAg value in the seropositive cases was 2122 COI, while the only detected anti-HCV value was 39.12 COI. All HBsAg-positive cases (n=6) were male, and the anti-HCV-positive case was female. Three of the HBsAg-positive cases were construction workers; the other cases were teachers, drivers, and shopkeepers. The anti-HCV-positive case was a housewife. Other risk factors are listed in Table 2.

Table 1. Seropositive cases

	HbsAg	anti-HCV	anti-HIV	Total
Seropositivity	n=6 (3.04%)	n=1 (0.5%)	0	n=7 (3.55%)

Table 2. Risk factors

	HbsAg positive n=6	anti-HCV positive n=1	anti-HIV positive n=0	All cases n=197
Drugs	0	0	0	12 (6%)
Alcohol	2	0	0	33 (16.7%)
Major surgical procedure	1	1	0	41 (20.8%)
Tooth extraction	0	1	0	55 (27.9%)
Blood transfusion	0	0	0	14 (7.1%)
Hemodialysis	0	0	0	3 (1.5%)
Tattoo	0	0	0	10 (5%)
Household infection	0	0	0	4 (2%)
History of infection	0	0	0	0
Other	0	0	0	0

DISCUSSION

The results of our study show that cases who underwent major surgery, tooth extraction, and alcohol consumption were associated with the presence of hepatitis B and hepatitis C.

The main components of the current approach to health and safety at work include worker participation, expert support, worker information, worker training, the protection and prevention approach, and risk assessment [5,6]. Risk assessment consists of two basic steps: First, the hazard must be defined. For example, sharp-edged tools and materials used in procedures that cause physical injury during autopsy are a source of danger. At the same time, known/unknown sharp objects such as metal caps and filaments found under the skin or inside the body can cause injury during autopsy. An ICD used to treat malignant tachyarrhythmias, which is inserted into the body and generates 20-40 joules of electricity, is a potential autopsy hazard [7]. While unexploded projectiles retain their hazard potential due to heat and vibration, fragmented projectile cores can cause minor injuries [8]. Corpses contaminated with radioactive substances for diagnostic or treatment purposes or in industrial areas before death are potential radioactive sources [9]. Chemical substances are another hazard for autopsy personnel. Formaldehyde, used in tissue preservation, can cause symptoms such as irritation of the eyes, mucous membranes, and skin. It is a long-term risk factor for all types of cancer and has a cumulative effect on lung cancer [10,11]. Other hazards include poisoning from pesticides such as organophosphates and metal phosphides, cyanide poisoning, and poisoning from gases used in chemical warfare such as tabun and sarin [4]. In addition, infections that can occur, for example, from the needle of a syringe used during the autopsy, from injuries with sharp objects such as scalpels contaminated with blood, from splashes of infected blood or body fluids on mucous membranes, and inhalation of airborne particles, pose a serious risk [2].

Cases have been reported in which individuals have died as a result of hepatitis B as an occupational disease [12]. In addition, the incidence of transmission of hepatitis B through sharps injuries or needlestick injuries is about 30% [13]. HBsAg positivity was analyzed in 2888 blood samples of patients from urban and rural areas in Diyarbakır, Şanlıurfa, Batman, and Mardin provinces, and the incidence was reported to be 7% [14]. In a study conducted on 1095 samples in Tokat province, the frequency of HBsAg positivity was reported as 5.5%, and in another comprehensive study conducted in Ankara on 61,786 samples, a similar rate (5.58%) was found [15,16]. In a study conducted on 38,505 blood samples from hospital outpatients in İzmir province, the HBsAg positivity rate was 6.5% [17]. Inci et al. found HBsAg positivity of 3.9% in a study conducted on 21,865 blood samples in the province of Artvin [18]. In the Sayhan study, the HBsAg frequency in the

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preoperative evaluation of 994 patients was reported as 1.5%, while this frequency was reported as 2% in the study by Aydın et al. [19,20]. As shown in the studies conducted, the frequency of HBsAg positivity varies between 1.5% and 7% throughout Turkey, and the rate of 3.04% found in our study is consistent with the values in our country.

The incidence of transmission of hepatitis C through sharp objects or needlestick injuries is about 3% [21]. In a study conducted by Yıldırım et al. on 1095 samples, the incidence of anti-HCV positivity was reported to be 2.1% [15]. In a study conducted on 38,505 blood samples, the frequency of anti-HCV positivity was 1.3%. In another comprehensive study conducted on 60,507 blood samples from patients and blood donors presenting to the Ankara outpatient clinic, the frequency of anti-HCV positivity was 1.5% [16,17]. Recent studies have found seropositivity rates of 0.85%, 0.95%, 0.62%, 1.9%, 1%, and 1.5% [18,21-26]. Although the seropositivity rate in our study (0.5%) is slightly below the national average, we believe similar rates can be achieved in studies with larger sample sizes.

Tokars et al. reported that 4 (0.36%) of 1,103 healthcare workers who had percutaneous contact with HIV-infected blood showed seroconversion [27]. In a multicenter study conducted in Italy, 1,534 healthcare workers who had come into contact with HIV-infected blood percutaneously or via the mucous membranes were included in the study. As a result of the follow-up, the seroconversion rate was found to be 0.10% after percutaneous exposure and 0.63% after mucosal exposure [28]. In Ankara, serological analysis of 57,247 blood samples from patients and blood donors showed anti-HIV seropositivity of 0.087% [16]. A comprehensive study conducted on 34,666 samples found anti-HIV positivity of 0.04% [17]. Serological tests performed by Kocazeybek et al. on 229 corneal transplant donors showed seropositivity for hepatitis B and hepatitis C, but no anti-HIV positivity was found [29]. Considering the HIV seropositivity rates in national studies, it was only natural that no positivity was found in our study of 197 cases. This situation does not exclude the fact that HIV is a source of risk at autopsy. Other sources of risk, hepatitis B and hepatitis C, have been detected serologically in autopsy cases, and cadavers are a source of risk to medical staff.

Among inexperienced autopsy personnel, injury-related percutaneous blood contact occurs in 1 in 11 autopsies, compared to 1 in 55 autopsies among more experienced personnel [4]. In some studies on occupational exposure to blood and body fluids in healthcare workers, the rate of sharps injuries in surgeons was 1.3-15.4%, while the rate of mucocutaneous blood contact was reported to be 6.4-50.4% [30,31]. In a similar study, 95% of all percutaneous injuries were reported to be caused by needlesticks and 3.6% by scalpel cuts [32]. The nature of injuries is different in those who perform autopsies. People are exposed to incisions rather than needle sticks. Most of these incisions occur when the scalp is opened. In addition, about 8% of surgical gloves are punctured during autopsy, which can result in existing lesions on the hand coming into contact with infected blood during prolonged use [4]. Therefore, there is a risk of infection from injuries that occur during autopsy.

The second step in risk assessment is determining the degree of risk the hazard poses. The greater the probability of the event or situation occurring and the more serious the consequences, the higher the risk. There are various methods for risk assessment. The "5x5 method" is the simplest and most widely used among these methods. It can also be easily applied to any situation. This method is based on a formulation that evaluates the frequency of occurrence of the event and the severity of the consequence by ranking them from one to five according to specific criteria (Table 3). Based on the data obtained from this method, five different risk levels are determined for the hazard in question, such as "insignificant," "low," "medium," "high," and "unacceptable," and appropriate measures are taken [5]. Let us consider the possibility of cutting or stabbing injuries during the autopsy. If the use of cutting and stabbing tools occurs daily due to the autopsy process and if they are used carelessly, the risk is unacceptable because there is a possibility of contracting a fatal and serious disease such as hepatitis and AIDS due to the injuries. If the risk is unacceptable or a high-risk situation occurs, the necessary precautions should be taken to prevent this situation.

Table 3. Risk assessment table "5X5 method"

5X5 method		Severity of the result				
		1. Accident without damage/injury	**2. Minor injury requiring first aid**	**3. Requires at least 3 days of rest**	**4. Severe injury or illness**	**5. One or more fatal accidents**
Frequency of occurrence	**1. Once a year**	Meaningless	Low	Low	Low	Moderate
	2. Every three months	Low	Low	Low	Moderate	Moderate
	3. Once a month	Low	Low	Moderate	Moderate	High
	4. Once a week	Low	Moderate	Moderate	High	High
	5. Every day	Low	Moderate	High	High	Unacceptable

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However, the "5x5 method" cannot always be used for risk assessment. In such cases, attention should be paid to many parameters, such as the transmission route, the severity of the infectious agent (non-toxic/non-pathogenic, pathogenic/lethal), the concentration of the agent, the physical condition of the environment (technical construction, air flow, inlets, and outlets), the protective equipment, the training and behavior of the personnel, the factor for which there is limited information, and the technical materials used. The more these factors play a role, the higher the risk and the more precautions must be taken [33]. Because HIV and the hepatitis B and hepatitis C viruses are pathogenic and blood-borne, the morbidity and mortality rates and the spread of the diseases (hepatitis, AIDS), the transmission of infections (hepatitis B, hepatitis C, HIV) during the autopsy procedure is highly risky.

Following the risk assessment, the appropriate biosafety level for the autopsy is determined and performed under these conditions. In environments where there are pathogens that can be transmitted through blood and body fluids, such as the infectious pathogens in our study, second-degree biosafety level measures are sufficient, while in environments where there are pathogens that can be transmitted through the air, such as the tuberculosis pathogen, third-degree biosafety level measures are required. In addition, in environments where there is a risk of transmission of pathogens such as the Ebola virus, which causes a high mortality rate and for which there is no vaccine or treatment yet, and Nairovirus (Crimean-Congo hemorrhagic fever pathogen), which is more common in Tokat, Sivas, and Yozgat regions of our country, fourth-level biosafety conditions should be provided.

CONCLUSION

In cases where forensic autopsies are performed, medical personnel involved in the autopsy are at high risk of contracting hepatitis B, hepatitis C, and AIDS.

Since it is not always possible to access medical records, we consider it appropriate to exercise extreme caution in the use of personal protective equipment to minimize the risk of infection in all cases, especially for those with a history of major surgery and alcohol or drug use.

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
Approval was obtained from the Tokat Gaziosmanpaşa University School of Medicine Ethics Committee (decision number 83116987-027, date: 07.01.2016).

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Original Article

The perception of undergraduate education and profession, inclination towards ethical values, and personality traits of physiotherapy and rehabilitation students: A sample of Alanya Alaaddin Keykubat University

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Abstract

Aim: The aim of this study was to examine the relationship between the perspectives of students studying physiotherapy and rehabilitation at the undergraduate level, their tendencies towards ethical values, and their personality traits.

Materials and Methods: This study was conducted with the participation of 187 students enrolled in the Department of Physiotherapy and Rehabilitation at Alanya Alaaddin Keykubat University Faculty of Health Sciences. The evaluations of the Physiotherapy students were carried out through a survey that they could complete via Google Forms, using three different measurement tools: the Questionnaire for Physical Therapy Students' Attitudes Toward Their Profession and Education (Q-PTSAPE), the Ten-Item Personality Inventory (TIPI), and the Ethical Values Orientation Scale (EVOS).

Results: A positive significant relationship was found between the emotional stability and responsibility subscales of the TIPI and the education satisfaction, career choice satisfaction, adequate clinical experience, education satisfaction subscales, and total score of the Q-PTSAPE ($p<0.05$). It was observed that the responsibility subscale of the TIPI was positively significantly correlated with the education satisfaction subscale and total score of the Q-PTSAPE ($p<0.05$). A positive significant relationship was found between the extraversion, emotional stability, responsibility, agreeableness, and openness to experiences subscales of the TIPI and the total score of the EVOS, as well as between the TIPI and all subscales of the EVOS ($p<0.05$).

Conclusion: For the physiotherapy profession, where person-centered treatment is essential, it is emphasized that individuals who are emotionally stable, have a strong sense of responsibility, are extroverted, agreeable, cooperative, and particularly value love and respect, are important for all aspects of the treatment process for both physiotherapists and patients.

Keywords: Physiotherapy students, professional attitudes, ethical values, personality

INTRODUCTION

A profession is defined as a job that an individual performs to sustain their life, requiring education and work to develop their knowledge and skills [1]. The profession of physiotherapy and rehabilitation is practiced by physiotherapists. The aim of this profession is to help individuals regain their lost functional abilities, whether due to congenital reasons or other causes (accidents, injuries, sports injuries, etc.), maximize their movement capacities throughout their lives, and maintain this maximum level. Additionally, physiotherapists take on roles such as promoting healthy aging, providing preventive healthcare services, and enhancing the quality of life for healthy individuals [2].

When an individual's interests, skills, and personality traits are taken into account during career selection, the individual tends to achieve more successful outcomes in the profession [3]. In order for the profession of physiotherapy to be practiced successfully,

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individuals must possess certain essential qualities. These qualities include good communication skills, the ability to cope with stress, a developed sense of empathy, problem-solving and organizational abilities, good time management, analytical skills, responsibility, and proactivity [4].

An individual's adaptation to a situation or action and their state of readiness is defined as attitude [5,6]. Professional attitude, on the other hand, refers to the emotional inclination that employees have towards their profession. The factors that determine a worker's professional attitude are based on their feelings and thoughts about the functions of their profession and its place in society. The professional attitude formed by the employee influences how the profession is practiced [7].

Ethics can be defined as the evaluation of an event or behavior as right or wrong. Just as there are ethical values to follow in many stages of daily life, there are also professional ethical values that must be adhered to in work life. These values include the moral principles, rules, and norms related to the profession [8]. As employees' adherence to professional ethics increases, the respect and trust that the profession receives from society also grow [9]. During the professional training process, it is of great importance for students to receive ethical education, as it plays a key role in their success in the profession and in taking the right steps after graduation [10,11].

There are several studies in the literature investigating the professional awareness of physiotherapy and rehabilitation students [1,12,13]. However, no study has been found that examines the relationship between students' attitudes towards their undergraduate education and profession, their personality traits, and their tendency toward ethical values. The aim of this study is to examine the relationship between the undergraduate education and professional perspective, ethical values orientation, and personality traits of students in the field of physiotherapy and rehabilitation.

MATERIAL AND METHOD

This study was conducted with the participation of 187 students who were enrolled in the undergraduate program of Physiotherapy and Rehabilitation at the Faculty of Health Sciences, Alanya Alaaddin Keykubat University, and volunteered to participate in the study.

Ethical Aspects of the Study

The study was approved by the Non-Interventional Ethics Committee of Alanya Alaaddin Keykubat University (Date: 13.02.2024, Decision number: 02/11). Written informed consent, prepared in accordance with the Helsinki Declaration, was obtained from the students included in the study.

Inclusion Criteria

- Being an undergraduate student enrolled in the Physiotherapy and Rehabilitation Department of the Faculty of Health Sciences at Alanya Alaaddin Keykubat University
- Agreeing to voluntarily participate in the study.

Exclusion Criteria

- Since participants need to be proficient in Turkish to understand the scales used in the study and answer the questions appropriately, students whose native language is not Turkish were excluded from the study.

Evaluation Methods

After obtaining the demographic information of the participants included in the study, their evaluations were conducted using the Physiotherapy Students' Undergraduate Education and Professional Attitudes Survey, the Ten-Item Personality Inventory, and the Ethical Values Orientation Scale. Data were collected through a survey that students could complete themselves via Google Forms.

Demographic Form

Sociodemographic information, including age, gender, class, and the way students chose the physiotherapy and rehabilitation department, was recorded for the participants in the study.

Questionnaire for Physical Therapy Students' Attitudes Toward Their Profession and Education (Q-PTSAPE)

This survey, which was validated and reliability-tested in Turkish by Taşvuran, Horata, and colleagues in 2022, consists of 25 questions. For each question in the survey, there is a rating system based on a 5-point Likert scale, and the highest total score achievable from the survey is 125. A high score indicates that the student has a positive attitude toward the profession and professional education. The survey has four distinct sub-sections, which are as follows: "A = Are students satisfied with their profession/department choice? B = Do students have high expectations for a good future? C = Do students have adequate clinical experience? and D = Are students satisfied with their education?" [14,15].

Ten-Item Personality Inventory (TIPI)

The Ten-Item Personality Inventory, consisting of ten items, was developed by Goslin and colleagues based on the five major personality traits (extraversion, agreeableness, responsibility, emotional stability, and openness). Each item on the scale is rated on a seven-point Likert scale ranging from "strongly disagree (1)" to "strongly agree (7)". This scale, which has been adapted into many languages, was adapted to Turkish culture by Atak in 2013 [16–18].

Ethical Values Orientation Scale (EVOS)

Developed by Kaya, the Ethical Values Orientation Scale consists of 16 items, each rated on a five-point Likert scale ranging from "strongly disagree (1)" to "strongly agree (5)". The scale is divided into three sub-dimensions: "Love-Respect" (items 1–8), "Justice-Honesty" (items 9–13), and "Cooperation" (items 14–16). The higher the score an individual receives from the scale, the more likely they are to be inclined toward ethical values [19,20].

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Statistical Analysis

The effect size calculated in the reference study was found to be high (d=1.09) [21]. Assuming that a similar effect size could be achieved, a power analysis was conducted, and it was determined that with an effect size of d=0.50, and 40 students from each class (a total of 160 volunteers) participating in the study, a power of 85% at a 95% confidence level would be achieved [21]. In line with this, our study was conducted with a total of 187 participants, including 1st, 2nd, 3rd, and 4th-year students from the Physiotherapy and Rehabilitation Department of the Faculty of Health Sciences at Alanya Alaaddin Keykubat University, who volunteered to participate in the study.

Data analysis was performed using SPSS 25.0 software (IBM SPSS Statistics 25 software, Armonk, NY, IBM Corp). According to the results of the Kolmogorov-Smirnov test, the data were found to follow a normal distribution. Continuous variables are expressed as mean±standard deviation, while categorical variables are expressed as frequency and percentage. The relationships between continuous variables with normal distribution were examined using Pearson correlation analysis. The significance level for all statistical analyses was set at 0.05.

RESULTS

Sociodemographic information, such as gender, class level, and reasons for choosing the profession, of the 187 physiotherapy and rehabilitation students included in the study, is detailed in Table 1. According to this, it was determined that 67.4% of the students were female and 32.6% were male. It was found that 29.4% of the students were first-year, 21.9% were second-year, 32.6% were third-year, and 16% were fourth-year students. Furthermore, 82.4% of the students had chosen the physiotherapy and rehabilitation department voluntarily, and 42.8% had chosen the profession because it aligned with their area of interest (Table 1).

Table 1. The sociodemographic information of the participants.

		Mean	SD
Age		**20.60**	**1,86**
		Number	**%**
Gender	**Female**	126	67.4
	Male	61	32.6
Class	**1st class**	55	29.4
	2nd class	41	21.9
	3rd class	61	32.6
	4th class	30	16.0
Did you choose the department willingly?	**Yes**	154	82.4
	No	33	17.6
What is the reason you chose this department?	**To fall within one's area of interest**	80	42.8
	Good job opportunities	54	28.9
	My AYT score is sufficient for university admission	41	21.9
	Family/environment request	36	19.3
	Physiotherapist's advice	34	18.2
	Not to be unemployed	26	13.9
	The location of the department	11	5.9
	Friend's recommendation	10	5.3
	To transfer to another institution	8	4.3
	Family profession	1	0.5

Mean: average, SD: standard deviation, AYT: field competency test

The average and standard deviation of the total scores and sub-parameters of the Q-PTSAPE, EVOS, and TIPI for the physiotherapy and rehabilitation students are provided in Table 2. According to this, the parameter with the highest total score for Q-PTSAPE was education satisfaction (25.29±5.45). This was followed by adequate clinical experience (23.50±6.38), career choice satisfaction (22.88±4.32), and future expectations (17.86±3.60). The highest total score for EVOS was found in the love-respect subparameter (32.99±9.30). This was followed by justice (20.60±5.85) and cooperation (12.19±3.49). When looking at the TIPI scores, it was observed that the students' scores for extraversion (9.84±3.06), emotional stability (8.57±2.83), responsibility (10.58±3), agreeableness (10.66±2.71), and openness to experiences (10.17±2.99) were uniformly distributed (Table 2).

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Table 2. Findings related to professional attitude, ethical values, and personality traits

		Mean	SD
Q-PTSAPE	**Section A (Job selection satisfaction)**	22.88	4.32
	Section B (Future expectations)	17.86	3.60
	Section C (Sufficient clinical experience)	23.50	6.38
	Section D (Educational satisfaction)	25.29	5.45
	Total	89.52	16.01
EVOS	**Love and respect**	32.99	9.30
	Justice	20.60	5.85
	Collaboration	12.19	3.49
	Total	65.78	18.19
TIPI	**Extraversion**	9.84	3.06
	Emotional stability	8.57	2.83
	Responsibility	10.58	3.00
	Soft-headedness	10.66	2.71
	Openness to experiences	10.17	2.99

Mean: average, SD: standard deviation, Q-PTSAPE: Questionnaire for Physical Therapy Students' Attitudes Toward Their Profession and Education, EVOS: Ethical Values Orientation Scale, TIPI: Ten-item Personality Scale

The relationship between the Q-PTSAPE, EVOS, and TIPI for physiotherapy and rehabilitation students is detailed in Table 3. A statistically significant negative relationship was found between the "future expectations" subscale of Q-PTSAPE and the "love-respect" subscale (p=0.024, r=-0.165) and the total score (p=0.046, r=-0.146) of EVOS (Table 3).

Table 3. The relationship between professional attitude, ethical values, and personality

			Q-PTSAPE					EVOS			
			A section	B section	C section	D section	Total	Love and respect	Justice	Collaboration	Total
EVOS	**Love and respect**	**r**	-0.034	-0.165*	-0.099	0.001	-0.085				
		p	0.644	0.024	0.178	0.994	0.245				
	Justice	**r**	-0.004	-0.135	-0.086	0.021	-0.058				
		p	0.958	0.065	0.243	0.771	0.428				
	Collaboration	**r**	0.030	-0.095	-0.050	0.023	-0.025				
		p	0.679	0.198	0.499	0.757	0.733				
	Total	**r**	-0.013	-0.146*	-0.088	0.012	-0.067				
		p	0.862	0.046	0.233	0.875	0.361				
TIPI	**Extraverted**	**r**	-0.002	-0.016	0.061	0.074	0.045	0.408*	0.366*	0.462*	0.415*
		p	0.975	0.826	0.409	0.316	0.541	0.000	0.000	0.000	0.000
	Emotional stability	**r**	0.159*	0.141	0.150*	0.242*	0.217*	0.187*	0.180*	0.183*	0.188*
		p	0.030	0.054	0.040	0.001	0.003	0.010	0.014	0.012	0.010
	Responsibility	**r**	0.065	0.094	0.100	0.225*	0.155*	0.426*	0.382*	0.404*	0.418*
		p	0.374	0.198	0.174	0.002	0.034	0.000	0.000	0.000	0.000
	Agreeableness	**r**	0.034	-0.059	-0.008	0.077	0.019	0.482*	0.448*	0.493*	0.485*
		p	0.648	0.426	0.909	0.297	0.800	0.000	0.000	0.000	0.000
	Openness to experience	**r**	-0.073	-0.052	-0.019	0.069	-0.015	0.358*	0.314*	0.367*	0.354*
		p	0.320	0.481	0.799	0.346	0.836	0.000	0.000	0.000	0.000

Q-PTSAPE: Questionnaire for Physical Therapy Students' Attitudes Toward Their Profession and Education, EVOS: Ethical Values Orientation Scale, TIPI: Ten-Item Personality Scale, r: Pearson correlation analysis

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A statistically significant positive relationship was found between the "emotional stability" subscale of TIPI and the "career choice satisfaction" (p=0.030, r=0.159), "adequate clinical experience" (p=0.040, r=0.150), "education satisfaction" (p=0.001, r=0.242) subscales, and the total score (p=0.003, r=0.217) of Q-PTSAPE. A positive significant relationship was also observed between the "responsibility" subscale of TIPI and the "education satisfaction" subscale (p=0.002, r=0.225) and the total score (p=0.034, r=0.155) of Q-PTSAPE (Table 3).

A positive relationship was found between the subscales of TIPI, including "extraversion" (p=0.000, r=0.415), "emotional stability" (p=0.010, r=0.188), "responsibility" (p=0.000, r=0.418), "agreeableness" (p=0.000, r=0.485), and "openness to experiences" (p=0.000, r=0.354) and the total score of EVOS. Additionally, a statistically significant positive relationship was found between TIPI and all subscales of EVOS (Table 3).

DISCUSSION

In this study, the relationships between physiotherapy and rehabilitation students' undergraduate education, professional perspectives, ethical values orientation, and personality traits were examined in detail. The findings showed that students' voluntary choice of their department had a significant impact on their professional attitude and ethical values orientation. A review of the literature indicates that individuals who choose their department voluntarily tend to show a more committed and careful approach to their profession [22]. These findings support the impact of our study on students' future goals and ethical values.

The relationships between personality traits and professional success are striking. It has been observed that individuals who are extroverted and have a high sense of responsibility are more satisfied with their profession and have positive expectations for the future. This finding aligns with studies in the literature that emphasize the importance of responsibility and discipline [22,23]. Additionally, it has been suggested that the personality traits of female students may influence their interest in the physiotherapy profession.

In the context of ethical values, it is noteworthy that students scored high in the love and respect dimensions. This supports studies that emphasize the importance of empathy and respect for others in professional success. In research by Hernando et al., which examined the ethical values of university students, the most common ethical value was respect, which includes basic respect for others' ideas and values, covering both classmates and academics [24,25]. Additionally, VanderKaay et al. [26] emphasized that ethical decision-making skills enhance clinical performance. In the study by Akyürek and Yenel [10], which examined university students' orientation to ethical values based on demographic variables, it was stated that university students place more importance on love and respect than other ethical values.

The study by Mercader et al. highlights the impact of ethical values on social commitment and social responsibility [25]. In this regard, having high levels of social commitment, social sensitivity, and social responsibility skills are key factors that enhance the ability to empathize. A high ability to empathize leads to tolerance towards individuals with differences and the development of helping skills [27,28]. Especially, the ability to empathize is an important concept in healthcare professionals and emphasizes the significance of personal characteristics of healthcare professionals in improving healthcare systems [29]. Studies have shown that students studying health sciences have higher levels of empathy compared to students in other fields [30].

The tendency of university students towards ethical values determines their level of adopting and applying ethical principles and increases the likelihood of displaying behavior in line with these principles in their professional lives [10]. The literature emphasizes that the tendency towards ethical values is crucial for fulfilling professional duties and responsibilities in individuals working in the healthcare field [20]. Aydın et al., in their study, stated that students in the health sciences field have a high tendency towards ethical values [31]. Our study shows a positive relationship between the professional future expectations and the tendency towards ethical values of physiotherapy students.

Kırca et al., in their study evaluating the tendency of nursing students towards ethical values, found that students who studied nursing with love and voluntarily had a higher tendency towards ethical values compared to those who did not enjoy studying the field [20]. However, contrary to these findings, there are studies that suggest no significant relationship between students' satisfaction with their program and their tendency toward ethical values [11]. Despite all the contradictions, studies on ethical awareness show that individuals capable of making high-level ethical decisions have better clinical performance [26]. In this regard, physiotherapists working with disadvantaged groups must respect individuals' expectations from life and treatment, as well as their interests and lifestyles, to increase treatment effectiveness. It is essential to emphasize that this requires a strong inclination towards ethical values, ethical awareness, and empathy. In our study, the high ethical scores of physiotherapy students in the love and respect sub-dimension support this perspective.

CONCLUSION

This study comprehensively evaluated the relationship between physiotherapy and rehabilitation students' undergraduate education, professional attitudes, inclination towards ethical values, and personality traits. The findings indicate that students' voluntary choice of their department positively affects their professional attitudes and inclination towards ethical values. This result is consistent with studies in the literature that show individuals who make their career choice consciously exhibit higher professional satisfaction and commitment.

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In the context of personality traits, it has been observed that emotional stability, a sense of responsibility, and extraversion have a significant impact on professional success and satisfaction. This finding is supported by existing literature that emphasizes the importance of responsibility and discipline in professional life. In particular, the high scores obtained in the love and respect sub-dimensions of ethical values indicate that students understand the critical importance of empathy and respect for others in healthcare professions.

The positive relationship between ethical awareness and professional attitude suggests that students' competence in ethical decision-making processes positively influences their clinical performance. Empathy, a vital component for healthcare professionals, was found to be at a high level among physiotherapy students, indicating that these individuals are well-equipped to provide patient-centered care. This finding highlights the importance of cultivating empathy as it directly supports the students' ability to deliver effective, compassionate care in clinical settings.

In conclusion, the positive attitudes of physiotherapy students towards their profession, their personality traits, and their inclination towards ethical values are promising for their future professional success and contributions to public health. These findings once again emphasize the importance of enhancing ethical awareness and supporting personal development during the undergraduate education process. Strengthening ethical education within training programs will be a crucial step toward improving professional competence and societal sensitivity.

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 study was approved by the Non-Interventional Ethics Committee of Alanya Alaaddin Keykubat University (Date: 13.02.2024, Decision number: 02/11).

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