

## An Important Risk Factor for Nursing Students: Sharp Instrument Injuries

## Hemşirelik Öğrencileri İçin Önemli Bir Risk Faktörü: Kesici-Delici Alet Yaralanmaları

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## ABSTRACT

**Objective:** Sharp instrument injuries constitute a significant occupational risk for nursing students, exposing them to blood-borne pathogens. This study aimed to investigate the prevalence, causes, and outcomes of sharp instrument injuries among fourth-year nursing students during their clinical training.

**Materials and Methods:** This prospective and descriptive study was conducted with 190 fourth-year nursing students at a university in Türkiye during the 2022–2023 academic year. Students were divided into two groups, each completing a 14-week clinical placement in either the fall or spring semester. Data were collected using a structured case reporting form and analyzed with descriptive statistics.

**Results:** Sharp instrument injuries occurred in 14.7% of students. The most frequent procedures leading to injury were subcutaneous injections (32.1%) and recapping needles (50.0%). Injuries were most common in internal medicine departments (39.3%) and peaked between days 21 and 40 of clinical practice (42.9%). Primary contributing factors included carelessness (64.3%), insufficient supplies (50.0%), and lack of experience (32.1%). Emotional responses to injury included anxiety (64.3%) and fear (50.0%). All affected students received follow-up care, with no seroconversion for HIV, HBV, or HCV reported.

**Conclusions:** Sharp instrument injuries pose a notable occupational risk for nursing students, primarily due to inexperience, inadequate equipment, and unsafe practices. While simulation training may lower injury rates, increased confidence and speed during clinical placements can heighten risk. Strengthening curricula on safe practices, ensuring supervision, and offering emotional support are key to reducing injuries and enhancing clinical learning.

**Keywords:** Nursing education, nursing students, occupational exposure, sharps injuries, workplace safety

## ÖZ

**Amaç:** Kesici-delici alet yaralanmaları, hemşirelik öğrencileri için önemli bir mesleki risk oluşturarak onları kan yoluyla bulaşan patojenlere maruz bırakmaktadır. Bu çalışmanın amacı, dördüncü sınıf hemşirelik öğrencilerinin klinik uygulamaları sırasında yaşadıkları kesici-delici alet yaralanmaları sıklığını, nedenlerini ve sonuçlarını araştırmaktır.

**Materyal ve Metot:** Bu prospektif ve tanımlayıcı çalışma, 2022-2023 akademik yılında Türkiye'deki bir üniversitede 190 dördüncü sınıf hemşirelik öğrencisi ile yürütülmüştür. Öğrenciler, her biri güz ya da bahar döneminde 14 haftalık bir klinik stajı tamamlayan iki gruba ayrılmıştır. Veriler yapılandırılmış bir vaka raporlama formu kullanılarak toplanmış ve tanımlayıcı istatistiklerle analiz edilmiştir.

**Bulgular:** Öğrencilerin %14,7'si kesici-delici alet yaralanmaları yaşamıştır. Yaralanmaya en sık neden olan işlemler subkutan enjeksiyonlar (%32,1) ve iğne kapatma işlemleri (%50,0) olmuştur. Yaralanmalar en fazla dâhiliye servisinde (%39,3) görülmüş ve klinik uygulamanın 21–40. günleri arasında en yüksek seviyeye ulaşmıştır (%42,9). Başlıca nedenler dikkatsizlik (%64,3), yetersiz malzeme (%50,0) ve deneyimsizlik (%32,1) olarak belirlenmiştir. Yaralanmalara verilen duygusal tepkiler arasında kaygı (%64,3) ve korku (%50,0) öne çıkmıştır. Yaralanan tüm öğrencilere takip bakımı sağlanmış olup, HIV, HBV veya HCV serokonversiyonu gözlenmemiştir.

**Sonuç:** Bulgular, hemşirelik öğrencilerinde görülen kesici-delici alet yaralanmalarının büyük ölçüde deneyimsizlik, yetersiz ekipman ve güvensiz uygulamalarla ilişkili olduğunu göstermektedir. Simülasyon temelli eğitim yaralanma oranlarını azaltabilirken, klinik uygulama sırasında artan güven ve işlem hızının riski artırabileceği belirtilmiştir. Klinik uygulamalarda güvenliğe odaklanan müfredatların geliştirilmesi, sıkı gözetim sağlanması ve duygusal destek sunulması hem yaralanma oranlarını azaltmak hem de öğrencilerin klinik öğrenme deneyimlerini ve mesleki gelişimlerini iyileştirmek açısından temel stratejiler olarak önerilmektedir.

**Anahtar Kelimeler:** Hemşirelik eğitimi, hemşirelik öğrencileri, iş yeri güvenliği, kesici-delici alet yaralanmaları, mesleki maruziyet

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## INTRODUCTION

Sharp instrument injuries (SIIs) refer to injuries caused by tools such as needles and scalpels used in healthcare settings. These injuries are one of the major occupational risks and significantly contribute to the transmission of blood-borne infections. According to data provided by the WHO, SIIs account for 39% of Hepatitis C, 37% of Hepatitis B, and 4.4% of HIV infections among healthcare workers globally.<sup>1,2</sup>

Due to their active involvement in patient care during clinical training, nursing students have increased exposure to sharp instruments and injury risk.<sup>3</sup> Compared to experienced nurses, they often lack the clinical competence needed to handle these instruments safely. According to Benner's model, clinical competence develops through five stages: novice, advanced beginner, competent, proficient, and expert.<sup>4</sup> Therefore, nursing students are more vulnerable to sharp instrument injuries during early training.<sup>5</sup> Reported prevalence rates for SIIs among healthcare workers vary between 41.5% and 64.9%.<sup>6-8</sup> Among nursing students, findings in the literature show considerable variation, with prevalence ranging from 18.8% to 71%, depending on the country, study year, and methodology. Among nursing students, prevalence rates vary depending on country, study year, and methodology. Reported rates include 60.3% in China,<sup>9</sup> 19.4% in Türkiye,<sup>10</sup> 71% in Vietnam,<sup>11</sup> 49% in another study conducted in Türkiye,<sup>12</sup> 35% in a systematic review encompassing multiple countries,<sup>13</sup> and 18.8% in Taiwan.<sup>14</sup> Despite their frequency, many SIIs remain unreported, with underreporting rates between 39.5% and 86.9%.<sup>5,9,13,15</sup> These injuries typically occur in clinical settings, training hospitals, and laboratories, often due to unsafe practices such as recapping needles<sup>9,12</sup> and improper disposal<sup>9,11</sup> during procedures. Studies underline the need for safe equipment, personal protective tools, and better training to prevent such incidents.<sup>9,10,12,13,16</sup>

Beyond physical effects, SIIs can lead to psychological consequences. Affected individuals may experience anxiety, fear, or panic<sup>17-19</sup> and elevated levels of stress and depression have been observed.<sup>20</sup> Among students, such injuries may reduce confidence in clinical practice, provoke fear, and negatively affect academic performance.<sup>21,22</sup>

These findings reveal the importance of sharps injuries in terms of both clinical and psychological effects. However, it is stated that the majority of students do not report injuries due to anxiety and fear.<sup>23</sup> This study aimed to investigate the prevalence, causes, and outcomes of SIIs among fourth-year nursing students during clinical training. Unlike previous studies that rely on retrospective recall, it uses a pro-

spective design to document injuries in real time, providing more accurate data to support prevention and educational efforts.

## MATERIALS AND METHODS

**Ethics Committee Approval:** For the implementation of the study, ethics committee approval was obtained from Duzce University Scientific Research and Publication Ethics Committee (Date: 20.10.2022, decision no: 22/417). Before starting data collection, institutional permissions and verbal and written consent were obtained from all student nurses participating in the study.

**Type of Research:** The study was conducted with a prospective design to examine sharp instrument injuries among nursing students and to determine their causes.

**Range and Sample of the Research:** The study was conducted between October 2022 and June 2023 with fourth-year nursing students (N=190) at a university in Türkiye. Before starting clinical practice, all students received 16 hours of occupational health and safety training, including approximately three hours on the prevention of sharp instrument injuries. The clinical practice was carried out four days a week in the inpatient clinics of the university hospital under nurse supervision and lasted a total of 56 days. During this period, students performed invasive procedures on real patients for the first time. The students were divided into two groups, with one group completing their training in the fall semester and the other in the spring semester. All internship participants were included in the study.

**Data Collection Methods:** Personal Information Form and Case Report Form were used in data collection. The Case Report Form was created by the researchers. This form consists of 12 questions and includes questions such as date, time, place, region, severity of the injury, how the injury occurred, and contamination status of the sharp object.

**Data Collection:** A total of 190 students were followed up by researchers during the internship period in the fall semester (95) and spring semester (95) for two 14-week academic terms. In the event of a contaminated SII, the student was given the necessary support by a researcher, and data was collected by meeting with the student face-to-face within 8 hours. Non-contaminated SII (such as glass stuck in the hand while breaking medicine ampoules) were determined as an exclusion criterion.

**Statistical Analysis:** The study consists of data from 190 participants. Analyses were conducted using the IBM SPSS Statistics 26 software. Frequencies (number, percentage) were calculated for categorical variables, while descriptive statistics (mean, standard deviation) were used for numerical variables.

## RESULTS

The students were  $21.8 \pm 1.8$  years old on average, 75.3% female, 24.7% male. All students were tested for HIV, Hepatitis B and Hepatitis C before starting the internship, and no problems were detected. In addition, all students completed their Hepatitis B vaccinations before the internship. Of the students we followed, 85.3% were not injured, 13.7% ( $n=26$ ) were injured once, 1% ( $n=2$ ) were injured twice, and 14.7% ( $n=28$ ) were injured with sharp objects (Table 1).

Of the students who experienced needlestick injuries, 32.1% experienced injuries while performing subcutaneous injections, 50% while closing the nee-

dle cap, and 39.3% in internal medicine clinics. Most of the students (64.3%) stated that they acted carelessly, and 50% experienced a problem with insufficient supplies. In addition, half of the students who experienced needlestick injuries stated that they felt fear after the incident (Table 2).

When we examine the distribution of injuries by day, it is seen that injuries begin from the third day and continue in the following days with experience. In addition, 42.9% of the students experienced injuries between the 21st and 40th days of their internship (Figure 1).

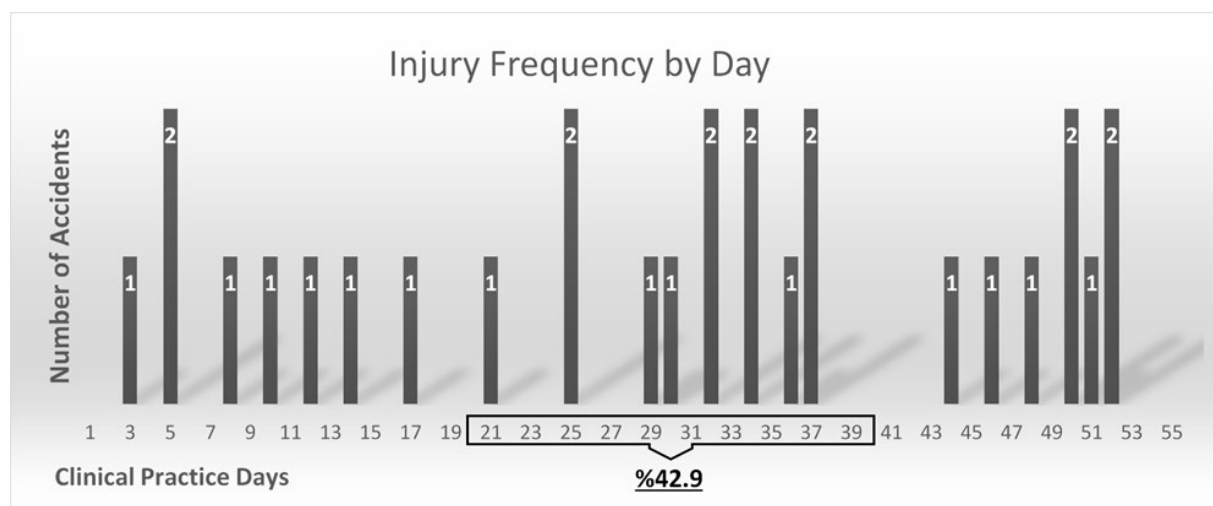
**Table 1.** Demographics and contaminated SII occurrence ( $n=190$ ).

| Information        |               | Data           |
|--------------------|---------------|----------------|
| Age, Mean $\pm$ SD |               | 21.8 $\pm$ 1.8 |
| Sex, n (%)         | Male          | 47 (24.7)      |
|                    | Female        | 143 (75.3)     |
|                    | No injuries   | 162 (85.3)     |
| Injuries, n (%)    | Injured once  | 26 (13.7)      |
|                    | Injured twice | 2 (1.0)        |

**Table 2.** SII: Characteristics, causes and emotional reactions ( $n=28$ ).

| Information  |   | Data      |
|--|---|-----------|
| Procedures in which SIIs occurred, n (%)               | Subcutaneous injection                            | 9 (32.1)  |
|  | Blood glucose measurement                         | 7 (25)    |
|  | Intramuscular injection                           | 5 (14.3)  |
|  | Withdrawing blood                                 | 3 (10.7)  |
|  | Intravenous catheterization                       | 2 (7.1)   |
|  | Disposing of medical waste                        | 2 (7.1)   |
| Stage of the procedures where the SIIs occurred, n (%) | During the needle cap closing                     | 14 (50)   |
|  | During the actual procedure                       | 11 (39.3) |
|  | While throwing away the waste                     | 3 (10.7)  |
| Clinics, n (%)   | Internal clinic                                   | 11 (39.3) |
|  | Surgical clinic                                   | 7 (25)    |
|  | Labour ward                                       | 6 (21.4)  |
|  | Emergency ward                                    | 3 (10.7)  |
| Reasons Expressed, n (%)                               | Paediatrics ward                                  | 1 (3.6)   |
|  | Being careless                                    | 18 (64.3) |
|  | Being in a rush                                   | 7 (25)    |
| Problems Experienced, n (%)                            | Patients' sudden movements                        | 3 (10.7)  |
|  | Insufficient supplies (such as no treatment tray) | 14 (50)   |
|  | Inexperience                                      | 9 (32.1)  |
|  | Misdirection by nurse                             | 5 (17.9)  |
| *Post-injury Emotions, n (%)                           | Worry   | 18 (64.3) |
|  | Fear  | 14 (50)   |
|  | Sadness   | 6 (21.4)  |

\*: More than one emotion was expressed.



**Figure 1.** Injury frequency by day.

In the controls performed after the injury, it was determined that the needles to which 89.3% of the students were exposed were not contaminated with HIV, HBV or HCV. However, it was determined that the needles with which two students were injured were contaminated with HBV and one student

was injured with a needle whose infectious disease status was unknown. All students who were injured were monitored for HIV, HBV and HCV, and no evidence of infection was detected in the first six months of serological blood test results (Table 3).

**Table 3.** Contaminated materials and 6th month control results (n=28).

| Information                   | Data                       | Students' 6-month serological blood test results |
|-------------------------------|----------------------------|--|
| Uncontaminated needles, n (%) | HIV, HBV, HCV<br>25 (89.3) | Negative   |
| Contaminated needles, n (%)   | HBV<br>2 (7.1)             | Negative   |
| Unknown source, n (%)         | 1 (3.6)                    | Negative   |

## DISCUSSION AND CONCLUSION

SIIs pose the greatest threat to nursing students during clinical practice due to the risk of accidental exposure to body fluids and infected blood. In the current study, 13.7% of the students we followed for 14 weeks in two academic terms experienced a sharp object injury, 1% twice, and a total of 14.7% of the students experienced a sharp object injury. When the literature is examined, different results are observed worldwide, ranging from 14.1% to 64.5%.<sup>13,15,23-26</sup>

In a meta-analysis analyzing the prevalence of needlestick injuries in nursing students, articles between 2002 and 2021 were examined. The lowest overall prevalence was stated as 6%, and the highest as 51%. In addition, this study stated that it was 38% in Asian countries, 9% in the United States, and 30% in European countries.<sup>27</sup> When the results of this study are compared with the world literature, it is seen that it is at a very good level compared to other regions, except the United States. When cur-

rent studies across Türkiye are examined, two studies stand out. In the first study, the SII rate of nursing students who practiced for four years was reported as 31%.<sup>28</sup> Another study conducted five years ago in the nursing department where this study was conducted reported the SII rate of nursing students as 27.8%.<sup>22</sup> Five years ago, this study found that students practiced at the patient's bedside across all grade levels due to the lack of a simulation laboratory. In this context, it is evaluated that the SII rates of students who practiced at the patient's bedside in the fourth grade decreased significantly after practicing in the simulation laboratory during the first, second and third grades.

Of the students who experienced a sharp object injury, 32.1% experienced injuries while performing a subcutaneous injection and 50% while recapping needles. When the literature is examined, "recapping the previously used syringes" is stated as the most common cause of SIIs.<sup>22,23,26,28</sup> The tiny and thin

needles used for subcutaneous injections make closure more difficult. A study on nurses showed that removing and/or replacing needle caps with bare hands was associated with a higher incidence of sharps injuries associated with insulin injection.<sup>29</sup> These findings highlight the need to avoid needle recapping strictly and to implement safer injection practices—particularly during subcutaneous procedures—to reduce sharp instrument injuries among nursing students effectively.

According to the study findings, nursing students experienced the most injuries in 39.3% of the internal medicine clinics, and 42.9% of them experienced injuries between the 21st and 40th days of their internship. In studies conducted in Türkiye, similar to the study, most injuries occurred in an internal medicine clinic.<sup>15,28,30</sup> The increase in the number of subcutaneous injections in treatment protocols at internal medicine clinics may explain this rise.

In the current study, injury rates were found to increase during the middle stages of clinical practice, coinciding with periods of greater procedural experience compared to the beginning of training. While the literature often attributes high rates of sharps injuries among nursing students to their inexperience,<sup>12</sup> our findings suggest that the accumulation of experience and the resulting self-confidence may paradoxically contribute to an increased risk of injury.

Specifically, 64.3% of students reported injuries due to carelessness and 17.9% due to rushing, supporting the notion that increased procedural workload and overconfidence may lead to lapses in attention and safety practices. Similarly, Palloş et al.<sup>15</sup> identified carelessness (51.1%) and rushing (27.7%) as the most common causes of injuries among nursing students. To mitigate injuries resulting from carelessness, it is essential to cultivate a strong culture of safety through continuous clinical mentoring, regular skill-based assessments, and reflective practices that encourage students to evaluate their actions and maintain focus during procedures critically.

Nevertheless, a notable proportion of students (32.1%) in our study reported that a lack of experience was also a contributing factor to their injuries. Consistently, previous research indicated that approximately 70% of students suffered needlestick injuries due to insufficient manual skills, attributable to limited experience.<sup>12</sup> Moreover, external factors such as a lack of supplies and unpredictable patient reactions were reported to have contributed to injury occurrence during clinical practice.

In addition to physical injuries, emotional reactions were frequently reported by students following sharp injuries. In our study, 64% of nursing students stated that they experienced anxiety, and 53.6% reported feelings of fear after injuries. This is consistent with

previous findings, where anxiety and fear were reported by 43.4–55.3% of nursing students following needlestick injuries.<sup>15,25</sup> Similarly, studies conducted among nurses have shown that emotional changes following sharp injuries are common, with 58.6% of nurses reporting emotional distress.<sup>29</sup> Furthermore, fear of negative consequences may prevent students from reporting incidents, as indicated in previous studies.<sup>23</sup>

In conclusion, this study examines the incidence, underlying causes, and consequences of sharp instrument injuries among nursing students during their clinical placements. The results indicate that such injuries predominantly stem from inexperience, lapses in attention, and insufficient access to appropriate equipment. Furthermore, students frequently report experiencing emotional responses such as anxiety and fear following these incidents. The findings suggest that training conducted within simulation laboratories may contribute to a reduction in the occurrence of injuries. Nevertheless, as students gain confidence and clinical exposure, an associated risk of increased injury rates may emerge, possibly due to overconfidence or complacency. These outcomes underscore the urgent need to strengthen safe practice strategies within nursing education curricula. Moreover, ensuring robust supervision and implementing comprehensive support systems to address the emotional well-being of students are essential components in fostering both safety and resilience. By prioritizing injury prevention and promoting a culture of safety, nursing education programs can make a substantial contribution to the professional development of future nurses. This study was conducted at a single institution, which may limit the generalizability of the findings. Moreover, the low number of contaminated sharp object injury cases made it impractical to perform inferential statistical analyses such as chi-square or regression, as meaningful subgroup comparisons could not be achieved. Future research should involve multicenter studies with larger sample sizes to enhance generalizability and examine additional factors—such as institutional protocols, reporting practices, and coping strategies—that may influence the incidence and management of sharp instrument injuries among nursing students.

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