

An Evaluation and Comparison of Needlestick and Sharps Injuries to Students in Different Healthcare Sciences Departments

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Abstract

Objectives: The aim of this study was to determine the frequency of occupational needlestick and sharps injuries in students in different departments of the Health Sciences Faculty, and to determine and compare the reasons for these injuries. **Methods:** This study is cross sectional type. Total of 840 (1st year students were not included) registered university students were identified and it was planned to contact all the students without selective sampling. **Results:** A total of 649 students voluntarily participated in the study. While injuries are seen more often in the departments (such as; nursing, midwifery, anesthesia) applying medical treatment. **Conclusion:** In respect of students exposed to occupational injuries while participating in clinical applications, it is also important that the necessary protective measures are taken by the institution that students are not left unsupervised in the application of medical treatment, that students are immunized and are educated in protection against occupational injuries.

Keywords: Needlestick; Sharps; Injuries; Healthcare Science; Student

Introduction

Throughout the world, approximately more than 59 million healthcare personnel face several occupational risks each day. Occupational exposure to biological agents in particular may be life-threatening. [1] In addition, occupational exposure to blood or body fluids is widely recognized as a major threat for transmitting blood-borne pathogens. The OSHA, CDC and WHO recommend that precautions are taken to protect healthcare workers against occupational risks.

Primary of these precautions is immunization against biological agents that constitute occupational risks and recording injuries that occur. Despite these precautions, 3 million of 35 million healthcare workers around the world are exposed to pathogens through blood and blood products, 2 million of which are hepatitis B virus, 0.9 million, hepatitis C virus and 170,000, HIV. Of these injuries, 15,000 result in HCV, 70,000 in HBV and 1000 in HIV. Moreover, 90% of these injuries occur in developed countries. [2] Different occupational groups are exposed to needlestick and sharps injuries, and it has been reported that anaesthetists, nurses and radiologists experience these injuries more than those in other occupations. [3-5]

Students in Health Sciences faculties may also be exposed to occupational risks just as much as healthcare personnel. During student training, it is important that protective measures are taken, awareness is formed of the occupational risks and gaps in knowledge are removed to reduce exposure to biological agents. In a study in Turkey that compared midwifery and nursing students, it was reported that 59.3% of the midwifery students and 58.5% of the nursing students had experienced needlestick

injuries during clinical applications. [6] Factors such as lack of clinical experience, lack of knowledge and lack of manual skills increase the exposure to occupational needlestick and sharps injuries. [7]

Management of the occupational exposure of healthcare personnel starts in the training period and continues after graduation. The concept of healthcare personnel within the WHO guidelines and occupational precautions includes all healthcare workers and students studying health sciences. However, despite the implementation in many countries of information about precautions against occupational risks during training, guidelines for protection, and immunization services, the incidence of occupational injuries is known to be high, and apart from local studies, there are no comprehensive global data about the exposure of students.

In accordance with CDC and WHO recommendations, healthcare institutions in Turkey have established infection control committees and personnel health units for the management of occupational risks in the field of healthcare. These units monitor all healthcare personnel, including students, in respect of occupational risks, and help to maintain training and other legally required procedures. Before students participate in

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clinical applications in the faculties where they are training, they are vaccinated against Hepatitis B and receive training in the management of occupational risk and clinic orientation.

The aim of this study was to determine the frequency of occupational needlestick and sharps injuries in students in different departments of the Health Sciences Faculty, and to determine and compare the reasons for these injuries.

Research Methodology

This study is cross sectional type. The research population was formed from 1500 university students, who were studying within the framework of health sciences (nursing, midwifery, anesthesia, emergency response and first aid, geriatric care, physiotherapy, medical documentation and secretarial studies, medical laboratory technicians) in the Kahramanmaraş Sutcu Imam University, south of Turkey. In the spring term of 2017-2018, a total of 840 registered students were identified (1st year students were not included). It was planned to contact all the students without selective sampling. A total of 649 students voluntarily participated in the study, giving an inclusion rate of 77.2%.

Within Health Sciences faculties in Turkey, the course duration in nursing and midwifery departments is a total of 4 years, with the last 3 years including both theory and practical clinical applications. The duration of anaesthesia, emergency response and first aid, geriatric care, physiotherapy, medical documentation and secretarial studies, and medical laboratory technician units are 2 years, with theory and clinical applications in the final year, and these educational courses are given within

the Health Sciences Vocational Further Education Colleges. First-year students were not included in the research as they are not trained in clinical applications.

Following a scan of the relevant literature, a questionnaire was prepared by the researchers. The data collected in the questionnaire comprised socio-demographic characteristics and information about needlestick and sharps injuries (40 items).

The data were analyzed statistically using SPSS version 22.0 software. Results were stated as mean ± standard deviation (SD) values. Comparisons of occupational risk exposure according to department and socio-demographic characteristics were made using Chi-square analysis. A logistic regression model was formed of the departments and the occupational injury status, and comparisons were made. Data were analyzed in a 95% confidence interval (CI). A value of p<0.05 was accepted as statistically significant.

Results

The socio-demographic characteristics of the students are shown in Table 1. The students included in the study had a mean age of 20.51±1.96 years, with 60.2% aged <20 years. The majority of the students were female and in the second year of study. The departments in which the study participants were studying were nursing, midwifery, anaesthesia, medical secretarial studies, medical laboratory technician, geriatric care, emergency response, and physiotherapy, respectively. An occupational needlestick or sharps injury within the last year was reported by 43.9% of the students, and of this group, 55.4% were aged <20 years, 81.8% were female and 52.6% were in the

Table 1: Comparison of the socio-demographic variables of students and the frequency of occupational injuries.

Variables	Total		Frequency of Occupational Injuries		x /p**
	n	%*	Yes n (%*)	No n (%*)	
Age <20 years	391	60.2	158 (55.4)	233 (64.0)	6.124/ 0.040
21-22 years	204	30.5	104 (36.5)	100 (27.5)	
>23 years	54	8.3	23 (8.1)	31 (8.5)	
Gender					6.773/ 0.006
Female	499	76.9	233 (81.8)	266 (73.1)	
Male	150	23.1	52 (18.2)	98 (26.9)	
Year of study					43.279/ 0.000
2nd	415	63.9	150 (52.6)	265 (72.8)	
3rd	126	19.4	58 (20.4)	68 (18.7)	
4th	108	16.6	77 (27.0)	31 (8.5)	
Department					89.687/ 0.000
Nursing	199	30.7	109 (38.2)	90 (24.7)	
Midwifery	131	20.2	82 (28.8)	49 (13.5)	
Anesthesia	87	13.4	45 (15.8)	42 (11.5)	
Physiotherapy	28	4.3	11 (3.9)	17 (4.7)	
Emergency Technician	37	5.7	8 (2.8)	29 (8.0)	
Medical Secretary	65	10.0	4 (1.4)	61 (16.8)	
Geriatric Care	45	6.9	12 (4.2)	33 (9.1)	
Medical Laboratory Technician	57	8.8	14 (4.9)	44 (11.8)	
Total	649	100.0	285 (43.9)	364 (56.1)	

*Column Percentage **Chi-square test p<0.05

second year of study. When evaluated according to department, the students who had experienced injury within the last year were in the nursing (38.2%), midwifery (28.8%), anaesthesia (15.8%), physiotherapy (39%), medical laboratory technician (4.9%), geriatric care (4.2%), emergency response (2.8%) and medical secretarial studies (1.4%) departments [Table 1].

Comparisons of some characteristics of the needlestick and sharps injuries according to department are shown in Table 2. More than half of the students who experienced a needlestick or sharps injury within the last 12 months were in the midwifery, nursing and anaesthesia departments.

Students in the medical secretarial studies department experienced the fewest needlestick and sharps injuries in the previous year. When the contamination status of the material causing the injury was questioned, 23.9% of the students stated that they were injured with contaminated material. Nearly all of the injuries (97.9%) were to the hands. Most of the injuries occurred while preparing treatment, taking blood or performing an injection. Of the nursing students, 27.5% were injured with contaminated material, 51.4% with an injector needle, 33.9%

while performing an injection and almost all were injured in the hands.

Half of the emergency medicine technicians and geriatric care students were injured with infected material and none of the medical secretarial studies students. The materials causing the most injuries were injector needle, followed by broken ampoule glass fragments. Other than the hands as the body area injured, 1 student in midwifery was injured in the abdomen and 1 student from the midwifery, nursing and physiotherapy departments in the arm. Although the reasons for the injury varied according to the departments, it was seen to be generally while performing an injection, taking blood or breaking an ampoule. Students in the medical secretarial studies department reported that they were injured by sharp materials in the working environment, and all of these stated that the injury occurred in the pathology or other laboratory secretarial units. The mean number of injuries within the previous year is shown in Table 3. The frequency of injuries of the students was 0.53±1.25 (min.-max.:1-10). Within the 1-year period, the most frequently injured students were seen to be those in the nursing and anaesthesia departments.

Table 2: Characteristics of needlestick injuries according to departments.

Variables of Occupational Exposure	Departments of Health Science									X ² /p**	
	Total n=285 n (%)	Nursing n=199 n (%)	Midwifery n=131 n (%)	Anesthesia n=87 n (%)	Physiotherapy n=28 n (%)	Emergency Technician n=37 n (%)	Medical Secretary n=65 n (%)	Geriatric Care n=45 n (%)	Medical Laboratory Technician n=57 n (%)		
Needlestick injury within the last year											
Yes	285 (43.9)	109 (54.8)	82 (62.6)	45 (51.7)	11 (39.3)	8 (21.6)	4 (6.2)	12 (26.7)	14 (24.6)	57.805/ 0.000	
No	364 (56.1)	90 (45.2)	49 (37.4)	42 (48.3)	17 (60.7)	29 (78.4)	61 (93.8)	36 (73.3)	43 (75.4)		
Was the last injury with contaminated needle stick materials?											
Yes	68 (23.9)	30 (27.5)	15 (18.3)	6 (13.3)	2 (18.2)	4 (50.0)	0 (0.0)	6 (50.0)	5 (35.7)	30.679/ 0.006	
No	190 (66.7)	69 (63.3)	63 (76.8)	35 (77.8)	7 (63.6)	2 (25.0)	4 (100.0)	6 (50.0)	5 (35.7)		
Unknown	27 (9.5)	10 (9.2)	4 (4.9)	4 (8.9)	2 (18.2)	2 (25.0)	0 (0.0)	0 (0.0)	4 (28.6)		
Needlestick materials											
Injector needle	124 (43.5)	56 (51.4)	38 (46.3)	10 (22.2)	5 (45.5)	3 (37.5)	4 (100.0)	7 (58.3)	5 (35.7)	201.854/0.000	
Intravenous needle	4 (1.4)	0 (0.0)	1 (1.2)	0 (0.0)	1 (9.1)	0 (0.0)	0 (0.0)	0 (0.0)	2 (14.3)		
Intracatheter	24 (8.4)	12 (11.0)	6 (7.3)	2 (4.4)	0 (0.0)	1 (12.5)	0 (0.0)	1 (8.3)	2 (14.3)		
Suture needle	2 (0.7)	0 (0.0)	0 (0.0)	0 (0.0)	1 (9.1)	1 (12.5)	0 (0.0)	0 (0.0)	0 (0.0)		
Lancet needle	4 (1.4)	1 (0.9)	3 (3.7)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)		
Surgical Blade	2 (0.7)	1 (0.9)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	3 (25.1)	1 (7.1)		
Ampoule and glass shards	113 (39.6)	36 (33.0)	33 (40.2)	33 (73.3)	4 (36.3)	3 (37.5)	0 (0.0)	0 (0.0)	1 (7.1)		
Other materials	12 (1.8)	3 (2.8)	1 (1.2)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (8.3)	3 (21.4)		
Injured area of the body											
Hands	279 (97.9)	108 (99.1)	80 (97.6)	45 (100.0)	10 (90.9)	8 (100.0)	4 (100.0)	12 (100.0)	12 (85.7)		38.180/0.000
Arms	3 (1.1)	1 (0.9)	1 (1.2)	0 (0.0)	1 (9.1)	0 (0.0)	0 (0.0)	0 (0.0)	1 (7.1)		
Abdomen	2 (0.7)	0 (0.0)	1 (1.2)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)		
Other	1 (0.4)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (7.1)		
Circumstances leading to injury											
While taking blood	32 (11.3)	11 (10.1)	8 (9.8)	3 (6.7)	1 (9.1)	1 (12.5)	0 (0.0)	4 (33.3)	4 (36.4)	174.162/0.000	
While performing treatment	59 (20.9)	25 (22.9)	23 (28.0)	5 (11.1)	3 (27.3)	1 (12.5)	0 (0.0)	1 (8.3)	1 (9.1)		
While inserting an intravenous needle	5 (1.8)	1 (0.9)	0 (0.0)	0 (0.0)	0 (0.0)	1 (12.5)	0 (0.0)	0 (0.0)	3 (27.3)		
Broken ampoule	108 (38.3)	14 (12.8)	33 (40.2)	32 (71.1)	3 (27.3)	2 (25.0)	0 (0.0)	1 (8.3)	0 (0.0)		
While inserting an intracatheter	29 (10.3)	14 (12.8)	7 (8.5)	2 (4.4)	1 (9.1)	1 (12.5)	0 (0.0)	2 (16.7)	2 (18.2)		
While performing an injection	33 (11.7)	37 (33.9)	8 (9.8)	3 (6.7)	1 (9.1)	2 (25.0)	0 (0.0)	4 (33.3)	1 (9.1)		
Other	16 (5.7)	7 (6.4)	3 (3.7)	0 (0.0)	2 (18.2)	0 (0.0)	4 (100.0)	0 (0.0)	0 (0.0)		

Table 3: Mean frequency of occupational injuries in students in different departments of health science.

Departments of Health Science	Frequency of Injuries within the last year	
	X ± SS	Min-max
Nursing	1.43 ± 0.91	0-5
Midwifery	0.96 ± 1.53	0-10
Anesthesia	1.06 ± 2.12	0-10
Physiotherapy	0.50 ± 1.07	0-4
Emergency Technician	0.05 ± 0.22	0-1
Medical Secretary	0.09 ± 0.42	0-3
Geriatric Care	0.31 ± 0.70	0-3
Medical Laboratory Technician	0.08 ± 0.28	0-1
Total	0.53 ± 1.25	1-10

Table 4: Logistic regression analysis of odds ratio (OR) for the status of occupational injuries in students in different departments of Health Science.

Departments of Health Science (Reference category: be injured)	B	p-value	OR	95% CI
Nursing	1.294	0.001	3.647	1.709-7.781
Midwifery	1.533	0.000	4.634	2.107-10.189
Anesthesia	1.207	0.001	3.344	1.594-7.012
Physiotherapy	0.793	0.113	2.209	0.828-5.893
Emergency Technician	-0.158	0.755	0.853	0.316-2.309
Medical Secretary	-1.628	0.007	0.196	0.060-0.639
Geriatric Care	0.64	0.889	1.066	0.433-2.626
Medical Laboratory Technician	0 ^a	0	0	0

^aThis parameter is set to zero because it is redundant.

Nominal logistic regression analysis was applied to the injury status and departments. The results are shown in Table 4.

In the nominal logistic regression analysis, four departments were significant in the final regression model and accounted for 32.2% of the variability in the status of occupational injuries (R2 = 0.135, p<0.001). Nursing (OR = 3.647, 95% CI [1.709, 7.781]), midwifery (OR = 4.634, 95% CI [2.107, 10.189]) and Anesthesia (OR = 3.344, 95% CI [1.594, 7.012]) had high odds in the status of occupational injuries [Table 4].

Discussion

Throughout the practical training periods of students in Health Sciences departments, they are exposed to occupational risks of needlestick and sharps injuries. In many countries, there are guidelines and preventative measures to protect healthcare personnel against needlestick and sharps injuries after graduating from training, healthcare institutions and hospitals monitor the occupational exposure of healthcare workers and are responsible for in-service training. Despite sufficient equipment and knowledge to protect healthcare personnel, occupational exposure remains at a high level in several countries. Other than local studies of this area in literature, there are insufficient comprehensive studies of students in Health Sciences departments.

Almost half of the students in the current study reported that they had experienced a needlestick or sharps injury within the last year. Studies of this subject in literature have been mostly conducted on nursing and medical students. In a case-control study by Dante in 2014, 239 of 2514 nursing students reported that they had experienced an injury and 187 had been exposed to

bodily fluids.^[8] Studies in developing countries have shown that healthcare workers and students have insufficient knowledge and rates of exposure to biological agents are high.^[9]

In the current study, which compared the socio-demographic characteristics with the injury status of students in different Health Sciences departments, it was determined that female students aged<20 years, in the second year of study (the first year of starting clinical applications), in nursing, midwifery and anaesthesia departments, were exposed to more injuries (p<0.05). That students aged <20 years in the first year of participating in clinical applications experienced significantly more injuries could be attributed to lack of knowledge and experience and not having yet acquired a sufficient level of manual skills. This was consistent with previous findings in literature that have shown that the lack of experience of students, insufficient knowledge of precautions to be taken and lack of clinical skills increase the rates of occupationally acquired infections.^[9]

In the guidelines published by the WHO for protection against HIV/AIDS, it is emphasized that attention must be paid to protective precautions within the theory and practical training of students. In several studies of nursing students in Turkey, it has been determined that one third experienced occupational injury and very few reported the injury.^[10] Studies conducted on healthcare workers have reported a frequency of 32.4% sharps injuries, at rates of 29% in nurses, 73% in surgeons, 73% in gynecologists and 40% in dentists.^[11] Recent studies in Kuwait, Nigeria, and Saudi Arabia have identified that NSIs are a leading cause of occupational injury in the workplace.^[12-14] In a study of nursing students in Jordan, the injury rate was reported as 26.2%.^[15]

Within the Health Sciences departments, students in the medical secretarial studies department were exposed to the fewest occupational injuries in the current study. The material causing injury to medical secretarial students was not contaminated and all were an injector needle. Although students in the medical secretarial studies department are not authorized to perform medical treatment, they reported injuries sustained from injector needles left in the working environment (on the registration desk). These injuries to medical secretarial students show that healthcare workers who are authorized to perform treatments in healthcare institutions do not take sufficient precautions in the disposal of materials used, as they left sharp objects in the working environment. As expected, more than half the nursing and midwifery students in the current study were exposed to occupational injuries. This can be explained by the lack of manual skills and the fact that nursing and midwifery students perform more invasive interventions than students in other departments. Of the students who experienced occupational injury, 23.9% were injured by contaminated material. When evaluated by department, it was reported that half of the emergency response and geriatric care students were injured by contaminated material. In a study of nursing students in China, 59.9% were reported to have been injured by a syringe needle, and 41.5% of these had been using it on a patient.^[16] In the current study, the most common cause of injury was injector needle, and broken ampoule and glass shards. Almost all the injured students were injured in the hands. It has been previously reported that the most injuries to healthcare workers are caused by hypodermic needle (42.1%), suture needle (31.9%), and glass items (15.8%).^[17,18] Several studies have reported that injuries occur during injections.^[19]

In the current study, 33.9% of the nursing students reported that they were injured while performing an injection. In total, most of the students were injured while breaking an ampoule, applying treatment (injection, administering drugs etc) and taking blood. A significant difference was seen between the frequency of injury in students in departments which apply treatment more often, such as nursing, midwifery and anaesthesia, and in the students of departments which apply treatment less [Table 2]. That the mean number of injuries within the last year was greatest in nursing, midwifery and anaesthesia students in the current study was consistent with findings in literature [Table 3]. Various studies have shown that compared to other healthcare workers, nurses are more likely to be at risk of exposure to occupational injury.^[20-22]

In this study, the relationship between exposure to injury and the department of study was evaluated with regression analysis. The results showed that those studying in nursing, midwifery and anaesthesia departments had at least a 1-fold greater risk of exposure to occupational injury [Table 4].

Conclusion

In conclusion, students in Health Sciences departments may be exposed to needlestick and sharps injuries during practical training. While injuries are seen more often in the departments

applying medical treatment, students in departments that do not apply medical treatment or are auxiliary to medical treatment were seen to be injured less often than students in departments not performing medical treatment were exposed to injuries shows that precautions were not taken at a sufficient level in the application area. There is a need for further studies to determine the frequency of occupational injury to students in healthcare departments, the causal factors and risk management. In respect of students exposed to occupational injuries while participating in clinical applications, it is also important that the necessary protective measures are taken by the institution that students are not left unsupervised in the application of medical treatment, that students are immunized and are educated in protection against occupational injuries.

Competing Interest

The authors declare that they have no competing interests.

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