

**ORIGINAL PAPER****Needlestick and Sharp Injuries among Nursing and Midwifery Students****Şerife Kurşun, PhD**

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**Abstract**

**Background:** The students, especially studying at health school students, due to their inadequacy in clinical experience and technical knowledge are at high risk of exposing themselves to blood-borne pathogens via needlestick and sharp injury.

**Aim:** The aim of the study was to investigate the frequency of needlestick and sharp injuries among nursing and midwifery students, the affecting factors and the practices related to the subject.

**Methodology:** This study was descriptively and retrospectively performed using a questionnaire. It consisted of 18 questions that were composed of the questions concerning demographic features of the students and related to needlestick and sharp injuries. The study was performed in 434 students from the Health School of Selçuk University and accepting to participate in the study.

**Results:** Descriptive statistics and chi-square were used for data analysis. It was determined that among the students, 83.9% were exposed to needlestick and sharp, 66.2% did not wear gloves while performing the practices, 77.9% were vaccinated against hepatitis B, and 91.7% were injured while breaking ampoules.

**Conclusions:** As a consequence of the study, the rate of the use of protective methods was detected to be decreased although the rate of needlestick and sharp was high among health school students.

**Key Words:** Midwifery, nursing, student, needlestick, sharp injuries

**Introduction**

Needlestick and sharp injuries (NSSIs) increasing the spread of blood-borne diseases or infections are a significant challenge for health care workers (Beltrami et al., 2000; Wang et al., 2003; Smith & Leggat, 2005; İlhan et al., 2006; Yang et al., 2007; CDC, 2009; Talas, 2009). In the report by the Center of Disease Control and Prevention, it was pointed out that some 385.000 NSSIs take place in hospital workers in USA per annum, and mean 1000 sharp injuries occur daily (CDC, 2009). Exposure of health care professionals to blood-borne infections often occurs by pricking needles into the hands of professionals, sharp injuries via blood-contaminated apparatus or splashing of infected blood/body fluids onto mucosa (Beltrami et al., 2000; CDC, 2009). More than 20 pathogens and microorganisms, for example hepatitis B virus (HBV), hepatitis C virus (HCV) and Human Immunodeficiency Syndrome (HIV) related to health care, are contaminated via blood (Beltrami et al., 2000;

İlhan et al., 2006). It is estimated that a person with no vaccination against HBV the risk of HBV contamination as a result of contact with the cut or single needle pricking is 6-30%, the risk of HCV contamination is 1.8%, and the risk of HIV contamination is 0.3% (Beltrami et al., 2000; CDC, 2009).

As with all health care professionals, nursing and midwifery students in clinical practice in hospital may also be exposed to blood-borne pathogens by accident. Students are at risk in terms of NSSIs due to some factors. Their manual skills are insufficient and their clinical experience is limited. At the same time, they might have insufficient background knowledge to recognize the level of risk that is posed by patients and insufficient knowledge about standard infection control principles for blood-borne pathogens. (Shen et al., 1999; McCarthy & Britton, 2000; Shiao et al., 2002; Patterson et al., 2003; Wang et al., 2003; Reis et al., 2004; Yang et al., 2004; Smith & Leggat, 2005).

The aim of the study was to investigate the frequency of NSSIs among nursing and midwifery students, the affecting factors and the practices related to the subject.

## Methods

### Study Setting and Design

This descriptively and retrospectively study was carried out at Health School of Selçuk University between 8 May and 12 May 2006 in Konya.

### Ethical Considerations

There is no ethics committee at the university. So, written permission was received from the school administration in order to perform the study. Also oral consent of the students was taken for the study.

### Participants

The study sample was derived from nursing students who were undertaking a four-year undergraduate program for a professional degree in nursing and midwifery in Turkey. During the first year of the university program, the first semester (one semester is 14–16 weeks) is classroom-based training for basic science courses (including anatomy, physiology, and biochemistry). Clinical practice begins in the second semester in the “Basic Principles and Practices of Nursing Course”, which requires 8 h of theory classes and 12 h of clinical practice. Other semesters have 2 or 3 days (16–24 h) of formal clinical practice per week. Total 507 students from the Department of Nursing (286) and the Department of Midwifery (221) consisted of the population of the study. Accepting to join the study, existing in the school in the hours while performing the study, 434 students (85.6%) consisted of the sample group.

### Data Collection and Instrument

In the present study, data were accumulated using a questionnaire. The questionnaire consisted of 11 questions divided into two parts. The first part presented socio-demographic features (age, class, and department) of the students. The second part had questions about the needle stick and sharps injuries (including frequency, causes, affecting factors and, practices performed after the injuries), whether the protective method was used during injury, whether the event was reported, whether HBV immunization status, and whether information about injury.

## Procedure

The questionnaire was reformed under the light of data obtained from the pilot scheme of the study. After the pilot scheme, all participants were informed of the survey's objectives before completing the questionnaire. On average, it took approximately 10 min to complete the questionnaire. The data were collected in May.

### Data Analysis

In the evaluation of the data, chi-square test was used, and the scores were reported as numbers and percentiles. “p” values smaller than 0.05 are statistically considered significant.

## Results

The average age of the students was  $20.86 \pm SD = 1.82$  years. All of the participants were females. 25.6% of the students were in second-year, 53.2% from the department of nursing (Table 1). It was determined that of the students, 83.9% experienced n NSSIs at least once, no infections were observed after the injury, and 68.9% received essential information and training (during undergraduate education, in-service training, course, etc.) on injuries.

Independent variables, such as the year, department, were compared with the characteristics, like exposure to NSSIs, the use of a preventive method during the injury, the existing of hepatitis B vaccine and training about wounds. Upon investigating the exposure to the injuries, as well as the year and department, students in the first year were found to be less exposed to NSSIs than those from other classes ( $p < 0.05$ ). No relationship was found to be between department and the experience of injuries. Of the students, 66.2% were determined not to wear gloves while dealing with the practices leading to NSSIs. Compared wearing gloves during injury with the independent variables, the students in first year were found to use gloves less ( $p < 0.05$ ). Of the students, 77.9% were found to be vaccinated against hepatitis B. When examined the status of hepatitis B vaccination, the rate was found to be lower among second-year students ( $p < 0.05$ ) (Table 2). When investigated the status of information/education related to ne NSSIs, the students in first year were found to have less information on the subject ( $p < 0.05$ ). No relationship was determined between the education and department ( $p > 0.05$ ).

**Table 1.** Characteristics of the students (n=434)

Characteristics	n	%
<b>Year of training</b>		
First year	108	24.9
Second year	111	25.6
Third year	110	25.3
Fourth year	105	24.2
<b>Department</b>		
Midwifery	231	46.8
Nursing	201	53.2
<b>Mean ± S.D</b>		
<b>Age</b>	20.86±1.82	
<b>SD: Standard Deviation</b>		

**Table 2.** The Comparison of exposure to NSI, use of protective method, and Hepatitis B vaccination with characteristic of students

Characteristic	Exposure to needlesticks and sharp injuries				Use of protective method during injury				Hepatitis B vaccination										
	No		Yes		$\chi^2$	p	No		Yes		$\chi^2$	P	No		Yes		$\chi^2$	p	
	n	%	n	%			n	%	n	%			n	%	n	%			
Class	First year	34	31.5	74	68.5	0.000	25.633	59	79.7	15	20.3	8.392	0.039	17	15.7	91	84.3	15.703	0.001
Second year		10	9.0	101	91.0			65	64.4	36	35.6			39	35.1	72	64.9		
Third year		14	12.7	96	87.3			62	64.6	34	35.4			23	20.9	87	79.1		
Fourth year		12	11.4	93	88.6			55	59.1	38	40.9			17	16.2	88	83.8		
Characteristic	Exposure to needlesticks and sharp injuries				Use of protective method during injury				Hepatitis B vaccination										
	No		Yes		$\chi^2$	p	No		Yes		$\chi^2$	P	No		Yes		$\chi^2$	p	
Department	n	%					n	%	n	%			n	%	n	%			
Midwifery	33	16.3	170	83.7	0.005	0.946	110	64.7	60	35.3	0.322	0.570	43	21.2	160	78.8	0.195	0.659	
Nursing	37	16.0	194	84.0			131	67.5	63	32.5			53	22.9	178	77.1			
<b>TOTAL</b>	<b>70</b>	<b>16.1</b>	<b>364</b>	<b>83.9</b>			<b>241</b>	<b>66.2</b>	<b>123</b>	<b>33.8</b>			<b>96</b>	<b>22.1</b>	<b>338</b>	<b>77.9</b>			

**Table 3.** Data related to injuries (n=364)\*

	<b>n</b>	<b>%</b>
<b>Causes of injury</b>		
Breaking ampoule	333	91.7
Use of injector	221	60.7
Given in the operation of the instruments	39	10.7
Other (suture needle, intravenous catheter etc)	34	9.3
<b>Factors affecting injury</b>		
Hurrying	284	78.0
Inattentiveness	250	68.7
Heavy workload	135	37.1
Contaminant removal	39	10.7
Other (lack of experience, patient)	28	7.7
Equipment shortage	14	3.8
<b>Practices performed after the injury</b>		
Cleansing with antiseptic solution	302	83.0
Cleansing with water and soap	159	43.7
Bleeding injured area	130	35.7
Determining the source and reason for treatment	58	15.9
Other (reporting, blood test etc)	26	7.1

\* More than one option is marked.

Replies more than one was given to the questions including the conditions associated with NSSIs, factors affecting injuries and procedures performed after the injuries. It was detected that 91.7% of the students explained the reason of the injuries as breaking ampoules to the question of the factors affecting the wounds, 78% as hurrying while handling with the practice to the same question and 83% as cleansing with antiseptic to the question of the practices performed after the injuries (Table 3). The rate of reporting the cases after the injuries was found to be quite low.

## Discussion

The response rate of participants in the study is quite high (85.6%). Like other health care workers, nursing and midwifery students are also at high risk as to blood-borne pathogens forming via NSSIs due to their insufficient hand skills and limited clinical experience (Shen et al., 1999; McCarthy & Britton, 2000; Wang et al., 2003).

In studies in different countries on nursing students, the frequency rates of NSSIs were found to be 27% in Canada (frequency of injuries in the previous academic year) (McCarthy and Britton, 2000), 61.9% (Shaio et al., 2002) and 50.1% (Yang et al., 2004) in Taiwan, 40% in Brazil (Reis et al., 2004), 13.9% in Austria (frequency of injuries in the last year) (Smith & Leggat 2005), %9.4 in United States (Blackwell et al., 2007), 78% (during the 12-month study period) in Lithuania (Lukianskyte et al., 2012). In a study in China, the rate of NSSIs was found as 20% in the group trained for universal measures and the care after wounds after 4-week follow-up and 46% in the group trained with standard method (Wang et al., 2003). In another study performed among the students from the departments of medicine, dentistry, nursing and midwifery, the frequency rate of NSSIs was also determined to be 71.1% (Askarian & Malekmakan, 2006). However, in various studies performed among health school students (nursing, midwifery, health officials) in Turkey, the rates of injuries were determined between 35.5% with 74.1% (Aslan et al., 2005; Talas & Orhan, 2005; Gezer & Aytekin, 2007; Kuyurtar & Altıok, 2009; Talas, 2009; Karadağ, 2010). In this study, the majority of students were determined to experience NSSIs. The rate of injuries in our study is higher, compared to other studies (McCarthy & Britton, 2000; Shiao et al., 2002; Reis et al., 2004; Yang et al., 2004; Aslan et al., 2005; Smith & Leggat, 2005; Talas &

Orhan, 2005; Blackwell et al., 2007; Gezer & Aytekin, 2007; Talas, 2009; Karadag, 2010). While other studies (McCarthy & Britton 2000; Shiao et al., 2002; Reis et al., 2004; Smith and Leggat 2005) investigated only first-second period of the students during their undergraduate education, students from each year were included into our study and investigated in terms of their experiences in clinical practice. Therefore, the difference can explain the higher frequency rate of exposure to NSSIs in our study.

In several studies (Can et al., 2003; Smith & Leggat, 2005; Deisenhammer et al., 2006; Talas, 2009) carried out among nursing and medical students, it was found that the frequency rate of NSSIs rises as the number of the year increases. Conversely in another study, had been determined that last year students are reduced of the rate of injury (Kuyurtar & Altıok, 2009). In so-called study, it was detected that the students in first year are exposed to NSSIs less, but the students from upper classes are exposed to injuries more (Table 1). The fact that the rate of NSSIs rises with increasing year may be associated with longer period of the clinical practice, and complexity and difficulty of the practices supposed to be performed by the students from upper classes.

Considering all blood samples and bodily fluids form the patients as potential sources of infections, all essential measures should be taken. In performing particularly invasive professional practices, such protective measures as the use of gloves are important to prevent from risky contacts (CDC, 2009). In the study performed by Shen et al. (1999) in order to investigate the risk of NSSIs among medical students, the majority of students were stated to wear gloves at the time of injuries. Likewise, in another study performed by Patterson et al. (2003) among medical students, students announced to use single or double gloving while performing invasive practices. In a study carried out by Wang et al. (2003) it was found that of 76 practices requiring the use of gloves, students used gloves only in 8 cases (11%). In their study, Askarian & Malekmakan (2006) reported students not to use gloves while interfering with the patients and almost all of the medical and nursing students not to wear protective glasses in operating rooms and emergency units. In another study, it was found that 43.9% nursing students never used protective equipment when handling sharp (Yao et al., 2010). In a study performed in Turkey, it was

stated that of the students experiencing NSSIs, 65.2% were found not to wear gloves (Talas, 2009). In this study, about two thirds of students were found not to use gloves, and the rate of use of gloves in among first students was also determined to be low (Table 2). These results indicate that students have poor knowledge in the avoidance of professional risks or they neglect the significance of protection in health. Therefore, the awareness of professional risks in the students should be increased, and students should also be enabled to take preventive measures in the practices related to patients.

Hepatitis B, likely to be an infectious disease via NSSIs, is one of the diseases prevention can be achieved with vaccination. Therefore, all health care professional and students are essential to be vaccinated because of being in a high risk group. In various studies performed among the students from different fields of health in world and Turkey, the rates of hepatitis B vaccination were changed between 50% with 99.3%. (Shen et al., 1999; McCarthy & Britton, 2000; Shiao et al., 2002; Can et al., 2003; Patterson et al., 2003; Wang et al., 2003; Smith & Leggat, 2005; Askarian & Malekmakan, 2006; Deisenhammer et al., 2006; Gezer & Aytekin, 2007; Kuyurtar & Altıok, 2009; Talas, 2009; Karadağ, 2010; Yao et al., 2010). In the present study, the rate of hepatitis B vaccination was found to be 77.9%. In their studies, Smith and Leggat (2005) and Deisenhammer et al. (2006) stated that the vaccination rate rises with increasing number of the years, while Talas (2009) stated that the vaccination rate decreases as the number of the years increases. In this study, while the vaccination rate was found to be lower only in second year students, the same rate was higher among other class (Table 2). In the school where the study was performed, a newly designed program for hepatitis B vaccination was introduced to be administered to all students.

In a study, 87.8% of the students were determined to get informed about the contact with blood-borne pathogens and universal measures (Askarian & Malekmakan, 2006). In another study performed in Turkey, 84.8% of students were found to be equipped with the information related to this subject (Talas, 2009). The two thirds of the students included into our study were determined to have knowledge and training regarding NSSIs, and the rate of the training given rises with the increasing number of years. However, it is a limitation in this study

that no investigation was performed as to the content of the training.

In order to prevent the exposure to NSSIs, such measures particularly as not recapping the needles and throwing disposable injectors into hole proof boxes should be taken (CDC, 2009). In a study, causes of injuries reported most frequently were from burs among dental students, needlestick (90% suture, 10% hollow-bore) among medical students, and cuts among nursing students (McCarthy and Britton, 2000). In a number of studies, use of injector (opening and closing of cap) and glass objects (breaking ampoule) were among causes of NSSIs (Shiao et al., 2002; Reis et al., 2004; Yang et al., 2004; Smith & Leggat, 2005; Kuyurtar & Altıok, 2009; Talas, 2009; Karadağ, 2010; Yao et al., 2010; Lukianskyte et al., 2012). This study also found similar results with other studies. So, it is essential that the students should be trained to develop their hand skills before clinical practice. In a study performed among nursing students in Brazil, the factors affecting the rate of exposure to NSSIs were found as lack of attention (22.2%), lack of experience (13.9%), inadequate hand skills (9.7%) and hurrying (6.9 %) (Reis et al., 2004). In another studies, the factors affecting the rate of exposure to NSSIs were found as carelessness, stress, lack of practice, lack of familiarity with the devices and lack of training (Cheung et al., 2012); inattention, tiredness and heavy workload (Lukianskyte et al., 2012). It was also found in this study that such factors as hurrying, inattentiveness and heavy workload affect the exposure to NSSIs. In the prevention of the exposure to NSSIs among trainees, experience and skills are two significant entities to be increased. So as to prevent the contamination stemming from blood-borne pathogens via NSSIs to health care professionals, it is necessary to prevent this kind of injuries. Because the contact with infected materials is unlikely to be prevent, appropriate measures should be taken just after the exposure to injuries. After the exposure to NSSIs, it is suggested that the exposed area be cleansed with water, soap or an antiseptic solution, the event be report, risk assessment of the source and the health worker exposed be performed, and a program for monitoring/treatment be made up (CDC, 2009). In different studies' rate of students who did not report injury was changed between 39.5% with 96.2% (Shiao et al., 2002; Yang et al., 2004; Smith & Leggat, 2005; Askarian & Malekmakan,

2006; Blackwell et al., 2007; Kuyurtar & Altıok 2009; Talas, 2009; Karadağ, 2010; Yao et al., 2010; Cheung et al., 2012). It was also found in another study that in addition to reporting the events, students demanded tests to be performed to determine whether the risk of infections existed after the exposure to the injuries at the rate of 47.9% for patients and of 22.9% for themselves (Yao et al., 2010). A vast majority all the students in the study were determined to cleanse injuries with antiseptic solution, and a small number were determined to report injuries and to demand tests in order to determine risk assessment (Table 3). The rate of reporting the injury after the exposure is low, as with other studies. This situation may indicate that the absence of reporting process in hospital; students didn't care about the event; they didn't know the process of reporting; they think affected on exam grade because of the process of reporting and they didn't want to be seen as having poor clinical skills.

### **Limitations of the Study**

This study was conducted with nursing and midwifery students in Konya. So, its generalizability is limited. Moreover, the retrospective nature of the self-report survey has some weaknesses, including problems of recall. Despite these limitations, however, the rate of participation to the study was high. Also this study can serve as a foundation for further studies on NSSIs among nursing students.

### **Conclusion**

In the present study, the rate of exposure to NSSIs among nursing and midwifery students was found to be high, while the rate of taking preventive measures and the status of information/training about the subject was low. In the light of these results, it is essential that nursing and midwifery students, an important group in health care system, should be protected from professional risks like other health care professionals. To achieve this target, it is suggested that before starting clinical practice, all students be trained about how to avoid injuries and blood-borne pathogens, the effectiveness of these trainings be assessed with a meticulous effort, all students be vaccinated, hand skills of the students be improved before clinical practice, and management procedures be formed in clinical practices after injuries.

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