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Experiences with Needle-stick and Sharp Object Injuries for Healthcare Workers in a State Hospital in Tokat Province, Turkey

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ABSTRACT

Healthcare workers are at risk because they are in contact with patients and a variety of materials that may be infected. Needle-stick and sharp object injuries can cause the transmission of blood-borne diseases. This study described the research regarding injuries from needle-sticks and sharp objects, and the precautions to be undertaken in the event of such injuries in order to enhance occupational and other safety. This study was conducted at Tokat State Hospital, affiliated with the Tokat Association of Public Hospitals General Secretariat. From Jul to Oct 2015, 550 health care workers were interviewed. These volunteers answered a 29 question survey face to face. The survey responses were statistically analyzed using SPSS version 16. The group was 59.6% female, and 44.4% were nurses. When the needle-stick and sharp injury properties of the research group were evaluated, 20.72% had experienced an injury in the last year, and 31.09% had such an injury at some point during their career. Moreover, 88.54% of the volunteers answered that they had been vaccinated for hepatitis B. Although there were a large number of injuries, a very small number of these cases were reported. The use of safe medical tools and periodic educational programs that teach precautionary measures can reduce the number of injuries.

KEYWORDS: *Healthcare workers, Needle-stick/sharp tools, Injury, Occupational health and safety*

INTRODUCTION

One of the working environments that pose significant risks to employee health and safety is the hospital [1]. Healthcare personnel who aim to provide community health services are exposed to many hazards and occupational accidents due to the nature of their work. The dangers and risks affecting the health of healthcare workers are grouped as biological, physical, ergonomic, chemical, psychosocial, and so forth. There are 29 types of physical, 25 types of chemical, 24 types of biological, 6 types of ergonomic, and 10 types of psychosocial hazards and risks in hospitals [2].

The risk of needlestick and sharp object injuries has increased for physicians, nurses, support personnel, laboratory technicians, and waste collectors due to their work environment [3].

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During daily clinical practice, occupational exposure for healthcare workers is defined in terms of blood and other infected liquids or materials on the skin, in the eye, on the mucous membranes, or in parenteral contact. The most common type of exposure is percutaneous injury, most often through needle-sticks. Healthcare personnel face the risk of needlestick and sharp injuries in all areas of their hospital, including in the operating room, at the bedside (blood taking, injection, and resuscitation), in the outpatient clinics (small practise, dressing), and in the laboratory (bleeding, tube breakage) [4].

Injuries caused by needlestick and sharp tools (injector needles, Bisturia, etc.) are an important problem for healthcare workers because they increase the risk of infection [5]. Indeed, this occupational group is exposed to dangerous and deadly blood-borne pathogens every day [6]. Needle-stick and sharp injuries can transmit 20

pathogens that are very serious, such as hepatitis B, hepatitis C, and HIV [4, 7-9]. The average risk for HIV transmission after percutaneous exposure is approximately 0.3%, the risk of HBV transmission is 30%, and the risk of HCV transmission is approximately 3%-4% [10-12]. WHO has estimated that percutaneous injuries in developing countries cause 45%-60% of hepatitis B and C infections for healthcare workers [13]. Moreover, other diseases such as tuberculosis, diphtheria, herpes, malaria, Ebola, the plague, and Ebstein-Barr disease can be transmitted to healthcare workers through needle-stick injuries [14]. Such blood-borne diseases have consequences including chronic illness, disability, and death.

Over the years, studies have been ongoing regarding the development and prevention of blood-borne infections, especially AIDS, hepatitis B, and hepatitis C. Despite the publication of guidelines and the establishment of relevant training programs, infections by needle-sticks and sharp objects continue. Dangerous and infected fluids can enter the body via contaminated needle-sticks. Even very small amounts of fluid may transmit serious illness [15].

Needle-stick injuries and exposure to blood and bodily fluids are defined as occupational accidents in Occupational Health and Safety Law No. 6331.

This study aimed to determine the conditions of encountering needle-stick injuries by healthcare workers at a state hospital, the interventions they used after their encounter, and the reasons for their encounter.

MATERIALS AND METHODS

After a review of the causative factors, preventative measures, and information on specific infections, the development of prevention programs has a key role in ensuring workers' health and safety.

Since that lack of contact with the patient or the patient's materials is not a risk, the survey included healthcare worker working at Tokat State Hospital from Jul to Oct 2015, who are in contact with patients and their blood and body fluids. For this purpose, this study questioned physicians, midwives, nurses, health officers, laboratory technicians, biologists, medical waste workers, and housekeeping staff. The population for the research group was 550 people.

A questionnaire consisting of 29 questions in two sections was used. Questionnaire forms were created using appropriate databases. The first section consisted of questions to obtain the sociodemographic characteristics of the healthcare workers such as age, gender, occupation, work place, job experience. The second section involved questions that included personal protective equipment (gloves, apron) use, injury experience concerning needle-sticks, injury prevalence, hepatitis B vaccination, the applications that caused the injury (blood collection, sutures, drug applications, etc.), medical equipment that can cause injuries (needle, scalpel, Lancet, etc.), injury report status of the healthcare workers, and non-reporting reasons.

The Ethics Committee's permission was obtained from the Gaziosmanpaşa University Faculty of Medicine and the General Secretariat of Tokat Public Hospitals Association.

Volunteers made up the study group. The research data were collected through the coordination of unit responsible workers; they were asked to fill in the forms themselves. The data obtained from the study were analyzed using SPSS version 16 (Chicago, IL, USA), and in order to communicate statistical data, t-test and for comparison qualitative data, chi-square test was used. The descriptive statistics for all the variables were given in number and percentage, and P <0.005 was considered meaningful.

This study was planned as a survey that would contribute to occupational health and safety measures by determining the attitudes and behaviors leading to needle-stick injuries. This study evaluated the effectiveness of the existing control measures and standard precautions for healthcare workers.

RESULTS

The needle-stick injury incidence of 550 healthcare workers was 31.09% during their profession. The gender, distribution of tasks, working time, and are averages of the healthcare personnel in the research group is given in Table 1, that shows 59.6% of respondents are female, and 44.4% are nurses. The average of age is 37.6 yr (min 19, max 58), and 62.5% of the healthcare personnel in the research group are employees in clinic.

When needlestick and sharp injuries for the research group were evaluated, 20.72% of the group was injured in the previous year, and 31.09% were exposed at some point in their careers (Table 2). The instrument that caused the highest rate of injuries was the injector tip (63.2%), and this number was statistically significant (P-value < 0.005). One hundred twenty-six injured personnel (73.7%) were married, and fifty personnel (29.2%) had 20 or above job experience.

With regard to exposure to injury, 22.8% of injuries occurred when trying to insert the needle cover, 9.3% occurred when allocating the needle from the syringe, and 2.5% occurred when assigning the needle to the stab box (P < 0.005).

In terms of the shift, where in an injury occurred, the difference between the night shift and

the day shift was statistically significant (P < 0.005). Injuries during the day shift were more common (67.3%).

In 70.17% of the wounds, the object that caused the injury made contact with a patient's blood or body fluids, and 15.2% of these involved a patient infected with a disease. During the process, 90.6% were using personal protective equipment (P < 0.005), and 89.4% of the group had been vaccinated for hepatitis B. However, while 12.2% of these people were vaccinated, they did not know their immunity status. The ratio of hepatitis B vaccination in the professional groups was statistically significant (P < 0.005) and the difference was due to the low vaccination rates of the cleaning staff (Table 3).

Table 1. Descriptive characteristics of the research group

Variable	Description	Needle stick/sharp injuries				Value	
		Injured		Noninjured			
		Frekans				X^2	*P*
		n	%	n	%		
Age group (yr)	17≤age≤24	15	8.8	23	6.0	41.05	0.381
	25≤age≤40	100	58.4	226	59.6		
	41 or above	56	32.8	130	34.4		
Marital status	Married	40	23.4	67	17.7	2.71	0.258
	Single	126	73.7	303	79.9		
	Widow	5	2.9	9	2.4		
Gender	Male	61	35.7	161	42.5	2.26	0.079
	Female	110	64.3	218	57.5		
Working years	0≤ yr≤3	27	15.8	59	15.6	8.71	0.069
	4≤yr≤6	23	13.5	56	14.8		
	7≤yr≤10	30	17.5	84	22.2		
	11≤yr≤20	41	24.0	110	29.0		
	20 or above	50	29.2	70	18.5		
Occupation	Nurse	94	55.0	150	39.6	23.88	0.008
	Physician	25	14.6	45	11.9		
	Laboratory staff	14	8.2	31	8.2		
	Cleaning staff	20	11.7	105	27.7		
	Others*	18	10.5	48	12.6		
Work place	Laboratory	14	8.2	32	8.4	540.74.	0.000
	Clinic	70	40.9	240	63.4		
	Blood center	2	1.2	9	2.4		
	Intensive care	13	7.6	29	7.7		
	Emergency	23	13.4	9	2.3		
	Operating room	42	24.6	29	7.7		
	Policlinic	4	2.4	30	7.9		
	Others**	3	1.7	1	0.2		
Educational level	Secondary school	20	11.7	91	24.0	22.28	0.000
	High school	13	7.6	55	14.5		
	Associate degree	60	35.1	94	24.8		
	Bachelor's degree	59	34.5	96	25.3		
	Postgraduate	19	11.1	43	11.3		

* Anesthesiology technician, radiology technician, etc

** Radiology unit, organ transplant center, sterilization room

n: Number

Tablo 2. Injury frequency in the last year (n: 114)

Occupation	1 times		2 times		3 times		More than 3	
	n	%	n	%	n	%	n	%
Nurse	38	33.3	16	14.00	1	0.8	5	4.38
Physician	11	9.6	3	2.60	1	0.8	4	3.50
Laboratory staff	5	4.3	6	5.26	1	0.8	0	0.00
Cleaning staff	6	5.2	0	0.00	1	0.8	0	0.00
Others *	12	10.5	2	1.75	1	0.8	1	0.80

***** Anesthesiology technician, radiology technician, etc

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Table 3. Hepatitis B vaccination status by occupation (n: 550)

Occupation	Vaccinated, İmmune		Vaccinated, the immune status is not clear		Non-immune	
	n	%	n	%	n	%
Nurse	213	87.29	17	6.96	14	5.73
Physician	58	82.85	7	10	5	7.14
Laboratory staff	34	75.5	3	6.66	8	17.7
Cleaning staff	75	60	19	15.2	31	24.8
Others *	51	77.27	10	15.15	5	7.57

* Anesthesiology technician, radiology technician, etc.

The difference between the occupational groups and the locations exposed to injury was significant (P < 0.005). The injury is the highest rate in nurses and has occurred in clinics.

The vast majority (78.9%) of the workers knew what to do after the injury.

The procedures after the injury are stated as "removing gloves, washing with soap and notify the relevant person about the injury", respectively.

80.5% of those participating in the study had been trained on needle-stick injuries and blood-borne infections; 91.6% reported that they had received occupational health and safety training and that they knew that needle stick injuries were occupational accidents.

The difference between education and needle-stick injuries was found to be significant (P < 0.005). Sixty injured health care workers (35.1%) had associate degree.

Eighty-eight of injured personnel (51.4) were not notified (P < 0.005). The least reported incidence of injury was determined by physicians. Regarding the reason for not reporting an injury, intensive workload had the highest ratio (60.8%), and P value is < 0.005.

Regarding professional groups and operations leading to an injury, the lowest rate of awareness was found among cleaning workers.

DISCUSSION

OSHA (Occupational Safety and Health Administration) reported on damage via a needlestick or sharp instrument for one million healthcare workers. Such events cause high psychological and financial distress in people, families, and society [16].

The annual cost of treatment and evaluation of needlestick and sharp injuries for healthcare workers is $500 million [9].

The increased incidence of needle-stick injuries is believed to arise from the combination of high-risk practices (injection, blood exposure, and lack of needle closure with low safety precautions taken by healthcare personnel. Such behaviors affect both the quality of care provided by healthcare workers and health and safety for those providing care [17].

Needle-stick and sharp instrument injuries also emotionally affect people in addition to transmitting infection [18]. Not knowing the infection status of the patient increases a healthcare worker's stress level. When the risk of infection is high, the health care worker, as well as his or her family, are affected by the injury. In cases of illness or disability, a healthcare worker loses business, income, and experiences diminished health. In addition, dismissal causes problems such as loss of promotions, loss of social status, loss of friendships, and possible environmental changes.

Needle stick injuries; because of the lack of protective vaccination with effective treatment, poor prognosis, causing blood-borne infections, and being preventable are important. Determining the causes of injuries and the precautions to be taken with needlestick and sharp tools will help guide the research to be done, and more importantly, reduce this occupational risk avoided.

Percutaneous injuries vary from 30%-70% [10, 19]. In our study, the frequency of injuries among health care workers was estimated at 31.09%. Our study found that healthcare professionals are at risk of communicable diseases, which is consistent with the literature.

The probability of infection after a needle-stick injury is 30% with regard to hepatitis B, 3%-4% regarding hepatitis C, and 0.3% regarding HIV [10,12]. These percentages indicate a significant risk for hepatitis B. In our study, hepatitis B, C ve HIV positivity was not detected in workers injured after needle-stick injuries.

Due to the hepatitis B vaccination is an effective way to protect against the disease [8, 20], all healthcare workers should be required to get this vaccination. Fully 88.54% of the study group had a hepatitis B vaccination. The rate was 85.2% in a study [5]. The immune status of a person should periodically be evaluated.

The most commonly injured body area with regard to needle-stick injuries is the hands, with an incidence rate of 94.73%, which is consistent with the literature. In a study, 88.1% [21] of the injuries were to the hands.

The most common cause of injury was the injector needle [22]. The most common cause was

the injector needle [23-24]. The reason for this is that the injector is the most commonly used instrument. In a study [19], 89.2% of the injuries involved an injector needle, and in our study, this rate was 63.2%.

Needle closure was the second most common cause of injury at 37% [17], and unsafe injection practices was a major indicator at 22.8% [14]. Needle closure is prohibited by OSHA's bloodborne pathogens standard [7, 25].

Gloves protect against contamination from blood and bodily fluids, and in cases of needle-stick injuries, they reduce the volume of material that is transferred to the skin.

During an injury, 90.6% of the employees were using gloves; this rate was 74% in similar studies [25].

The needle-stick and sharp injuries were reported, especially among young and inexperienced health care workers, at a range of 25%-80%. This is due to the increase in professional experience and occupational accumulation as age increases [26]. In our study, age and needle-stick injuries do not have an established relationship.

The injury rate was higher in women in a gender-based study [27]. The rate of injury was also highest in nurses [17, 19-20, 27-30]. In a study [5] on health personnel in general, the rate of injuries to nurses was 55%, and it ranked first. Martins and colleagues completed a study on healthcare workers in Northern Portugal, finding that the most injured were nurses (at a rate of 74.8% [22]. This may be due to the fact that the number of patients per nurse is so large that they may be associated with multiple responsibilities and poor organization, resulting in them hastily doing their jobs, providing care, completing IV cannulation, engaging in blood collection, and cleaning materials. The data in our study was consistent with the literature.

We think that the nursing profession represents the largest occupational group in the healthcare workforce and that exposure to needle-stick injuries increases due to the nurses' handling of the treatment clinics.

When looking at the work shift where in needle-stick injuries occurred, the majority of the injuries (67.3%) occurred during the day shift. The results are consistent with other findings [27, 31]. This may be related to patient circulation and procedural overload in daytime work in hospitals, daytime invasive interventions, and procedures creating a greater workload.

The safest way to protect one from needle-stick injuries is to use safety equipment. According to a CDC report, the use of a secure device brings about a 76% lower chance of a needle-stick injury [3, 32].

The safety devices must fulfil the National Institute for Occupational Safety and Health (NIOSH) criteria for recognized technical standards (e.g., safety devices should be easy to activate, intuitive to use, must be able to be activated with one hand, must not hinder use, must have clear awareness of activation on the part of the user, etc.) [32].

Universal precautions have also been reported to reduce the risk of blood-borne pathogens among health care workers [27]. In a study, 80% of all injuries were not reported [33]. In another study, [34], the reporting rate was 32%. This rate was found to be 48.6% in our study.

The reasons for not reporting the incidence of needle-stick injuries among health care workers is lack of knowledge of appropriate procedures after injury and the notion that the source was not infectious.

CONCLUSION

Employee training and controls of application reduced injuries by over 90%. Other effective measures to prevent infections include immunization against hepatitis B, the avoidance of unnecessary injections, the application of universal precautions, the avoidance of needle closure injuries, the use of sharp boxes, the use of safer instruments, the reduction of patient load per employee, the use and proper supervision of personal protective equipment, and training on the prevention of transmission and the risks to employees.

In addition, it should be mandatory to report to the occupational health and safety unit any needle-stick injuries. A health screening should be completed at regular intervals.

We recommend that hospitals combat such injuries by establishing better work environments, having sufficient human resources personnel, and providing safety equipment. In addition, hospitals should implement organizational strategies such as establishing an occupational health and safety unit to prevent such injuries.

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