

## Epidemiological characteristics of accidental needle-stick injury among health care professionals in primary healthcare in Zenica

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**Original submission:**

14 October 2019;

**Revised submission:**

28 October 2019;

**Accepted:**

01 November 2019

doi: 10.17392/1089-20

Med Glas (Zenica) 2020; 17(1):182-187

### ABSTRACT

**Aim** To determine the extent and characteristics of incidental injuries, primarily by needles and other medically sharp instruments and to recommend preventative activities to health care professionals.

**Methods** The survey was conducted among 200 healthcare and non-healthcare employees of the Primary Health Care Centre Zenica (48% of the total number of employees). Care workers were surveyed, and the sample was randomly selected in proportion to the number of employees in institutional departments. Respondents answered questions about gender and age, work experience and qualifications; the number and type of exposure to incidents in the past year, number of career incidents, number of reported incidents; information on the manner and cause of the incident.

**Results** The sample consisted mainly of females, 153 (83.2%). An exposure to incident during their work was experienced by 128 (69.6%) respondents: needle-stick injury, 79 (42.9%), unforeseen patient response, 42 (22.8%), rush to perform the procedure, 34 (18.5%), and negligence, 18 (9.8%). The incidents most frequently occurred in gynaecology department (all respondents experienced an incident event), followed by department of family medicine, 47 (67%). The main reason for these incidents was rush to perform procedures, in 9 (12.5%). Of 128 experienced incident events, 21 (16.4%) were reported.

**Conclusion** The low rate of reporting of exposure to incidents does not provide a realistic basis for risk assessment and preventive action. Primary task for improving safety of work processes at our setting will be to raise employee's awareness of the need to report exposure incidents.

**Key words:** prevention and control, risk assessment, risk factors

## INTRODUCTION

Patient treatment procedures can contribute to numerous health risks for patients and healthcare professionals. Healthcare professionals use a number of technologies that can lead to harmful events if they are used improperly or recklessly. A harmful exposure incident can occur when using complex and complicated technologies as well as using the simplest technologies on a daily basis. Considering the work done by healthcare professionals, injuries to sharp objects (stabbing incidents) are among the most common types of accidents they experience when working with patients (1). A stabbing incident is any injury caused by stabbing of a sharp object that does not normally require special care, but may lead to transmission of the infection from an infected object that caused stabbing (2). The highest risk of infection is borne by hollow needle incidents because contaminated blood can be inoculated into the exposed organism (3). According to a 2002 report by the World Health Organization (WHO), out of 35 million health workers worldwide, 2 million suffer a needle injury (4). The WHO estimates that after occupational exposure to stab incidents, the global workload for healthcare professionals is 40% for hepatitis B and C and 2.5% for human immunodeficiency virus (HIV) infections (5). These injuries can occur in different work processes, at different workplaces. In some cases, injection needle incidents during drug administration, injury during surgery, or some invasive diagnostic procedures predominate (6).

There are numerous causes of injury at work in healthcare professionals. They can be divided into groups according to cause factor: individual, environmental, and socioeconomic. A study conducted in 2015 at Kerman Hospitals found that the most common cause of incident situations is workload, lack of interest in work, stress, negligence, fatigue (7). Whether a healthcare professional becomes infected after occupational exposure to contaminated blood depends on several factors. The risk is higher if the prevalence of blood-transmission diseases in the general population is higher (8). Some of the factors which increase the risk of transmission of the infection are non-compliance with standard protection measures and non-implementation of post-exposure prophylaxis (9).

In order to minimize such infections among healthcare professionals, these injuries, as well as

any incident situation, should be reported, adhered to general protection measures in daily work and specific protection measures implemented in each incident situation (10).

Increased risks in the workplace as well as concern for the health of employees have resulted in the adoption of the Directive on the Prevention from Sharp Injuries adopted by the Council of the European Union in 2010. The Directive includes the implementation of the Framework Agreement on the Prevention of Injuries to Sharps in the Hospital and Health Sector (11). The Directive emphasizes the importance of assessing the risk of injury in the process of preventing and inhibiting injury by sharp objects in healthcare professionals. Risk assessment should consider the type of technology, organization of work, working conditions, level of qualifications, psychosocial factors related to the work and influence of factors related to the working environment (11).

In the process of stimulation of the quality of work and adopting accreditation standards in the Health Centre in Zenica (health institution providing primary health care) prescribed by the Agency for Quality and Accreditation in Health in the Federation of Bosnia and Herzegovina (AKAZ), it is envisaged to take preventive measures to reduce occurrence of incident situations (12). In order to evaluate at all the resulting injuries and to take preventive actions in order to reduce occupational exposure to stabbing incidents, it is necessary to determine epidemiological characteristics of the resulting injuries with sharp needles by healthcare professionals (13).

The aim of this research was to determine the frequency, causes of stabbing incidents and their relationship with the type of incident, the timing of events while providing care to patients on departments in the Primary Health Care Zenica.

## PARTICIPANTS AND METHODS

### Patients and study design

This prospective study was conducted with employees of the Primary Health Care Zenica during 2016. The data were collected through a questionnaire completed by trained interviewers.

Respondents were healthcare and non-healthcare workers who, at the time of the survey, happened to be at the departments and workplaces,

(to the present knowledge) at particular risk for the occurrence of stabbing incidents: family medicine (50), dentistry (20), gynaecology (10), laboratory (10), emergency medical service (30), preschool child health service (10), hygienic and epidemiological service (10), cleaning ladies within the technical service (20) and community nursing (40). The number of respondents per department was approximately proportional to the number of employees in those departments. The questionnaire was anonymous and the participation in the survey was voluntary.

The study was approved by the Ethics Committee of the Primary Health Care Zenica.

**Methods**

An anonymous survey was conducted with respondents using the questionnaire on hospital staff exposure and blood-transmission infections, which had already been used in a similar research in Croatia (14). The questions contain general, demographic data, and data about an exposure to patients' blood and body fluids. General information included age, gender, seniority and qualification. Incident event data included the number and type of exposure incidents in the past year (stabbing or mucocutaneous contact), number of career incidents, number of reported incidents, and information on the manner and cause of the incident as well.

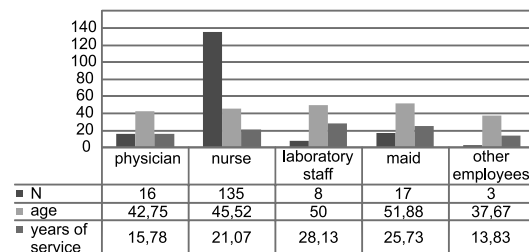
**Statistical analysis**

Descriptive and inherent statistics methods were used. A statistically significant result was accepted when the probability value was less than 0.05. Parametric and non-parametric statistical tests were used.

**RESULTS**

The Primary Health Care Zenica employed 384 employees. Of 200 intended for the survey, 184 (48%) responded and duly completed the questionnaire. The survey sample consisted mainly of female workers, 153 (83.2%). The average age of the respondents was 45.94 years, and the female respondents were on average significantly older than the male ones, by 12.4 years (47.75 and 35.35, respectively) ( $p < 0.05$ ). The average length of service of the respondents was 21.19 years; female respondents had, on average, signi-

ficantly more seniority level than male respondents (23.06 and 11.13, respectively) ( $p < 0.05$ ). Cleaning ladies were the oldest group with an average age of 51.88 years, and laboratory staff with the longest working experience of 28.13 years (Figure 1).



**Figure 1. Average age and length of service of the respondents according to the occupation of the respondents**

Exposure to an incident was experienced by 128 (69.6%) of the respondents during their working life and most often it was a needle-stick injection, 79 (42.9%) cases. In 92 (50%) cases the incident was repeated several times; in 21 (16.4%) cases the incident was reported to the immediate service manager (Table 1).

**Table 1. Structure of incident cases experienced by event type**

Exposure to a risk event during the working life	No (%) of participants
Hollow needle stitch (blood needle, injection needle, etc.)	79 (42.9)
Surgical needle stitch (sewing needle)	5 (2.7)
Scalpel cut	8 (4.3)
Glass cut (test tube, pipette ...)	27 (14.7)
Cutting another item	14 (7.6)
Contact of someone else's blood (fluid / tissue) with skin	54 (29.3)
Contact of someone else's blood with mucous membrane	25 (13.6)
Bite by a patient	4 (2.2)
<b>Total</b>	<b>184 (100)</b>

By the type of incident, the most common was a needle stick, 79 (42.9%) cases; the reasons were the unforeseen patient response in 42 (22.8%), rush to perform the procedure in 34 (18.5%) and negligence in 18 (9.8%) cases of adverse events. Another significant cause of incidental exposure was the contact of someone else's blood with the skin of a healthcare professional, in 54 (29.3%) exposed; the most significant reason was unforeseen patient response in 20 (15.6%) cases of adverse events (Tables 2 and 3).

According to the place of occurrence in the work processes at the Primary Health Care in Zenica, the most frequent incidents occurred at the Gynaecology Department, where all subjects experienced an incident event. At the Family Medicine

**Table 2. Incident event timing of 184 participants**

Incident event and timing	No (%) of participants
During the blood draw	5 (2.7)
During surgery	5 (2.7)
After disposal of an item	6 (3.3)
During cleaning	7 (3.8)
During disposal of an item	14 (7.6)
While replacing the needle cap	17 (9.2)
Unknown	19 (10.3)
Before medical intervention	23 (12.5)
During the injection	32 (17.4)
No incident happened	56 (30.4)
<b>Total</b>	<b>184 (100)</b>

**Table 3. Cause of incident**

Cause of incident	No (%) of participants
Improper disposal of waste	2 (1.1)
Mismanagement of the case	3 (1.6)
Negligence of another person handling the case	4 (2.2)
Lack of experience in handling the case	5 (2.7)
Fatigue	5 (2.7)
Unavailability of equipment for the safe disposal of sharp objects	7 (3.8)
Unknown	8 (4.3)
Negligence	18 (9.8)
Rush when stabbing a procedure	34 (18.5)
Unforeseen patient response	42 (22.8)
No incident happened	56 (30.4)
<b>Total</b>	<b>184 (100)</b>

Department 34 (75%) incident cases were registered; the main reason for these incidents was rush to perform procedures in 15 cases (12.9%) of adverse events. The second place in terms of the number of cases was the Laboratory 8 (89%) and Emergency Medical Department, 21 (81%) cases. The most common cause in both services was the unforeseen patient response (Table 4).

**Table 4. Incidental event by medical department**

Department (No of answers)	No of participants with an incident (%)
Emergency medical service (26)	21 (81)
Hygienic epidemiological service (10)	4 (49)
Family medicine (45)	34 (75)
Dentistry (20)	14 (70)
Gynaecology (10)	10 (100)
Laboratory (9)	8 (89)
Preschool child health service (10)	7 (70)
Community-health nurse (37)	21 (57)
Maids within the technical service (17)	9 (53)
<b>Total</b>	<b>128</b>

## DISCUSSION

Safety of healthcare professionals can be compromised in a number of simple or complex health procedures. In these procedures, healthcare professionals are often at risk of harming potentially contaminated instruments with infectious pathogens. Numerous procedures and measures

are prescribed in modern healthcare systems to prevent risk events: technical measures (needles that are designed for safe use, solid airtight waste containers, laser scalpels), education of health care professionals (proper handling and disposal of used needles and sharp objects, proper sampling, appropriate transportation of biological samples) and consistent wearing of personal protective equipment (gloves, goggles, masks, aprons, bathrobes, boots, shoe covers, etc.) (5).

Our research identified risk factors during the provision of health care in the Primary Health Care in Zenica at settings where injuries are most likely to occur, the reasons that contribute most to this, and where certain measures could be implemented to prevent risky injury.

The place of accidental injuries occurrence by sharp objects in the primary healthcare practice more often depends on the health care professionals' habits, preferred medical procedures and preventive procedures implemented (15). In developing countries and transition health systems, percutaneous administration of the drug substance is still preferred as well as frequent use of injections in their dispensaries (6). Some studies show that incidental injuries by sharp objects in hospital settings are different in frequency comparing to primary care. They indicate that contact of someone else's blood (or other body fluids / tissues) with the skin is the most common form of risk exposure, while being stabbed by a needle, and having blood contact with the mucosa in second and third place, respectively, in frequency (14). Our research confirms that primary healthcare has the highest risk of injury by the injection needle, second was the contact of other people's blood with the skin of a healthcare worker and glass injury.

In our study the most risky injury occurred during the injection, then before a medical procedure and then during returning the needle cap, and the least during the removal of blood or cleaning of the rooms and waste. A corroboration of this information is found with the causes leading to better understanding of their occurrence mostly during an intervention. Specifically, the most common cause of injury in our study was an unforeseen patient response and rush to perform the procedure.

From the results of our research, we can conclude that the Zenica Primary Health Care does not meet staffing and technical conditions that will

prevent the unforeseen patient response or haste of a healthcare worker. This can also be supported by a different structure of causes of injury in hospital settings where technical and staffing conditions are more favourable. Thus, in hospitals in Saudi Arabia, injuries occur more frequently after the intervention than during the intervention (13). Investigating stab injuries in nurses treating diabetics at European hospitals it was found that 203 (32%) nurses had a stabbing incident; the reasons are again putting the cap on the needle or disposal of unprotected needles on the table for needles or pins to pull the fingers (16). Numerous studies found incidental drop stitches to sharp needle after applying technically secure system for the administration of the drug (17, 18) or other instruments that can cause puncture wound (19).

In our study, majority of incident cases occurred in the family medicine department because the primary healthcare is based on family medicine. Yet, the greatest risk of providing health care was found at the Gynaecology Department, in the Haematology Laboratory and Emergency Department. The main objective of our research was to determine the extent and characteristics of incident

injuries primarily by needles and other medically sharp instruments, and to carry out preventive activities based on this knowledge.

Because of a low rate of reporting of exposure incidents it is not possible to provide a realistic basis for risk assessment and preventive action.

In the future work on improving the safety of work processes at the Primary Health Care Zenica, the primary task should be to raise employee's awareness of the need to report exposure incidents. It is possible only on the basis of a comprehensive analysis of the data, thus obtained that adequate preventive procedures can be proposed. In any case, the accreditation procedures proposed by the Agency for Accreditation and Quality in Health in the Federation of Bosnia and Herzegovina should be adopted as an initial prerequisite for improving the safety of health procedures.

#### FUNDING

No specific funding was received for this study.

#### TRANSPARENCY DECLARATION

Conflict of interest: None to declare.

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