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# Needlestick and Sharp Injuries Among Workers in Primary Health Care

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## Abstract

**Introduction:** Needlestick injuries (NSIs) are one of the most frequent routes of the transmission of bloodborne pathogens in health care settings and the substantial source of occupationally acquired bloodborne infections. They remain a significant problem for developing countries that lack the ability to implement more reliable technologies and available guidance because of the economic situation. The objectives of the study were to determine the frequency of NSIs among healthcare workers (HCWs) and supporting staff in primary health care, to investigate the factors that caused these injuries and to evaluate a set of implemented guides. **Methods:** A retrospective study of the Department of infection control records of NSIs between January 2003 and January 2016 was conducted. Incidence proportion (rate of injury risk) was calculated for each profession with reported NSIs. **Results:** A total of 156 NSIs and sharp injuries were reported to the Department of infection control during the 12-year period. Among the group of HCWs, medical nurses/technicians (54.49%) were the most common injured workers, and the lowest numbers were reported by a physical therapist and dental technicians (0.64%). In a total number of cases, support staff accounted for 16.67%. The most incidents occurred during the use of needles, in 146 (90.6%) cases. Calculated incidence proportion for medical doctors is 0.24%, 5.33% for dentists, and 13.8% for medical and dental nurses/technicians and laboratory technicians. For support staff, the calculated rate is 6.04%. **Conclusions:** At the primary health care level, the NSIs frequency among all employee profiles is lower and it is suggesting the possibility of underreporting cases. Healthcare facility management should consider introducing new and more reliable technologies to reduce the number of NSIs especially among nurses/technicians, laboratory technicians, and cleaning staff. Additional training and preventive measures should be directed towards the proper disposal of medical waste. Management of the Institution presented engagement to prevent the occurrence of NSIs, and it is a positive example for all countries in transition.

**Keywords:** Needlestick and Sharp Injuries, Healthcare Workers, Support Staff, Primary Health Care

## 1. Introduction

Needlestick injury (NSI) is recognized as an important hazard for healthcare workers (HCWs) (Canadian Centre for Occupational Health & Safety [CCOHS], 2018). It is defined as an accidental percutaneous piercing wound caused by a contaminated sharp instrument (Phillips, 2012). These injuries can occur at any time when people use, disassemble, or dispose of sharp instruments. If the sharp instruments are undisposed of properly, they can cause injury to other workers who encounter them unexpectedly. NSIs are one of the most frequent routes of transmission in occupationally acquired bloodborne infections (CCOHS, 2018). Injuries have transmitted many diseases to HCWs, but the most significant infections are hepatitis B, hepatitis C and Human Immunodeficiency Virus (HIV). According to the World Health Organization, 1 in 10 HCWs worldwide sustains it each year (Prüss-Üstün, 2005). The average number of HCWs injuries annually for the Europe B region, where Bosnia and Herzegovina belong, is 0.93 (Rapiti, 2005). Every injury will not result with infection, but significant factors contributing to their development are infectivity of contaminated biological material, depth of the wound, length of exposure, degree of viremia of the patient, and health status of the HCW (Vasic, 2011). It is estimated that after an injury in workplace situations from a needle contaminated with hepatitis B virus, there is a 6 to 30% chance that an exposed person will be infected, 1.8% remains a chance of infection for hepatitis C, and 0.3% chance for HIV infection (Ontario Hospital Association & Ontario Medical Association, 2018). Of the three million accidental injuries among HCWs annually, 40-65% of hepatitis B viral infections develop in developing countries, while in developed countries the percentage is less than 10% (Elseviers, 2014; Singhal, 2011; Tandir, 2005).

The previously mentioned differences are due to the developed precautionary awareness, availability of immunization, improved sharp waste disposal practices, and post-exposure prophylaxis, which is consistent with the recommendations of the Centers for Disease Control and Prevention (CDC) continuously available since 1987 (Centers for Disease Control and Prevention [CDC], 2001). The implementation of adequate preventive measures can preserve the health capacity of employees, but at the same time significantly reduce the cost of testing and treatment, since annual costs are estimated at €7 million in Italy and \$118 million to \$591 million in the United States (Saia, 2010).

The incidence of HCWs exposures and occupational infections in Bosnia and Herzegovina is unknown. In our country there is no surveillance program for occupational exposures to bloodborne viruses, even though there are published rules for reporting (Official Gazette Federation B&H, 2010). Over the last decade in Bosnia and Herzegovina, the infection morbidity rates for hepatitis B, hepatitis C, and HIV infection have increased. Currently, the country is experiencing a migrant crisis, and most migrants coming from endemic areas towards above mentioned viruses. Therefore, the objectives of the retrospective study were to determine the frequency of NSIs among HCWs and supporting staff in primary health care, to investigate the factors that caused these injuries and to evaluate a set of implemented guides. Our results will provide practical information for improving the effectiveness of prevention strategies.

## 2. Method

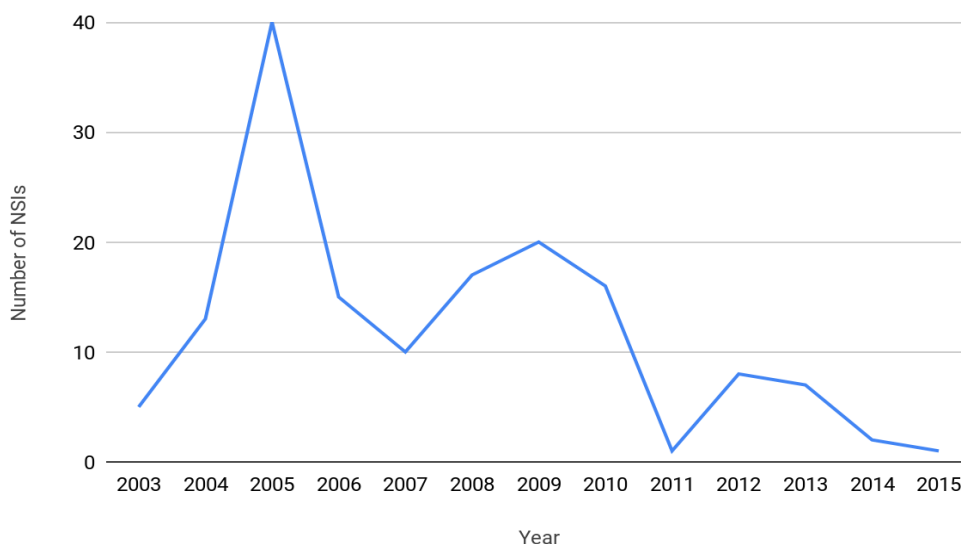
The Public Institution Health Centre of Sarajevo Canton is the largest institution in Bosnia and Herzegovina with 2031 employees. They are providing primary health care medical services to the general population. During 2017, they had 13.816,187 visits and services. A retrospective study of the Department of Infection Control records of needlestick injuries between January 2003 and January 2016 was conducted. Ethical approval was obtained from the Ethics committee of the Institution. Incidence Proportion (rate of injury risk) was calculated for each profession with reported NSIs according to available instructions (CDC, 2012). Collected data were analyzed in the statistical package SPSS 10.0 for Windows, and results are shown in charts and tables.

## 3. Results

A total of 156 NSI and sharp injuries were reported to the Department of Infection Control during the 12-year period. Of the 156 employees, 127 (81.41%) were females and 29 (18.59%) males. The mean age of individuals

was  $40.5 \pm 8.1$  years. In total, 7.68% of employees had NSIs. The majority were reported during 2005, in total 40 (25.64%). The numbers of reported NCIs through the years are shown in Figure 1.

Figure 1. Reported NSIs of Public Institution Health Centre of Sarajevo Canton through years



Among the group of HCWs, medical nurses/technicians (85) were the most common injured workers, which constituted 54.49% of all reported NSIs. Twenty-one (13.46%) of the incidents were reported by laboratory technicians and eleven (7.05%) by dental nurses. Eight dentists (5.13%) and three physicians (1.92%) reported various causes of injuries. The lowest number of injuries among this group of workers was reported by a physical therapist and dental technicians (0.64%). In a total number of cases, support staff accounted for 26 (16.67%). Among them, the majority (13.46%) were reported by the cleaning staff. All results are presented in Table 1.

Table 1. Job category of workers with reported NSIs (2003.-2015.)

Group of workers	Job category	Number (n)	Percentage (%)
Healthcare workers	Medical nurses/technicians	85	54.49
	Laboratory technicians	21	13.46
	Dental nurses	11	7.05
	Dentists	8	5.13
	Physicians	3	1.92
	Dental technicians	1	0.64
	Physical therapist	1	0.64
Support staff	Cleaning staff	21	13.46
	Housekeeper	3	1.92
	Labware cleaners	1	0.64
	Security officer	1	0.64
Total		156	100

The most reported incidents among all profiles occurred during the use of needles in 146 (90.6%) cases. Except for needles, laboratory technicians reported lancets in three (1.86%) and recapping in one case (0.64%). Among dental professionals, other sharp objects (dental explorer and elevator) were causes in individual cases (0.64%). Furthermore, the contact of blood (splash event) with mucous membranes of eyes was recorded by one dentist (0.64%), and it occurred during the extraction of teeth. During an intervention, the dentist didn't use personal protective equipment. There were, moreover, two attacks on staff by patients.

Calculated Incidence Proportion (rate of Risk) of NSIs for medical doctors is 0.24%, 5.33% for dentists, and 13.8% for medical and dental nurses/technicians and laboratory technicians. For support staff (cleaning staff, housekeepers, labware cleaners, security officers) the calculated rate of injury risk is 6.04%.

#### 4. Discussion

The NSIs potentially represent one of the most significant dangers to HCWs. Although the world's umbrella authorities have been continuously issuing guides for over 30 years, undeveloped countries often do not have the ability to implement them, primarily for economic reasons. For healthcare providers, prevention programs that have a legal foothold and compliance with guidelines are more cost-effective than treating occupational infections. These infections serve as high occupational risks and threats to healthcare workers, especially where basic rules of occupational safety and health are unimplemented (Sagoe-Moses, 2001).

Changes in the organization of the work process, the investments in protective equipment and innovative technologies, the availability of immunization, the introduction of prevention programs and education of the HCWs provide benefits to all stakeholders. This was recognized as a priority by the management of the Public Institution Health Centre of Sarajevo Canton and resulted in the adoption of a series of internal regulations in 2005. Among them, the most significant places are taking Guides on preventing and controlling home infections and measures to spread the infection within a healthcare organization. They contain the methodology for the organization of the processes, implementation of hygienic-prophylactic and anti-epidemic measures and their control. Implementation of these measures, the introduction of immunization with the engagement of employees has significantly reduced the number of NSIs, as it can be seen in Figure 1. This type of approach is typical in highly developed countries, but for Bosnia and Herzegovina as an undeveloped country with still visible war consequences, has been a significant step forward. According to our results, over the twelve-year period, 156 (7.68%) primary health care employees reported NSIs. A higher prevalence of injuries was registered in a study by Musa et al. (63.3%), conducted at a secondary level hospital in Sarajevo (Musa, 2015). A significant difference can be related to the complexity of medical interventions or possible cases of underreporting. However, the problem of underreporting is also encountered in highly developed countries like Sweden (Voide, 2012). In the region, 85 injuries were registered in Serbia over a nine-year period, and at a clinical hospital in Zagreb 1.881 in two years, placing health care in fourth place in the total number of occupational injuries (Janićević, 2011; Ministry of Health of the Republic of Croatia [MHRC], 2015). According to the results presented by Cooke & Stephens, studies from various countries reported a broad range from 14.9% to 69.4% of HCWs who have experienced an NSI (Cooke & Stephens, 2017). Based on the study by Rapiti Elisabetta et al., the most modest number of HCWs injuries per year was registered in Saudi Arabia (Rapiti, 2005).

Among the HCWs group, the most significant number of NSIs was reported by medical nurses/technicians 85 (54.49%). The result of our study correlates with the studies conducted in the world (Cooke, 2017; Khraisat, 2014). Matsubara presented that 12.8% nurses had NSI and that their low risk rate is connected to adequate equipment and educational classes (Matsubara, 2017). This result supports our opinion that decreasing of NSIs is possible, but it requires a great deal of engagement. According to Cho, 92 nurses consider it is important to report all body fluid exposure, but 58% perform that properly (Cho, 2013). Raising of awareness should be one of the primary goals together with the provision of safe work equipment. Studies conducted worldwide reported different results for laboratory technicians. A lower representation was registered in India (1.1%), Croatia (8%), and Mauritius (11.9%) (Goel, 2017; MHRC, 2015; Subraty & Moussa, 2007). Our result (13.46) correlates with a study conducted in the Lao People's Democratic Republic (12.5%) (Matsubara, 2017). Mentioned results are significantly lower than in Africa (46.6%) (Auta, 2017). In total, 7.05% of dental nurses reported NSI and it is similar with the study conducted in Taiwan (7.55%) (Lee, 2014).

Current results for medical doctors and dentists (1.92 and 5.13%) deviate from the results of studies conducted worldwide. The prevalence of NSIs among physicians ranges from 7.7% to 73.7% and dentists from 15.8% to 78.57% (MHRC, 2015; Matsubara, 2017; Goel, 2017; Lee, 2014; Khader, 2008). Reported differences in results and estimated risk for these HCWs profiles can be linked to the providing of simpler healthcare services at a primary health care level.

According to results of our study, notable attention should be directed to the group of support staff, since they significantly participate in the total number of NSIs (16.67%). Our results for the representation of NSIs in cleaning staff are correlated with the Khraisat and Musa studies in studies conducted in Malaysia and Bosnia and Herzegovina (12.8% and 15%, respectively) (Musa, 2014; Khraisat, 2014). The results imply the need for intensive training and control of staff work, especially in the segment of proper disposal of medical waste. We believe that future studies on NSIs should target the support staff group since the focus is solely on HCWs as a high-risk group.

The most frequent cause of NSIs in all employee profiles was a stab on a contaminated needle during the use and disposal of sharp waste (93.59%). Zhang and Cho reported significantly lower percentages (59% and 70.4%, respectively) (Cho, 2013; Zhang, 2015). This indicates that to reduce NSIs in the healthcare industry, it is necessary to introduce more reliable technologies into work, in line with the recommendations of the world authorities.

Our findings on the cause of NSIs in the dental service are correlated with Lee and Al Qahtani research conducted in China and Saudi Arabia (Lee, 2014; Qahtani, 2017). Although the representation of NSIs among dental staff is lower, excessive caution during manual work is important since they use a wide range of sharp instruments. The rate of injury risk based on our results varies from 0.24 to 13.8%. According to Elsevier et al. the risk rate based on different methodologies varied from 1.4 to 9.5 per 100 HCWs (Elseviers, 2014). Regarding the mentioned above, the possible impact on worker's well-being after NSI can be serious, and in most cases includes high level of stress.

## 5. Conclusions

At the primary health care level, the NSIs frequency among all employee profiles is lower and it is suggesting the possibility of underreporting cases. Healthcare facility management should consider introducing new and more reliable technologies to reduce the number of NSIs especially among nurses/technicians, laboratory technicians, and cleaning staff. Additional training and preventive measures should be directed towards the proper disposal of medical waste. Management of the Institution presented engagement to prevent the occurrence of NSIs, and it is a positive example for all countries in transition.

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