



Investigating Occupational Infections in Hospital Staff

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ABSTRACT

Introduction: With the spread of emerging diseases, more new infections threaten health care workers. One of the most important ways of transmitting infections is contact with infected blood and fluids of human body, including hepatitis B, hepatitis C and HIV infection. In this study, we will look at ways of transferring them at a general hospital.

Materials and methods: This study was conducted from 2012-2013 at a general hospital on data from all the health care workers who had been exposed to blood and body fluids of patients. The data were analyzed with descriptive statistics and Fisher's exact test by SPSS 20.

Results: The highest rate of occupational exposure was found among nurses (32.5%) and students (20%). These exposures had occurred most commonly in the emergency ward (41.3%). Percutaneous injury was reported in 96.3% of the cases. The history of hepatitis B vaccination was positive in all of the exposed health care workers. About 13.8% of the exposures had occurred in hepatitis B positive patients, and exposures with unknown sources were the most common (56.3%).

Conclusion: Having experience is the most important way of preventing occupational infections, and this experience should be transmitted by training newly arrived staff and students to the hospital, particularly specially students, who are most likely to be affected and contaminated. Moreover, a pre- and post-challenge planning for each health facility should be placed

Key Words: emerging diseases, HIV, health care workers, hepatitis B, hepatitis C, occupational exposures

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INTRODUCTION

Usually, when talking about occupational infections in the hospital, all the perceptions of AIDS and viral hepatitis C&B are due to the fact that the most common way of transmitting them to the hospital is through infected needles and blood contaminated with the virus, but hepatitis E virus, because of the flow of contaminated water, has been less studied, although there is potential for

the dissemination of hospital and care facilities, especially hepatitis E [1-4].

On the other hand, some viral infections such as the Crimean Congo (CCHF), hepatitis B and hepatitis C are transmitted not only through contaminated blood but also with higher transmission and traumatic potential and numerous cases of occupational infection in the hospital [5].

Another thing is that occupational infections are not limited to viruses transmitted through blood and fluid tissues, but also manual infection is transmitted through the air, as well as numerous cases of involvement in care centers such as prisons and

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hospitals[6-7].

The importance of occupational infections is increasing day by day as the form, and clinical manifestations of infections vary, so that in areas where these infections are not common, there is an increase in their incidence and another indication of the increasing proliferation of microbial resistance[8], both are dangerous for patients and the healthcare staff, such as increasing the emergence of resistance *Streptococcus pneumoniae* in pulmonary infections[9], *Klebsiella pneumoniae* in urinary tract nosocomial infections[10], and B group *Streptococcus* in women and infants with genital infections and post-delivery sepsis and meningitis[11].

Recently, the use of new technologies such as mobiles by nurses and healthcare staff also adds to the increased prevalence of occupational and post-traumatic infections[12].

Providing medical services for patients has always exposed hospital staff and health care providers to different pathogens especially blood-borne and other contaminating secreted pathogens [13]. The results of studies carried out all over the world have reported the annual incidence of occupational exposure to biological agents such as hepatitis B and hepatitis C viruses and HIV to be from 0.78 to 5.15 in every 100 individuals in hospital personnel [14-16].

Of a total of 35 million health care workers worldwide, 3 million cases experience occupational exposure to blood and other body fluids yearly, out of whom 2 million cases are exposed to hepatitis B, 0.9 million cases to hepatitis C, and 170,000 persons to HIV [17,18]. Personnel working in operating rooms, emergency rooms, and laboratories have an increased risk of exposure to these pathogens, and most of these biological factors are a major threat to their health [19]. Often these experiences not only cause fear, anxiety and stress for medical personnel working in hospitals, but they also can impose exorbitant costs on health care systems [20].

Most exposure injuries are related to needle sticks and needle sheathing. The CDC (Centers for Disease Control) estimates that 80% of these injuries are preventable [21]. Because of resistant and chronicity of HBV[22,23], vaccination of personnel against hepatitis B is advised but there is no vaccination for prevention of Hepatitis C, however in our province (Lorestan) most of HCV genotypes are 2&3 that are more treatable than 1&4[24,25].

For prevention of both hepatitis B&C, use of gowns and gloves and other protective tools during work, training hospital personnel in preventing occupational injuries, use of equipment with high safety in hospitals, enhancement of health care systems, and recording and reporting exposures in hospitals and clinics are among the preventive measures. Considering the above-mentioned measures, and the importance of the prevention of occupational exposure as a prominent way of contamination with biological blood-borne agents in health care workers, the present study was conducted to study the

epidemiology of occupational exposure to patients' blood and other body fluids and its related factors in health care workers of in Lorestan.

MATERIALS AND METHODS

This cross-sectional study was performed on all the personnel of Biggest general hospital in Lorestan (west of Iran), including physicians, nurses, nursing-aids, laboratory and operating room staff, students, and hospital attendants who had been exposed to blood and other potentially infectious secretions from March 2012 to September 2013. A census sampling method was applied, and the names of the exposed persons were derived from the Center for Contagious Disease Control and Prevention in the hospital. The data collection tool was a questionnaire consisting of demographic data, occupation, work shift, ward of service, cause of exposure, way of exposure, source of contamination, and history of vaccination against hepatitis B. All the subjects were informed of the objectives of the study, and their names were not recorded in the questionnaires due to ethical considerations. The collected data were analyzed using descriptive statistics. The Fisher's exact test with a confidence level of 95% was applied to compare causes of exposure in terms of gender and occupation.

RESULTS

Out of 80 health care workers who had been exposed to blood and other body fluids, 54 ones(67.5%) were female and 26 (32.5%) were male. The mean age of the subjects was 29.8±8.1 years. The youngest subject was 21 and the oldest was 55 years old. The majority of the health care workers were under 30 years of age. The highest and lowest rates of exposure were found for nurses (32.5%) and laboratory personnel (1.3%) respectively (Table 1). In terms of work shift, the highest rates of exposure were found for the morning shift (52.5%), the night shift (31.2%), and the evening shift (16.3%) respectively. The highest rate was reported in the emergency room (41.3%) and the lowest in the CCU and laboratory (1.3% each)(Table 2).

Moreover, 96.3% of the exposures were via percutaneous, 2.5% via mucous, and 1.2% via mucocutaneous paths. The source of exposure in most cases (97.5%) was blood and blood-containing secretions. In terms of cause of exposure, the highest rate was found for needlesticks(26.3%) and needle sheathing (22.5%), and the lowest for surgical instruments (1.3%)(Table2). All the exposed subjects reported a history of hepatitis B vaccination. Regarding the source of contamination, as shown in the table, 56.3% of the contamination had an unknown source, and the source of 13.8% was hepatitis B. Moreover, 11.3% of the subjects had simultaneous exposure to three pathogens of hepatitis B, hepatitis C, and HIV.

Concerning the cause of exposure and gender, suturing in the males (30.8%) and needle sticks in the females

(29.6%) were the highest rates for exposure causes, and the relationship between cause of exposure and gender was statistically significant ($p=0.021$). The analysis related to the cause of exposure in terms of occupation indicated the highest rates for suturing in doctors (60%), needlesticks in nurses (38.5%), needle sheathing in nurse-aids (66.7%), injections and needle sheathing in various medical students (31.3% each), and garbage collection in hospital attendants (100%), showing statistically significant differences based on the Fisher's exact test ($p=0.001$)

DISCUSSION

Health care workers are under constant threat from occupational exposure to blood-borne biological agents and other potentially infectious secretions of patients. In this study, 80 health care workers, who had been exposed to body fluids in our hospital, were studied. The mean age of the subjects was 29.8 years old, showing the importance of working experience in occupational exposure. The highest rate of exposure was reported for the nurses in our study, and this finding is consistent with the findings in Oconnell et al. and Peng et al.'s studies in Ireland and Australia [20,21]. In Roxana et al.'s study in Italy, 67.2% of all the exposures were reported for nurses [27]. Since nurses constitute the majority of hospital staff, the highest rate of exposure in this group is predictable. Therefore, appropriate measures, including paying attention to the standard number of nurses for hospitalized patients and assigning them to working in various wards, have to be taken to protect nurses against occupational exposures. In addition, based on the results of the present study, a considerable percentage of the exposures occurred in the morning shifts, and this is compatible with the results of a study carried out by Bilski in Poland [28], which reported workload, high number of patients and requested tests, and high number of needlesticks as the main causes of high rates of exposure in the morning shift. In terms of place of exposure, the highest rates of exposure were found for emergency room, internal ward, and surgical ward respectively. In Jahan et al.'s study in Saudi Arabia, 46.8% of the exposures were reported in wards and 13.8% in emergency rooms, showing no consistency with the results of our study [29]. Moreover, the highest rates of exposure were reported for internal ward (35.3%), surgical ward (26.8%), and operation room (12.2%) in Singapore [12]. The difference between the results can be due to the differences in the structure of various health systems in terms of equipment safety and staff's skill level. Paying attention to safety precautions in emergency rooms is low, and it can be attributed to the nature of emergency rooms where patients' affairs and admissions towards have to be done quickly. In addition, the high number of patients and the low number of nursing staff in the emergency room justify the high rates of exposure in this study. Regarding the cause of exposure, our study reported the highest rates for needlesticks and needle

sheathing following injections. In a study by Ahmad Shah et al. in Afghanistan 46.3% of the exposure cases happened due to needle re-sheathing [19]. In most of studies, needlesticks and needle sheathing have been reported as the main causes of needle injuries [30]. Therefore, providing safer equipment with higher quality for different wards in a hospital, training staff in proper disposal of needles and in avoiding needle re-sheathing, and avoiding orders for tests without clear indications, which result in unnecessary needlesticks, can decrease needlesticks injuries. Concerning the source of exposure, in 56.3% of the cases the source was unknown. In Falagas et al.'s study in Greece, the rate for unknown sources was 46.7% [31]. To sum up, it seems that occupational exposure monitoring and reporting systems are not efficient, and underestimation of needle injuries in most health care centers, particularly in developing countries, has been reported. It is estimated that the actual rate of damages due to needle injuries is ten times more than the rate reported by monitoring systems in hospitals [32]. Therefore, in order to prevent occupational damages in health care workers, it is necessary to consider essential training for these persons in preventing occupational damages and observing safety principles and overall standards. Moreover, emphasizing the use of protective tools during invasive procedures, cleaning and collection of patients' stuff and enhancing their practical skills, providing staff for health care centers based on available standards, paying attention to staff's vaccination against hepatitis B and its subsequent serology, and enhancing monitoring and reporting systems in hospitals are among the most important measures that have to be taken into consideration. Also, accurate completion of medical staff's health files, preparation of health cards for them, and provision of supportive measures after damages including appropriate diagnostic and therapeutic actions can decrease the consequences of the damages.

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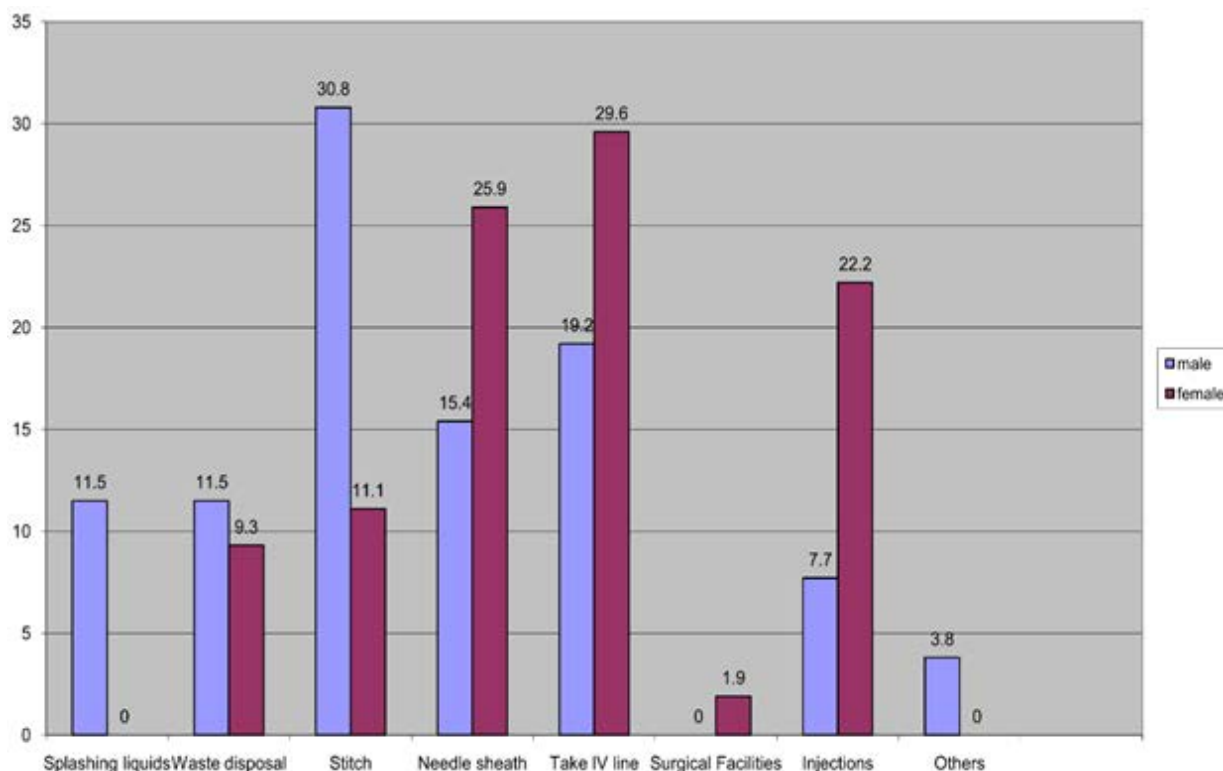
Table 1. Frequency of exposure to patients' blood and other body fluids in the personnel working in Lorestan Biggest general hospital terms of occupation and ward

Occupation	Number (Percentage)	Ward	Number (Percentage)
Doctors	5 (6.3)	Emergency room	33 (41.3)
Nurses	26 (32.5)	Internal	16 (20)
Nurse-aids	3 (3.8)	Surgical	6 (7.5)
Laboratory personnel	1 (1.8)	Infectious	4 (5)
Students	16 (20)	ICU	3 (3.8)
Medical interns	9 (11.3)	CCU	1 (1.3)
Attendants	8 (10)	Operation room	16 (20)

Others	12 (15)	Maternity	1 (1.3)
Total	80 (100)	Total	80 (100)

Table 2. Frequency of exposure to patients' blood and other body fluids in the personnel working in Lorestan Biggest general hospital d in terms of cause and source of exposure

Cause	Number (Percentage)	Source	Number (Percentage)
Fluids splashed	3 (3.8)	Hepatitis B	11 (13.8)
Garbage Collection	8 (10)	Hepatitis C	1 (1.3)
Suturing	14 (17.5)	HIV	1 (1.3)
Needle sheathing	18 (22.5)	Hepatitis B & hepatitis C	3 (3.8)
Needlesticks	21 (26.3)	Hepatitis B & HIV	8 (10)
Surgical instruments	1 (1.3)	Hepatitis C & HIV	12 (2.5)
Injections	14 (17.5)	Hepatitis B, Hepatitis C & HIV	9 (11.3)
Others	1 (1.3)	Unknown	45 (56.3)
Total	80 (100)	Total	80 (100)



Graph 1. Frequency of cause of exposure to patients' infectious secretions in terms of gender