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ORIGINAL ARTICLE

Needle Stick Injuries among Healthcare Workers of Cairo University Tertiary Care Hospitals between Incidence, Knowledge and Response

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ABSTRACT

Background*: Needle stick injuries (NSIs) are Major occupational hazards, especially among Health Care Workers (HCWs). Serious blood-borne illnesses of human immunodeficiency virus (AIDS), Hepatitis B, and C can spread through NSIs.* ***Objectives****: The study's goals were to assess the knowledge, attitude, and response of healthcare workers toward needle stick injuries.* ***Methodology****: A cross-sectional descriptive study was conducted, using a convenient sample of 470 healthcare workers from Cairo University Hospitals. Data were collected by questionnaire from February 2024 to May 2024.* ***Results****: The prevalence of NSIs among HCWs was 23.2%, which was higher in nurses compared to specialized doctors and other study groups. The highest number of needle stick injuries occurred due to needle recapping (35.5%). A significant relation was found between NSIs and the job categories and between NSIs and the years of experience. A considerable percentage of the participants performed satisfactorily in taking the immediate correct post-exposure action of washing the prick site with soap and water 94% of nurses, 85% of specialized doctors, 77% of house officers, and 100% of lab technicians. Completely immunized HCWs against Hepatitis B constituted 57% of the study participants.* ***Conclusion****: The study showed that the majority of NSI incidents occurred due to syringe recapping and these incidents can be prevented by increasing training on safe injection practices and introducing new safe injection devices.*

INTRODUCTION

Needle prick injuries in healthcare settings are frequent occurrences that can affect healthcare workers on different levels of medical service[1]. Despite protective and preventive measures that have been taken nationally and globally to reduce such accidents, they still occur due to different reasons either related to patients such as agitation and irritability, or related to healthcare workers regarding awareness, training, or work stress[2]. Consequently, healthcare workers, because of their working environment, are at greater risk for needle prick injuries and sharp injuries that can be complicated by occupational acquisition of blood-borne pathogens such as hepatitis B, C and HIV. The average risk of HIV transmission among healthcare workers after needle stick injury with HIV-contaminated needles or sharps has been estimated as 0.3%[3]. On the other hand, HCV transmission after percutaneous exposure to HCV-infected blood was estimated globally at a percentage of 2.6% according to a study conducted by WHO while HBV recorded 5.9% cases affected by needle stick injuries among healthcare workers[3]. Needle prick injuries are usually under-reported and that is why hospitals or institutions should not interpret a low reported rate as a low rate of injury. They should expect 10 fold increases in the recorded cases of needle stick injuries[4].

Needle stick injuries have significant undesirable consequences in healthcare settings, especially in developing countries. These injuries not only lead to health-associated consequences but also can lead to emotional distress among the medical team which in turn leads to missed workdays affecting directly the health care services [4].

Awareness of the medical personnel about needle stick injuries' possibilities, and protective and preventive measures are variable[4]. The availability of post-exposure prophylaxis varies in different healthcare settings[5]. Moreover, ways of reporting of needle stick injuries vary according to the applied system of

reporting of each healthcare institution and according to the infection control policy of the hospital[6].

When it comes to factors that have led to needle stick injuries in the past, we realized that most of these accidents occurred due to recapping of the needles after use for blood withdrawal from a patient. Nowadays, as a preventive corrective action, this maneuver has been prohibited and safe syringes that are self-retracting or have safety caps have been introduced to the market[7]. Safety boxes or sharp containers are designated for the disposal of sharp objects for proper containment instead of being discarded in easily penetrated plastic bags[8].

All through the years, a large number of cleaners and porters being injured by uncapped needles has been reported. Furthermore, this is concerning when a healthcare worker ignores infection control policies and discards needles into plastic bags instead of the safety boxes that have been designated specifically for the disposal of such sharp objects[1].

To prevent needle stick injuries, healthcare institutions developed their own infection control and safety policies based on documented international and approved guidelines. These protective protocols included safe injection practices with the use of self-retracting needles, sharp container placement in appropriate places when needed, and increasing awareness of healthcare workers about needle stick injury possibilities, hazards, immediate post-exposure activity, and vaccination necessity[6].

The knowledge, attitude, and practices regarding NSI vary widely among healthcare workers (HCWs). With this background, the present study was conducted among the HCWs of our institute with the following objectives:

1. To assess and compare the level of awareness, attitude, and practices regarding NSIs, standard precautions, and safe injection practices among doctors and nurses in a tertiary care hospital.
2. To study the incidence and factors resulting in NSI among the two groups.
3. To assess Hepatitis B immunization status in the study group.

METHODOLOGY

A cross-sectional descriptive survey was conducted in Cairo University Tertiary Care Hospitals and enrolled 470 HCWs in the period from February to May 2024 using a convenient sampling technique.

Data collection:

Data were collected using a structured questionnaire distributed using Google Forms or printed forms to healthcare workers of different categories. The questionnaire included socio-demographic data, needle stick injury situation, no of injuries for each HCW, immediate action taken post-exposure, infection control department notification, immune status of the exposed healthcare worker and history of vaccination with booster doses, follow-up tests of the source of infection and healthcare worker with post-exposure prophylactic action if taken[1,9,10].

Statistical analysis:

The pre-coded data were entered into the statistical package of the social science software program, version 21 (SPSS) to be statistically analyzed. Data were summarized using mean, SD, median, and IQR for quantitative variables and number and percent for qualitative variables. Comparison between qualitative variables was done using the Chi-square test, while an independent T-test was used for the comparison of Quantitative variables. Other statistical tests were used when appropriate. *P* value less than 0.05 was considered statistically significant.

Ethical approval:

The conducted study was approved by the Research Ethics Committee of the Institutional Review Board, Faculty of Medicine of Cairo University. (Serial N-13-2024)

This work has been carried out under the Code of Ethics of the World Medical Association (Declaration of Helsinki) for studies involving humans.

RESULTS

The demographic characteristics of the study participants showed 71.1% (n=334) females and 28.9% males. Nurses constituted the biggest participating category with a percentage of 43% (n=202), followed by specialized doctors and house officers that represented 23% (n=110) and 24% (n=113) respectively. Healthcare workers of the surgical and medical departments were the most common participating in the study with percentages of 22.9% (n=108) and 20% (n=95) followed by HCWs of anesthesia department 8.5% and lab workers 5.5%.

The participants with more than 5 years' experience constituted 54% of the study included personnel (n=256) Table 1.

Table 1:Demographic Data of the Study Participants

		N	%
Gender	**Male**	136	28.9
	Female	334	71.1
Category	**Specialized doctor**	110	23.4
	House officer	113	24
	Nurse	202	43
	Technician	14	3
	Worker	31	6.6
Department	**Surgical department**	108	22.9
	Medical department	95	20.2
	Anesthesia	40	8.5
	Lab	26	5.5
	Others	201	42.8
Years of Experience	**1 less than 1 year**	146	31.1
	1-5 years	68	14.5
	more than 5 years	256	54.4

Regarding vaccination with the full doses (3 doses) of HBV vaccine, 57.4% of the participants mentioned that they have received the 3 doses for Hepatitis B vaccine (n=270).

Follow up antibody titer testing was reported in 11.7% (n=55) of the included participants.

Satisfactory antibody level, more than 10IU/mg, was reported in 90.9% of vaccinated participants (n=50/55). Table 2

Table 2: Satisfactory Antibody Level Titre among the Study Participants

		N	%
Antibody level testing after HBV vaccination (n= 55)	Yes	50	90.9
	No	5	9.1
	Total	55	100.0

Needle stick injuries were reported by 23.2% of the participants (n=109).

Single accidents of needle stick injuries were reported in 54.1 of exposed personnel (n=59/109) and the other 45.9% (n=50/109) reported repeated needle prick injuries.

Needle prick injuries accidents were reported the most in wards with a percentage of 30.7%, followed by operating theaters with a percentage of 23.8%, ICU 16.8%, outpatient 15.8% and the lab showing 3%. Figure 1, Table 3

Table (3): Needle Stick Injuries among Participants

		N	%
Have you been subjected to needle stick injuries while working at Kasr El Aini during the past year?	**Yes**	109	23.2
	No	361	76.8
	Total	470	100
How many times have you been exposed to needle stick injury?	**Only one time**	59	54.1
	More than once	50	45.9
	Total	109	100.0
Workplace for occurrence of NSI (total accidents 109)	**Wards**	31	30.7
	Operating Theater	24	23.8
	ER	18	17.8
	ICU	17	16.8
	Outpatient Clinics	16	15.8
	Lab	**3**	**3.0**

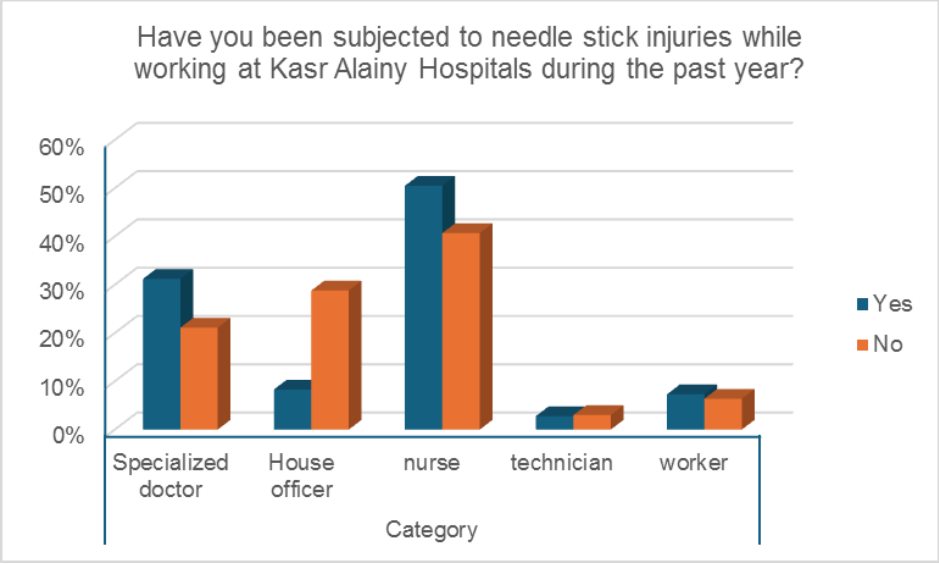

Fig. 1: NSI Incidents According to Work Category

Regarding Predisposing factors of needle stick injury, the NSIs mostly occurred by syringe recapping (35.5%) followed by sudden patient movement (31.8%)

Relation between the job category and NSI accidents was statistically significant with p value <0.001.

Relation between the years of experiences and the occurrence of NSI was statistically significant (p 0.01). Table 4

Table 4: Relation between Gender, Job Category, Years of Experience and NSI Accidents.

		Have you been subjected to needle stick injuries while working at Kasr Alainy Hospitals during the past year?				
		Yes (n= 109)		No (n=361)		
		N		N	%	P Value
Gender	**Male**	34	31.2%	100	27.8%	0.479
	Female	75	68.8%	261	72.2%	
Category	**Specialized Doctor**	34	31.2%	76	21.1%	<0.001
	House Officer	9	8.3%	104	28.8%	
	Nurse	55	50.5%	147	40.7%	
	Technician	3	2.8%	11	3.0%	
	Worker	8	7.3%	23	6.4%	
Years of Experience	**1 less than 1 year**	22	20.18%	128	35.46%	0.010
	1-5 years	21	19.27%	51	14.13%	
	More than 5 years	66	60.55%	182	50.42%	

Awareness about the availability of post exposure prophylaxis of HIV were reported by 58.42% of included nurses (n=118/202), 64.3 % of participating technicians (n= 9/14), and 60.7% of workers (n= 18/31), followed by specialized doctors and house officers with percentages of 28.2% (n=31/110) and 22.12% (n=25/113).

Training on proper needle prick injuries management was reported by 100% of participating workers, 92.86% of technicians, 88% of enrolled nurses, 38% of participating specialized doctors and 30% of enrolled house officers.

Awareness about availability of HIV/AIDS counseling center at Cairo University Hospitals was reported by 80% of participating workers, 45% of technicians, 53% of included nurses, 20.9% of specialized doctors and 14.9% of participating house officers.

Awareness about availability of Hepatitis Virus Center at Cairo University Hospitals was reported by 86% of the study included workers, 63% of technicians, 76% of participating nurses, 60% of included specialized doctors and 56% of house officers

Relation between NSI knowledge and work category was found to be statistically significant regarding awareness of availability of PEP, HIV and hepatitis centers at Cairo University hospitals (p 0.00, 0.00 and 0.001 respectively)

Relation between training on needle stick injury post exposure management and work category was statistically significant with a p value 0.00 with attention given to larger percentages of knowledgeable and trained non doctor category than doctors of different specialties and house officers.

Relation between awareness of availability of PEP of HIV and different HCW categories showed statistically significant difference (p<0.001)

Regarding the knowledge of participants about infection control measures importance and factors participating in increased needle stick injuries accidents, 100 % of workers and 99% of specialized doctors agreed that safe injection practices help reducing needle stick injuries accidents, followed by nurses in a percentage of 95% followed by house officers and technicians in percentages of 94.7% and 92.8% respectively.

When questioned "being pricked could be a cause of infection with blood-borne viruses", 100% of technicians agreed that needle prick injuries can transmit viral infections, followed by doctors and nurses with nearly 98% of each category, then workers in a percentage of 92%.

For the workload pressure as a possible cause for needle prick injuries, there was a statistically significant difference between the different categories (p < 0.001), as 58 % of the specialized doctors and 69.9% of the house officers thought that work pressure does not allow for the adherence to infection control practices. Table 5.

Table 5: The Relation between the Participants Category and Their Attitude toward NSI

Q		Category										P value
		Specialized doctor(n=110)		House officer (n=113)		Nurses (n=202)		Technician (n=14)		Workers (n=31)		
Do you think that practicing "safe injection" reduces the risk of needle stick injury?	**Yes**	109	99.1%	107	94.7%	192	95.0%	13	92.8%	31	100.0%	0.164
	No	1	0.9%	6	5.3%	10	5.0%	1	7.2%	0	0.0%	
Do you think that being pricked could be a cause of infection with blood-borne viruses?	**Yes**	108	98.2%	109	95.6%	199	98.5%	13	100.0 %	29	93.5%	0.255
	No	2	1.8%	5	4.4%	3	1.5%	0	0.0%	2	6.5%	
Do you think that work pressure allows for adherence to infection control practices?	**Yes**	46	42%	34	30.1%	102	50.5%	8	57%	26	84%	<0.001
	No	63	58%	79	69.9%	100	49.5%	6	30%	5	16.1%	

The HBV vaccination status showed statistically significant difference (p<0.001) between the different categories as the 70.9% of specialized doctors, 64% of the workers, and 58% of the nurses received the full doses (3 doses) of the vaccine while only 40.7% of the house officers had received the full doses as shown in table 6.

Table 6: The Relation between the Participants' Category and the HBV Vaccination

Q		Category										P value
		Specialized doctor		House officer		nurse		Technician		Worker		
		N	%	N	%	N	%	N	%	N	%	
Have you received all doses (3 doses) of the hepatitis B virus vaccine?	**Yes**	78	70.9%	46	40.7%	117	58%	7	50.0%	20	64.5%	<0.001
	No	32	29.1%	67	59.3%	85	42%	7	50.0%	11	35.5%	
If yes: Have you tested the antibody level after receiving the vaccine?		18	23.1%	14	30.4%	20	17.1%	2	28.6%	1	5%	0.102

Regarding the post exposure practices there was statistically significant difference (p 0.00) between the different categories in notifying the IC team as nearly half of the nurses 54.9% compared to 12% only of the specialized doctors has notified the IC team.

Regarding other actions taken post exposure, 100 % of the workers and technicians placed the puncture site under running water, followed by 94% of the nurses, 85% of specialized doctors and 77% of house officers.

Testing source of infection reported in 50% of technicians and house officers, followed by 35 % of specialized doctors and nurses.

DISCUSSION

Occupational hazards are common in many different medical fields, which necessitate the application of preventive measures and regulations to lessen the likelihood of accidents[11].

There is a wide range of incidences of needle stick injury data across the world. The incidence of NSIs among HCWs in this study was 23.2 % which is less than a similar study conducted in a tertiary care hospital in Dehradun that showed NSIs accidents in a percentage of 57 to 60%[11]. Another study showed higher percentage of NSI among HCWs with a percentage of the incidences of NSI among interns and nurses were 75.6% and 24.4% [9].On the other hand, our results regarding NSIs percentage were more than another study conducted in governmental hospital in Dammam, Saudi Arabia that reported NSI accidents in a percentage of 8.4%[12].This difference may be due to underreporting or due to longer duration of survey conducted in Dammam hospital over 2 years that gave bigger sample size with clearer image.

In this study, the prevalence of NSIs was higher in nurses 50% compared to specialized doctors 31%, and that was near to a the study conducted in Dammam

hospital that showed NSIs reports the most from nurses with a percentage of 58% and 24% from doctors[12].

In our study, the results showed higher prevalence of NSIs among females (68.8%) compared to that in males (31.3%) which is consistent with the survey study of Dehradun tertiary care hospital that showed percentage of females NSIs reports 60% compared to males NSI reports 40%[11].

Most of the reported NSI accidents occurred due to syringe recapping (35.5%) followed by sudden patient movement (31.8%) and this was similar to a study conducted in Baghdad teaching hospital in 2020 that showed the most common causes of NSI were recapping of needles (41.4%) followed by during drug administration (27.9%)[13].

On the other hand needle recapping constituted a bigger percentage than our results in a similar questionnaire based study conducted over 5 Arab Nursing Universities that showed 52% of exposed nursing students had recapped the used needles Egyptian nursing university and this difference can be due to restriction of the latter study on nurses with more chances of injection procedures than other risky procedures[14].

For the workload pressure as a possible cause for needle prick injuries 58 % of the specialized doctors and 69.9% of the house officers thought that work pressure does not allow for the adherence to infection control practices and that was higher than a similar study conducted in military hospitals in Tehran in 2019 and showed that workload, pressure and work stress constituted around 30% collectively from the collected answers[15].

Regarding HCWs experience, the present study showed that about 54% of the studied group had experience for more than 5 years. These results agreed with previous study that was conducted in Egypt in Dakahlia governorate over 27 hospitals and showed that >50% % of the participants had an experience more than 5 years[16].

This study found that NSIs occurred most frequently in the wards (30.7%), and that was similar to the survey conducted in Dammam hospital that showed most of NSI reports in wards (32%) [12].

We observed that 45.9% of the study group experienced NSI more than once. This is similar to the study conducted in tertiary care center in Kerala, India that showed NSI experience more than once in 46% of reports collected from nurses and 53.9% reporting interns[9]. Another study conducted among private general practitioners of Davangere city showed similar percentages of NSI reports among clinicians more than once (42%) [17].

Regarding knowledge, more than 90% of all participating categories agreed on safe injections practices to decrease NSI accidents and that was higher than a similar study that evaluated the knowledge of the participating categories concerning infection control measures in percentages of 42.9% and 57% of nurses and interns respectively[9].

In agreement with recommendations, most of the participants in our study had a satisfactory performance in taking the immediate correct PEP practice of washing the wound with soap and water in 100 % of the workers and technicians, followed by 94% of the nurses, 85% of specialized doctors and 77% of house officers and that was quite better than a study conducted in University hospital in Iran and showed appropriate response of hand washing post needle stick injury in 70% of participating HCWs[18].

Testing of source of infection for three major viral markers (HIV, HBV, and HCV) was not checked in 43% of house officers, 42% of specialized doctor and 44% of nurses and that was near to a similar study that was conducted in Kerala, India that showed testing of source and self in 55% of nurses and 44% of interns[9].

Notification of IC team about the NSI incident was done by 54.9% of nurses and that was near to the study conducted in Western Rajasthan that showed infection control notification after needle stick incidents in > 50% of nursing students[19].

Our results regarding IC notification post exposure were higher than a similar study that was conducted in 5 Arab Nursing Universities and showed reporting of NSI incident in only 18% and 15% of nursing students of Iraq and Jordan respectively[14].

Our study showed 57% of participants had full hepatitis B vaccination regimen and that was higher than a similar study conducted in healthcare facilities of Nile Delta and Upper Egypt that showed only 15.8% of participants were vaccinated against HBV with full regimen[20].

The current study showed 90% of HCWs that proceeded with HBV antibody testing were protected with antibody level >10 IU/ml and that was near to the study conducted in a teaching hospital in Kerala in 2018 and showed 92% of participants having HBV antibody >10IU/ml[21].

CONCLUSION & RECOMMENDATIONS

Sharp injuries among healthcare workers are considered a major threat for acquiring blood borne infections with sometimes fatal pathogens. Our study showed incidence of NSIs less than one third of HCWs of Cairo University Hospitals mostly caused by needle recapping which necessitates implementation of infection control measures on a wider scale with more training, auditing, troubleshooting, root cause analysis and adopting long term preventive strategies to decrease NSI incidents in hospitals.

This manuscript is original, not previously published, not in press nor submitted elsewhere in English or other languages, and is not currently being considered for publication elsewhere. I have contributed to this research as an author in all steps starting from the study design, data collection and analysis till manuscript drafting. All authors declare that they have seen and approved the manuscript's contents and contributed significantly to the work

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