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Original Research Article

A study of contaminated sharp injury and associated morbidity among health care workers

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ABSTRACT

Background: Needles are one of the biomedical waste materials generated during the treatment or procedure in the hospital. Improper handling, capping or disposal technique causes a major health hazard among the health care workers (HCWs). Needle stick injuries (NSIs) can occur accidentally at any time when people use, disassemble, or dispose needle. The aim of the present study were to find out the burden of chronic morbid condition due to NSIs to HCWs, to find out various risk factors responsible for causing chronic disease to HCWs and to suggest the prevention and control of needle stick injury among the HCWs.
Methods: A cross-sectional study, conducted among HCWs. Sample size was estimated by using standard formula and 312 HCWs were taken in study. Equal number of respondent was taken from each group. The information has been collected and data entry has been done using specific software SPSS version 20.0.
Results: Most of the HCWs were infected with hepatitis B (24.0%) followed by hepatitis C virus (8.7%) and HIV (1.9%) after the percutaneous injuries with needle of infectious patients during any intervention procedures of the patients.
Conclusions: Occupational exposures to percutaneous injuries are substantial source of infections with blood borne pathogens among health-care workers because of the poor practice as well as not opting personal protective equipment's during intervention process regarding preventive and control measures. These infections are highly preventable and should be eliminated.

Keywords: Health care workers, Needle stick injury, Hepatitis B virus

INTRODUCTION

Needles are one of the waste material generated during the treatment or procedure in the hospital. Improper handling, capping or disposal technique causes a major health hazard among the health care workers (HCWs). Needle stick injuries (NSIs) can occur accidentally at any time when people use, disassemble, or dispose needle. An estimated 600,000 to 800,000 needle stick and other percutaneous injuries are reported annually among U.S.[1] It is estimated that 100,000 NSIs occur annually in UK alone.[2] The causes consist of various factors like type and design of needle, recapping activities, handling, transferring specimen, collision between HCWs or sharps clean–up manipulating needle in patients line related work ,passing handling device or failure to disposed of the needle in puncture proof containers.[3] HCWs who are exposed to needles in their clinical activities are at an increased risk of acquiring needle stick injury, which may lead to serious or fatal infections with blood-borne

pathogenic infections such as hepatitis B virus (HBV), hepatitis C virus (HCV), or human immunodeficiency virus (HIV).[4]

Other infections that are transmittable through needle sticks include syphilis, malaria, and herpes.[5] According to WHO study, the annual estimated proportion of HCWs exposed to blood borne pathogens globally were HBV (5.9%), HCV (2.6 %), HIV (0.5%) corresponding to about 66000 HBV, 16000 HCV infections among them.[6] The average risk of transmission of HIV to a HCWs occur as a result of per-cutaneous exposure to HIV infected blood has been estimated as three in one thousand.[7] Seventy percent of the world's HIV population lives in Sub-Saharan Africa, but only 4% of worldwide occupational cases of HIV infection are reported from this region.[8] The risk of occupational transmission has been extrapolated by the WHO to convey the risk of an unsafe injection.[9]

The aim of the present study were to find out the burden of chronic morbidity due to NSIs to HCWs, to find out various factors responsible for causative chronic disease to HCWs and to suggest the prevention and control of needle stick injury among the HCWs.

METHODS

This was a cross-sectional study. Survey was conducted in the month of March 2013 to March 2014 covering of six different categories of HCWs of both sexes in a private tertiary care hospital Rohilkhand Medical College and Hospital Bareilly Uttar Pradesh who normally was dealing with needles. These were doctors, interns (M.B.B.S), nursing staff, nursing students, operation theatre (OT) technician and lab technician. Sample size (n) was calculated by using the formula (n)=4PQ/L2 (5% of p)^2. Sample size was calculated by assuming the prevalence of NSIs as 85.1% in a previous study with 10% absolute error.[10] By using the formula 4PQ/L2 (5% of p)^2. Assuming 10% non-response rate, the sample size was 312. Equal number of participants was taken from each category of HCWs.

Data collection involved the simple interviewing technique using a semi-structured questionnaire that was filled by interviewer. The information was collected and data entry has been done in specific software SPSS version 20.0.

RESULTS

Table 1 presents among 312 HCW males were 59.3% and females were 40.7%. Majority (46.5%) of the HCWs were in the age group of 20-24 years and 48.7% had length of service less than one year. 52 participants were taken from each category out of total 312 only 71.5% (223) were found vaccinated for hepatitis B vaccine.

Table 1: Distribution and characteristic of respondents (n=312).

Variable	N	%
Gender		
Male	127	40.7
Female	185	59.3
Age (years)		
<19	17	5.4
20-24	145	46.5
25-29	90	28.8
30-34	37	11.9
35-39	13	4.2
≥40	10	3.2
Distribution of respondents according to length of service (years)		
<1	152	48.7
1-4	101	32.4
5-9	49	15.7
10-14	5	1.6
≥15	5	1.6
Distribution of respondents according to job category		
Nursing staff	52	16.7
Nursing students	52	16.7
Interns (M.B.B.S)	52	16.7
Lab technicians	52	16.7
OT technicians	52	16.7
Resident doctors	52	16.7
Total	312	100.0

Continued.

Variable	N	%
Distribution of respondents according to their vaccination of hepatitis B		
Nursing staff	30	9.6
Nursing students	36	11.5
Interns (M.B.B.S)	45	14.4
Lab technicians	32	10.3
OT technicians	38	12.2
Resident doctors	42	13.5
Total	223	71.5

Table 2: Distribution of needle sticks injuries among HCWs in last 12 month.

Healthcare workers	Needle stick injury		Total
	Present	Absent	
	N (%)	N (%)	N (%)
Nursing staff	35 (67.3)	17 (32.7)	52 (100.0)
Nursing student	36 (69.2)	16 (30.8)	52 (100.0)
Intern	23 (44.2)	29 (55.8)	52 (100.0)
Lab technician	18 (34.6)	34 (65.4)	52 (100.0)
OT technician	36 (69.2)	16 (30.8)	52 (100.0)
Resident doctor	16 (30.8)	36 (69.2)	52 (100.0)
Total	164 (52.6)	148 (47.4)	312 (100.0)

$\chi 2=34.192$, df =5, p=0.05 (significant).

Table 3: Utilization of gloves during the procedure.

Healthcare workers	Utilization of gloves		Total
	Yes	No	
	N (%)	N (%)	N (%)
Nursing staff	17 (48.6)	18 (51.4)	35 (100.0)
Nursing student	15 (41.7)	21 (58.3)	36 (100.0)
Intern	18 (78.3)	5 (21.7)	23 (100.0)
Lab technician	13 (72.2)	5 (27.8)	18 (100.0)
OT technician	36 (100.0)	0 (0.0)	36 (100.0)
Resident doctor	12 (75.0)	4 (25.0)	16 (100.0)

$\chi 2=35.911$, df=5, p=0.05 (significant).

Table 4: Distribution of HCWs and their methods of recapping.

Healthcare workers	Recapping needle			
	Not recapping	One handed method	Two handed method	Total
	N (%)	N (%)	N (%)	N (%)
Nursing staff	15 (28.8)	10 (19.2)	27 (51.9)	52 (100.0)
Nursing student	12 (23.1)	13 (25.0)	27 (51.9)	52 (100.0)
Intern	9 (173)	18 (34.6)	25 (48.1)	52 (100.0)
Lab technician	19 (36.5)	14 (26.9)	19 (36.5)	52 (100.0)
OT technician	9 (17.3)	22 (42.3)	21 (40.4)	52 (100.0)
Resident doctor	12 (23.1)	15 (28.8)	25 (48.1)	52 (100.0)
Total	76 (24.4)	92 (29.5)	144 (46.2)	312 (100.0)

Table 2 presents among all the HCWs, needle stick injury was present in 164 (52.6%) of the workers. Nursing student and OT technician had got the maximum needle stick injury (69.2%) each followed by nursing staff (67.3%), intern (44.2%), lab technician (34.6%) and doctors (30.8%) respectively and association was found to the statically significant.

Table 3 represents it was observed that two third of the HCWs (67.7%) were using gloves during procedure and among them OT technician (100%) were using glove maximally followed by interns (78.3%), resident doctors (75%), and lab technician (72.2%). Association between utilization of gloves and needle sticks injuries was found to be statically significant.

Table 5: distribution of HCWs with investigations done after getting injured.

Health care workers	Investigation		Total
	Yes	No	
	N (%)	N (%)	N (%)
Nursing staff	18 (51.4)	17 (48.6)	35 (100.0)
Nursing student	26 (72.2)	10 (27.8)	36 (100.0)
Intern	21 (91.3)	2 (8.7)	23 (100.0)
Lab technician	1 (5.6)	17 (94.4)	18 (100.0)
OT technician	27 (74.6)	9 (25.4)	36 (100.0)
Resident doctor	11 (68.7)	5 (31.3)	16 (100.0)
Total	104 (63.4)	60 (36.6)	164 (100.0)

$\chi 2=39.334$, df=5, p=0.05 (significant).

Table 6: distribution of HCWs according to morbidity.

HCWs	No infection	HIV	HBV	HCV	Total
	N (%)	N (%)	N (%)	N (%)	N (%)
Nursing staff	14 (77.7)	1 (5.6)	1 (5.6)	2 (11.1)	18 (100.0)
Nursing student	12 (46.2)	1 (3.8)	8 (30.8)	5 (19.2)	26 (100.0)
Intern	21 (100.0)	0 (0.0)	0 (0.0)	0 (0.0)	21 (100.0)
Lab technician	1 (100.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (100.0)
OT technician	12 (44.4)	0 (0.0)	13 (48.2)	2 (7.4)	27 (100.0)
Resident doctor	8 (72.7)	0 (0.0)	3 (27.3)	0 (0.0)	11 (100.0)
Total	68 (65.4)	2 (1.9)	25 (24.0)	9 (8.7)	104 (100.0)

Table 4 shows that 46.2% HCWs were recapping the needle with two handed method while (29.5%) HCWs recapping the needle with one hundred method. Practice of recapping with one handed methods was found maximum among OT technician (42.3%) and rest of the HCWs (24.4%) were not using the one hundred recapping methods.

Table 5 represents that out of the 164 HCWs who sustained NSIs, only 63.4% of them had already undergone various investigations and rest of the HCWs (36.6%) did not agree for the investigations because of the ignorance or lack of awareness regarding NSIs. Investigation has been done after getting injured and association between two was found to be statically significant.

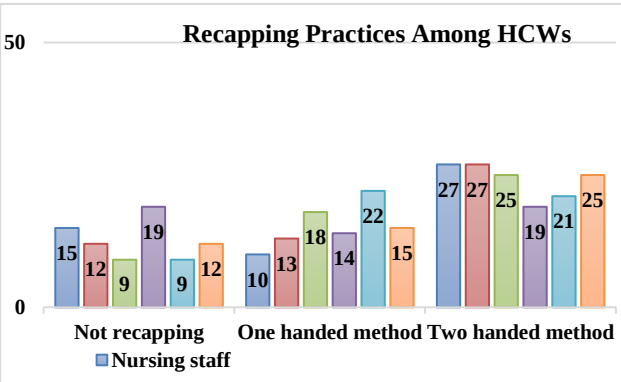

Figure 1: Various recapping practices among HCWs.

Table 6 shows that out of those HCWs who got investigated after getting NSI in previous one year (104), 24.0%were found to be positive of Hepatitis B, followed by HCV (8.7%) and HIV (1.9%).

DISCUSSION

The present study was planned to find out the burden of chronic morbidity due to NSIs, determinants responsible for causing chronic disease and to suggest there mediable measures for prevention and control of NSIs among HCWs. Increase prevalence of morbidity could be due to lack of awareness regarding injury and poor practices. In present study percentage of female HCWs were less (40.7%) as compare to Sharma et al at Delhi reported higher percentage of female HCWs (49.7%).[11] Out of total 312 HCWs in the study, 185 (59.3%) HCWs were male, 145 (46.5%) were in age group of 20-24 years and length of service were less than one year was reported 152 (48.7%) where as in Sharma et al study number of male and female HCWs were nearly equal (50.2 and 49.7% respectively), majority were in age group of 20-25 years (68.9%) and duration of service of HCWs was 1-2 year (35.7%).[11] In this study 71.4% of the HCWs were immunized with hepatitis B. whereas immunization with Hepatitis B vaccination was higher (91.5%) in Sharma et al and lower (67%) in the shah et al study.[11,12] The prevalence of needle stick injury among HCWs was 164 (52.6%) however this prevalence is much higher than 23.5% reported by Rampal et al in Malaysian and Hofranipour et al (39.4%) in Iran study.[13,14] Higher

prevalence of NSI as compare to our study was reported by various studies.[15,16] In this study 67% HCWs had worn gloves during the injury while Salelkar study reported only 58% of the HCWs were wearing gloves at the time of the injury.[17] Lee et al reported 62% of needle stick injury victims had worn gloves during the procedure.[18]

Only 29.5% of the HCWs were doing recapping with correct method while 24.4% were not doing recapping whereas Kakizaki et al have reported that three quarters of HCWs (73.6%) were not recapping the needle after procedure.[19] Among the 164 HCWs who get NSIs, more than fifty percent 104 (63.4%) were investigated. Among them majority were tested for HBV (87.5%) followed by HIV (50.9 %) and HCV (18.3%). It was found that one quarter (24%) of the source patient was infected with hepatitis B followed by HCV (8.7%) and HIV (1.9%). In Singru et al study the source patient were HIV negative in 52.87% of the occupational exposures; while in only 6.97% of the exposures, the source patient were HIV positive; in the rest (40.16%), the HIV status was unknown.[20] In Rampal et al study the knowledge on body fluid transmitted by HIV/AIDS and blood products was high (99.1%) whereas Kermode et al reported knowledge of transimission by HIV/AIDS (56.0%), and hepatitis B (10.6 %) was low.[21,22] According to shah et al among 100% HCWs hepatitis B was transmitted by infected needle-stick injury, which was higher as compare to present study.[23] Almost half (48.2%) of the HCWs also mentioned other disease like tuberculosis, malaria, cancer, leprosy, diabetes, asthma, tetanus, pneumonia and fever.

CONCLUSION

Occupational exposures to percutaneous injuries are substantial source of infections with blood borne pathogens among health-care workers because of the poor practice regarding protective measures. These infections are highly preventable and should be eliminated. There is a need of health education campaigns to enhance understanding of the importance of practicing protective measures.

Recommendation

In view of the above findings it is recommended that HCWs should be given education regarding universal precaution for NSIs. They should be immunized with hepatitis B and tetanus toxoid on joining the hospital. While handling with injection and sharps, they should follow universal precautions to prevent NSIs. Availability of adequate safety wear should be ensured to HCWs.

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