

## Original Research Article

# A study on needle stick injuries among health care workers in a tertiary care hospital in India

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**Received:** 16 February 2019

**Revised:** 27 February 2019

**Accepted:** 28 February 2019

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### ABSTRACT

**Background:** Needle stick injury among health workers is regarded as an occupational hazard. Health care workers are at risk of having blood-borne diseases in case they are exposed to blood and other biological samples of the patients. Moreover, staff including doctors working in tertiary care hospitals has high work load which results in increased chances of getting these injuries. The aim and objectives of this study were to find out the prevalence of needle stick injury among different categories of health care workers. Authors also aimed to assess the knowledge, attitude and practices associated with it.

**Methods:** A hospital based cross sectional study design to know the prevalence of needle stick injury among various health care workers of Karpagam Faculty of Medical Sciences and Research, a tertiary level care hospital in Coimbatore, Tamilnadu, India. A total of 250 health care workers were selected for the study purpose. A self-designed, semi-structured, pre-tested questionnaire was used to assess the prevalence of needle stick injuries and the factors associated with it.

**Results:** A majority of health care workers (94%) knew about needle stick injury and 92% were aware that HIV can be transmitted through needle stick injury, 78.4% and 69.65% were aware of Hepatitis-B and Hepatitis-C transmission respectively. About 28.4% of subjects had encountered needle stick injury in their past. Furthermore, it was found that type of exposure and place of exposure was significantly associated with different categories of health care workers ( $p < 0.001$ ).

**Conclusions:** Prevention of health workers against needle stick injury is the best possible way to prevent several blood borne diseases. There should be a prevention programme which special focus on training of health care workers. Further strategies aiming at preventive measures and reporting of the Needle stick injuries accidents should be made compulsory among health care workers.

**Keywords:** Blood borne diseases, Biological samples, Health care, Hepatitis Band C, Needle stick injuries, Occupational hazard

### INTRODUCTION

Needle stick injury among health workers is regarded as an occupational hazard.<sup>1</sup> Health care workers are at risk

of having blood-borne diseases in case they are exposed to blood and other biological samples of the patients.<sup>2</sup> The exposure to blood may be in the form of per-cutaneous injury (needle stick or sharp injury), muco-cutaneous

injury (blood and body fluids into eyes, nose or mouth) and contact with non-intact skin. When the workers in the hospital are involved with such high-risk patients, increased risk of transmission of these diseases are possible.<sup>3</sup> Health care workers has 0.5% chance of acquiring HIV through infected needle, 5.9% for Hepatitis-B and 2.6% for hepatitis-C through needle stick.<sup>4</sup>

Needle stick injuries are caused by sharps such as blood collection needles, intravenous cannulas, hypodermic needles, suture needles and hollow bore needles.<sup>5</sup> These injuries mainly occur during procedures like recapping, transferring specimens, during disposal or failure to dispose in puncture proof containers.<sup>6</sup>

Health care workers working in tertiary care hospitals have high work load which leads to increased chances of acquiring these injuries and adds to the gravity of situation that there is a problem of under-reporting that leads to false data.<sup>7</sup> Health care workers most commonly involved are nurses, doctors, surgeons, laboratory technicians, dialysis technicians and those working in transplantation units and blood bank.<sup>8</sup> Sanitary workers, waste handlers and other workers handling contaminated instruments with blood are at increased risk of acquiring blood-borne diseases.<sup>9</sup>

Health care workers should handle high risk patients carefully because currently there is no post exposure prophylaxis for hepatitis-C and hepatitis-B immunization is not completely protective in certain individuals.<sup>10</sup> Infectivity with HIV and HCV decreases within few hours, but HBV remains infectious for more than a week.<sup>11</sup> Even though, Hepatitis-B has the highest risk for infection, it has an effective vaccine and post-exposure prophylaxis but it is not so for HCV and HIV, hence prevention is the only way.<sup>12</sup> However, needle stick injury can be prevented through implementation of universal precaution guidelines, immunization against Hepatitis-B and personal protective measures.<sup>13</sup> Hence, present study aims at finding the prevalence of needle stick injury among different categories of health care workers in a tertiary care hospital in India. Further it also aims to assess the knowledge, attitude and practices associated with it.

## **METHODS**

The study was conducted among all the health care workers of Karpagam Faculty of Medical Sciences and Research, a tertiary level care hospital in Coimbatore, Tamil Nadu, for a period of two months from April 2016 to June 2016. During this period finalization of study tool, data collection and data analysis was done. A hospital based cross sectional study design was adopted for studying the prevalence of needle stick injury among health care workers.

The study was conducted among various categories of health care workers including consultants, senior residents, junior residents, interns, undergraduate medical students, staff nurses, lab technicians, nursing students, dental technicians, operation theatre assistants, sanitary workers and others. A total of 250 health care workers were selected for the study purpose. A self-designed, semi-structured, pre-tested questionnaire was used to collect data from the participants.

### ***The questionnaire includes three sections***

Demographic characteristics of health care workers includes variables like age, sex, education, job category, duration as health care workers and their immune status.

Assessment on knowledge, attitude and practices of needle stick injury among health care workers was used to assess the knowledge of health care workers regarding preventive measures, universal precaution guidelines and post exposure prophylaxis.

Prevalence of needle stick injury among health care workers contains questions regarding needle stick injuries (whether any health care worker has experienced needle stick injury in the past, events that lead to needle stick injury and whether the event was reported or not) etc. A cross-sectional study was carried out to study the prevalence of needle stick injury among health care workers and knowledge, attitude and practices about post exposure prophylaxis between months of April 2016 to June 2016. The study group consisted of various health care workers including consultants, senior residents, junior residents, interns, undergraduate medical students, staff nurses, lab technicians, operation theatre assistants and sanitary workers.

The study was carried out with participation of 250 health care workers. Strategy the study was carried out with the help of an anonymous, self-reporting questionnaire structured specifically to obtain both qualitative and quantitative data to identify predictive factors associated with needle stick injury. The researcher was present during the study to answer queries raised by participants.

The participants were given briefing about the purpose of the study. They were asked not to disclose their identity to assure them that this study was only for academic and research purposes. Health care workers who gave history of needle stick injury were directed to seek advice on post exposure prophylaxis from ICTS (integrated counseling and testing centre) in our hospital.

### ***Working definitions***

Needle stick injury: It is defined as any cut or prick to the subjects by a needle previously used on a patient in work related and sustained within the hospital premise.<sup>6</sup>

Case definition of needle stick injury: case definition of needle stick injury in the present study includes injuries caused by sharps such as hypodermic needles, blood collection needles, IV cannulas, suture needles, IV sets and needles used to connect parts of IV delivery system.<sup>14</sup>

Post exposure prophylaxis: Any preventive medical treatment started immediately after exposure to pathogen in order to prevent infection by pathogens and to prevent development of disease.<sup>15</sup>

**Ethical consideration**

Approval of ethical committee of our institution was sought before conducting the study. Informed and written consent from all the participants was taken. Confidentiality was maintained at all times during the

course of the study. There was no financial burden to the participants.

**Statistical analysis**

The data thus obtained was analyzed using SPSS software (version 20). Appropriate statistical methods (chi-square, t-test and Logistic regression) were applied as per requirement. P value ≤0.05 was considered significant.

**RESULTS**

A hospital based epidemiological study was conducted to find out the prevalence of needle stick injury among different categories of health care workers in a tertiary care hospital in Coimbatore, India.

**Table 1: Demographic characteristics of health care workers.**

| Demographic characteristics                       | N (250)          | Age (%) |
|---|------------------|---------|
| Age   | <20              | 41.2    |
|   | 20-40            | 45.2    |
|   | 40-60            | 11.2    |
|   | >60              | 2.4     |
| Sex   | Male             | 16.4    |
|   | Female           | 83.6    |
| Job category                                      | Senior doctors   | 18.0    |
|   | Junior doctors   | 25.2    |
|   | Nurses           | 33.2    |
|   | Lab technicians  | 6.0     |
|   | Nursing Students | 16.8    |
|   | Sanitary Workers | 0.8     |
| Duration as health care worker                    | <5 years         | 68.0    |
|   | 6-10 years       | 15.6    |
|   | 10-15 years      | 8.8     |
|   | >15 years        | 7.6     |
| Immune Status of HCWs (HBsAg, anti-HCV, anti-HIV) | Positive (HbsAg) | 0.4     |
|   | Negative         | 64.8    |
|   | Don't know       | 34.8    |
| Hep B vaccination                                 | Done             | 78.8    |
|   | Not done         | 21.2    |
| If yes, no. of doses taken                        | 1                | 9.2     |
|   | 2                | 15.6    |
|   | 3                | 35.6    |
|   | Booster          | 18.4    |

The study was carried for a period of two months from April 2016 to June 2016. Table 1 depicts the demographic characteristics of health care workers. Out of total sample of 250 health care workers, a majority (45.2%) were aged between 20-40 years of age followed by younger age group <20 years (41.2%). Maximum

health care workers were females (83.6%) and belonged to the job category of nurses (33.2%) followed by junior doctors (25.2%) and senior doctors (18.0%) respectively.

As far as duration of work was concerned, a majority of subjects working for <5 years were 68% whereas very

few study subjects working for a duration of >15 years were 7.6%. Majority of study subjects were negative for HbsAg, anti-HCV and anti-HIV, whereas only one subject was positive for HbsAg. Regarding Hepatitis-B vaccination, (78.8%) had been vaccinated and out of that 35.6% have taken 3 doses and 18.4% had taken a booster dose of vaccine respectively. Table 2 observed the level

of knowledge and preventive measures taken by health care workers regarding needle stick injuries. A majority of health care workers (94%) knew about needle stick injury and 92% of study subjects were aware that HIV can be transmitted through needle stick injury, 78.4% and 69.65% were aware of hepatitis-B and hepatitis-C transmission respectively.

**Table 2: Knowledge, attitude and practices of health care workers and preventive measures regarding exposure to needle stick injury.**

| Occupational hazards and preventive measures          |             | N (250) | Age (%) |
|---|-------------|---------|---------|
| Do you know about needle stick injury                 | Yes         | 235     | 94      |
|   | No          | 15      | 6       |
| Which diseases are transmitted by NSI                 | Hepatitis B | 196     | 78.4    |
|   | Hepatitis C | 174     | 69.6    |
|   | HIV         | 230     | 92      |
|   | None        | 16      | 6.4     |
| Do you ever have NSI                                  | Yes         | 71      | 28.4    |
|   | No          | 179     | 71.6    |
| Have you reported the incident of needle stick injury | Yes         | 40      | 56.3    |
|   | No          | 31      | 43.6    |
| Do you know about post exposure prophylaxis           | Yes         | 196     | 78.4    |
|   | No          | 54      | 21.6    |
| Do you know about universal precaution guidelines     | Yes         | 183     | 73.2    |
|   | No          | 67      | 26.8    |
| Do you know about needless safety devices             | Yes         | 200     | 80      |
|   | No          | 50      | 20      |

**Table 3: Response of various categories of health care workers regarding needle stick injury.**

| Categories                    | Responses given                       | Senior doctors | Junior doctors | Nurses   | Lab technicians | Total (N=250) | *P value |
|-------------------------------|---------------------------------------|----------------|----------------|----------|-----------------|---------------|----------|
| Do you ever have NSI          | Yes                                   | 10 (4)         | 14 (5.6)       | 37(14.8) | 10 (4)          | 71 (28.4)     | 0.57     |
|                               | No                                    | 35 (14)        | 49(19.6)       | 46(18.4) | 49 (19.6)       | 179(71.6)     |          |
| Type of exposure              | Needle stick                          | 6 (2.4)        | 13 (5.2)       | 24(9.6)  | 5 (2)           | 48 (19.2)     | 0.001    |
|                               | Blood splashes                        | 0              | 0              | 4(1.6)   | 0               | 4(1.6)        |          |
|                               | Body-fluid splashes                   | 0              | 0              | 1 (0.4)  | 1 (0.4)         | 2 (0.8)       |          |
|                               | both needle stick and blood splashes  | 4 (1.6)        | 3 (1.2)        | 8 (3.2)  | 2 (0.8)         | 17 (6.8)      |          |
| Location or place of exposure | Wards                                 | 1 (0.4)        | 8 (3.2)        | 18 (7.2) | 5 (2)           | 32 (12.8)     | 0.001    |
|                               | Both causality and ward               | 0              | 4 (1.6)        | 6 (2.4)  | 1 (0.4)         | 11 (4.4)      |          |
|                               | OT, ICU and OP                        | 7 (2.8)        | 1 (0.4)        | 9 (3.6)  | 2 (0.8)         | 19 (7.6)      |          |
|                               | All the above                         | 2 (0.8)        | 3 (1.2)        | 4 (1.6)  | 0               | 9 (3.6)       |          |
| How did injury occur          | Suturing                              | 4 (1.6)        | 3 (1.2)        | 2 (0.8)  | 0               | 9 (3.6)       | 0.015    |
|                               | Injection of drugs                    | 2 (0.8)        | 2 (0.8)        | 7 (2.8)  | 3 (1.2)         | 14 (5.6)      |          |
|                               | Disposal of needle                    | 1 (0.4)        | 2 (0.8)        | 11 (4.4) | 1 (0.4)         | 15 (6)        |          |
|                               | Blood withdrawal                      | 0              | 3 (1.2)        | 3 (1.2)  | 1 (0.4)         | 7 (2.8)       |          |
|                               | Both injection and disposal of needle | 0              | 1 (0.4)        | 6 (2.4)  | 1 (0.4)         | 8 (3.2)       |          |
|                               | All the above                         | 3 (1.2)        | 5 (2)          | 8 (3.2)  | 2 (0.8)         | 18 (7.2)      |          |

\*<0.05 = significant.

A total of 28.4% subjects reported having encountered one or more needle stick injury in their career, out of that 56.3% reported to the hospital authority. A 78.4% of study subjects knew about post exposure prophylaxis. A 73.2% and 80% of subjects were aware of universal precaution guidelines and use of needless safety devices in our hospital whereas less study subjects 26.8% and 20% were unaware of the universal precaution guidelines and safety device. A 12.8% of needle stick injuries occurred in wards, 7.6% in OT, ICU and OPD followed by 4.4% in causality and wards. Of these, 1.6% of senior

doctors acquired needle stick injury from Operation theatres during suturing and 3.2% of junior doctors had needle stick injury from wards followed by suturing (1.2%). Needle stick injury among nursing staff was maximum in wards (7.2%). Information was also elicited regarding the time of injury. It was higher during disposal of needle 4.4% followed by injection of drugs (2.8%). Furthermore, it was found that type of exposure and place of exposure was significantly associated with different categories of health care workers ( $p < 0.001$ ).

**Table 4: Response of health care workers after needle stick injury.**

| Categories                          | Responses given                      | Senior doctors | Junior doctors | Nurses  | Lab technicians | Total (N=71) |
|-------------------------------------|--------------------------------------|----------------|----------------|---------|-----------------|--------------|
| Actions taken by health care worker | Immediately washed the affected part | 5 (2)          | 9 (3.6)        | 9 (3.6) | 5 (2)           | 28 (11.2)    |
|                                     | Reported to authorities              | 5 (2)          | 10 (4)         | 2 (0.8) | 5 (2)           | 22 (8.8)     |
|                                     | Taken post-exposure prophylaxis      | 4 (1.6)        | 0              | 6 (2.4) | 2 (0.8)         | 12 (4.8)     |
|                                     | All the above                        | 1 (0.4)        | 3 (1.2)        | 2 (0.8) | 1 (0.4)         | 7 (2.8)      |
|                                     | No action taken                      | 0              | 0              | 2 (0.8) | 0               | 2 (0.8)      |

**Table 5: Cause of needle stick injury as per health care worker.**

| Categories                         | Responses given              | Senior doctors | Junior doctors | Nurses   | Lab technicians | Total (N=71) |
|------------------------------------|------------------------------|----------------|----------------|----------|-----------------|--------------|
| Reasons for getting exposed to NSI | Fatigue                      | 1 (0.4)        | 1 (0.4)        | 9 (3.6)  | 2 (0.8)         | 13 (5.2)     |
|                                    | Lack of skill                | 0              | 0              | 6 (2.4)  | 3 (1.2)         | 9 (3.6)      |
|                                    | Over crowding                | 5 (2)          | 7 (2.8)        | 12 (4.8) | 2 (0.8)         | 26 (10.4)    |
|                                    | Non-cooperation from patient | 2 (0.8)        | 2 (0.8)        | 1 (0.4)  | 1 (0.4)         | 6 (2.4)      |
|                                    | Negligence                   | 0              | 2(0.8)         | 5(2)     | 2(0.8)          | 9(3.6)       |
|                                    | All the above                | 2 (0.8)        | 2 (0.8)        | 4 (1.6)  | 0               | 8 (3.2)      |

Table 4 shows various responses of health care workers after getting needle stick injury. 11.2% of the study subjects after acquiring needle stick injury immediately washed the exposed part with water and spirit followed by 8.8% who had reported the incident to the concerned authorities while 4.8% had taken post exposure prophylaxis. Only a few subjects of 0.8% have not taken any kind of action.

Table 5 depicts various reasons cited by the health care worker after getting needle stick injury. 10.4% of the study subjects described overcrowding of patients as their main reason for needle stick injury followed by fatigue (5.2%) and lack of skill and negligence (3.6%). Only a few subjects (2.4%) considered non-co-operation from patient as a reason for needle stick injury.

**DISCUSSION**

There has been a significant unurge over the past decade in health hazards resulting from transmission of various

blood borne pathogens among health care workers. The risk of acquiring the infection depends on the precautions taken while dealing with the patients infected in a health setting.

The present study revealed certain aspects of needle stick injury in a rural tertiary care hospital in Coimbatore, India. A total of 250 health care workers participated in the study. Majority where between the age group of 20-40 and 83.6% of the health care workers were females. Present study shows that about 28.4% health care workers had at least one episode of needle stick injury in their lifetime which is higher than the study conducted by Rampal et al, in Malaysia (23.5%).<sup>1</sup>

Majority of the health care workers who sustained needle stick injury were nurses (14.8%) followed by junior doctors (5.6%) which is lower when compared to a study conducted by Jayanth et al, where 28.4% of nurses were affected by needle stick injury.<sup>16</sup> It may be due to patient overload in wards, greater time the nurses spend with the patients, frequent administration of injection, venous



puncture etc. Majority of the needle stick injury occurred in wards (12.8%) which are lower when compared to the study conducted by Rais N et al, where 41.6% of needle stick injury occurred in inpatient units.<sup>17</sup>

The most common source of needle stick injury in present study was during disposal of needle 6% which is similar to the study conducted by Sharma et al, where 5.1% subjects were injured during disposal of needle.<sup>18</sup> After sustaining needle stick injury, 11.2% of health care worker washed the exposed site with spirit and water and only 4.8% of health care workers had sought post exposure prophylaxis. This data is very low when compared to the study conducted by Jahangiri et al, where 70.2% of subjects washed with soap and water.<sup>19</sup> A 6% of health care workers considered themselves having lack of skill that lead to needle stick injury a figure lower when compared to the study conducted by Radha R et al, where 47% of subjects considered lack of skill.<sup>20</sup> Fatigue due to long working hours was the commonest reason cited by the respondents for getting needle stick injury.

Only 10% of the health care workers have reported the injury. The commonest reason cited did not know where to report and lack of time. Reporting was 6% among doctors and 2.8% among nurses. This may be because majority of health care workers were not aware of the reporting system that exists in their hospital. In a study by Radha R et al, in a hospital at Karnataka, India 85% of health care workers didn't report the injury.<sup>20</sup> Under reporting of needle stick injury can be prevented by including these issues in the job description and by regular monitoring by the management. Present study showed that 20% and 30% of health care workers were unaware that hepatitis-B and hepatitis-C can be transmitted through needle stick injury as compared to a study conducted by Pathak R et al, in India where 20% and 80% were unaware of hepatitis-B and hepatitis-C transmission respectively.<sup>21</sup> A 78.4% of health care workers had knowledge about post exposure prophylaxis for hepatitis-B and HIV. It is higher than the study conducted by Pathak R et al, where 72% knows about post exposure prophylaxis.<sup>21</sup> Vaccination is one of the best ways to protect health care workers from diseases transmitted through needle stick injury, but vaccination is only available for hepatitis-B. In the present study, the number of vaccinated health care workers is 78.8% and only 18.4% of health care workers have completed the vaccination with a booster dose. Higher data was found in a study conducted in Karnataka by Radha R et al, where 91% of subjects were vaccinated.<sup>20</sup> In order to increase awareness among health care workers the centre for disease control (CDC) and occupational safety and health administration (OSHA) in 1985 introduced universal precaution guidelines.<sup>22</sup> Knowledge about universal precaution guidelines in this study was found to be 73.2% which is higher than the study conducted in Armed Forces hospital, Saudi Arabia where 61% of health care workers were aware of universal precaution guidelines.

## CONCLUSION

Prevention of health workers against needle stick injury is the best possible way to prevent several blood borne diseases. There should be a prevention programmed which special focus on training of health care workers. Further strategies aiming at preventive measures and reporting of the Needle stick injuries accidents should be made compulsory among health care workers.

## Recommendations

Regarding the knowledge and preventive aspects in needle stick injury, doctors had better knowledge but paramedical and supportive staff (lab technicians and sanitary staff) had poor knowledge about it. Health care workers revealed that education, training, newer and safety devices, positive work environment, decreased patient load per health care worker and standard precautions can prevent needle stick injury. Further preventive measures and reporting of the incident should be made mandatory and health care workers should be aware of it in our hospital.

*Funding: No funding sources*

*Conflict of interest: None declared*

*Ethical approval: The study was approved by the Institutional Ethics Committee*

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**Cite this article as:** Bashir H, Qadri SS. A study on needle stick injuries among health care workers in a tertiary care hospital in India. *Int J Res Med Sci* 2019;7:1032-8.