Determinants of Needlestick Injury at Coastal Karnataka, India

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Abstract

Background: Needlestick injuries are considered as the most commonly occurring occupational injuries amongst healthcare workers. Blood-borne infections can be transferred via needlestick injury. Healthcare workers may acquire these injuries in their day-to-day work from inappropriate procedures and low safety measures.

Materials and Methods: A prospective observational study was conducted at a tertiary care hospital in coastal Karnataka. The study involves a complete time-bound enumeration of needlestick injuries for the period of seven months starting from October 2018 to April 2019. A self-generated data collection form was used as a study tool, which was given to the healthcare worker who had experienced needlestick injuries.

Findings: Most of the injuries have occurred in wards (45.4%) and during invasive procedures (52.3%). The majority of the injuries were occurring in the morning shift time (38.6%). The majority of study participants (52.3%) were working for 45 to 59 hours per week. Amongst the study participants, most of them were having up to 2 years of work experience (68.2%). The injuries were occurring during invasive procedures, due to improper disposal of needles, while collecting the waste, and suturing.

Conclusion: The determinants of needlestick injuries were identified using the data. Continuous education and training programs on the safe handling of needles would help prevent needlestick injuries in the hospital.

Keywords: *Needlestick injuries, infections, delivery of care, occupational health, standard precautions, healthcare worker*

Introduction

Occupational health involves all features of health and well-being in the workstation and has a solid emphasis on primary prevention of threats. The employee's place of work has several elements leading to various diseases.[1] Especially in hospitals, job-related health, and safety hazards are more. It is familiar with healthcare workers (HCWs) to get infections by a patient during direct patient care. Because the health care worker spends his entire work shift on patient care activities. Needlestick injury (NSI) is an unintended percutaneous penetrating wound triggered as a result of a contaminated needle of a syringe and sharps, through which the infections get transmitted through blood. NSIs are considered as the most commonly occurring

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occupational injuries amongst healthcare workers.[2]

Blood-borne infections like acquired immune deficiency syndrome (AIDS), hepatitis B, and hepatitis C can be transferred via needlestick injury. Every year, millions of HCWs have the threat of acquiring blood-borne illnesses in their workplaces because of needlestick injuries.[3] The most important actions initiating needlestick injuries are administering injections, blood collection for laboratory investigations, recapping the needles, improper handling or disposal of needles, collection and segregation of waste, and when moving blood or other body fluid to a sample bottle using a syringe.[4] The hazard level varies based on the occupation and working unit. Among HCWs nurses are most commonly experiencing NSIs because they are engaged in patient care activities like administering injections and insertion of intravenous lines for infusions.[5]

The World Health Organization (WHO) estimated that worldwide needle stick injury is 2 million per year. Out of that 37.6 percent of HCWs are having hepatitis B, 39 percent of them have hepatitis C and 4.4 percent of them have human immunodeficiency virus (HIV) infections through needlestick injuries.[6] The major risk factors for NSIs among HCWs are age, educational status, working unit, work experience, and workload. NSIs were seen mostly during injection administration, recapping, and disposing of the needles or sharps.[7, 8] This study attempts to explore the determinants of NSIs and recommending preventing measures.

Objectives of the Study

1. To identify the prevalence of needlestick injury among the healthcare workers

2. To explore the determinants of needlestick injury

Materials and Methods

Study Design: Prospective observational study

Study Setting: The study was conducted at a tertiary care hospital in coastal Karnataka.

Study Population: The study involves healthcare personnel like doctors, nurses, technicians, class-4 workers or housekeeping staffs, interns, and students with needlestick injuries reporting to the Hospital Infection Control Committee (HICC) and Safety & Sentinel Committee of that hospital during the period from October 2018 to April 2019. The details of the healthcare worker will be obtained through the register maintained by the Hospital Infection Control Committee.

Exclusion criteria: Healthcare workers denying to give consent for participation.

Sample size: Complete time-bound enumeration of needle stick injuries. During the study period, 44 HCWs had NSI

Study tool: A self-generated data collection form was used to collect the data.

Data Collection: The researcher approached the infection control nurse (ICN) to collect the information of HCW who had experienced NSI. Because ICN is an authorized person to capture the data from each department of the hospital. The data collection form was provided to the study participants within 24 hours after reporting to casualty.

Data Analysis: Data was entered in Microsoft Excel 2013. Descriptive statistics were expressed as frequencies and percentages. Root cause analysis (cause and effect diagram) and failure modes and effects analysis (FMEA) were done using the software Minitab 17.

Ethical Considerations: Ethical clearance for the study was obtained from the Institutional Ethical Committee (624/2018). Participation in the study was voluntary. After obtaining the ethical clearance from the concerned authority, the written consent of all participants in the local language was obtained before providing the data collection form. The participants were educated about the determination and procedures of the study by providing a participant information sheet.

Results

As a whole, 44 healthcare workers were included in the study. None of them refused to participate. This shows a response rate of 100%. Most of them were females (66%; n=29) amongst the study participants. The age of the study participants ranged in the middle of 18 and 52 years, the mean age is 27.6 years. NSI was highest amongst the HCWs from 23 to 27 years of

age (36.4%; n=16), followed by 18 to 22 years (31.8%; n=14), 28 to 32 years & 33-37 years (9.1%; n=4 each), 38 to 42 years (4.5%; n=2), 43 to 47 years (4.5%; n=2), and 48 to 52 years (4.5%; n=2).

Out of 44 participants, NSI was highest among the interns and students (22.7%; n=10), followed by Staff nurses (18.2%; n=8), housekeeping staffs (16%; n=7), junior residents and technicians (6.8%; n=3) then registrars (4.5%; n=2), and senior resident (2.2%; n=1). Most of the NSIs have occurred in wards (45.4%; n=20), followed by intensive care unit (20.4%; n=9), casualty (13.6%; n=4), operation theatre (9.1%; n=4), outpatient department (6.8%; n=3) and dialysis (4.5%; n=2). The majority of the NSIs were occurring in the morning shift time (38.6%; n=17), followed by night shift (27.3%; n=12), evening shift (15.9%; n=7), afternoon shift (6.8%; n=3), general shift (4.5%; n=2), general OPD timings (2.3%; n=1), and on-call duty hours (2.3%; n=1).

NSIs were found to be highest in April (n=10), followed by February (n=8), October (n=7), November (n=6), January (n=5), December (n=4), and March (n=4). Most of the study participants had NSIs during invasive procedures (52.3 %; n=23), followed by disposal (36.3%; n=16), post procedure (4.5%; n=2), accidental prick (4.5%; n=2), and recapping (2.3%; n=1).The majority of study participants were working for 45 to 59 hours per week (52.3%; n=23), followed by 30 to 44 hours (22.7%; n=10), 75 to 89 hours (11.3%; n=5), 60 to 74 hours and non-specific duty hours (4.5%; n=2), 0 to 14 hours (2.3%; n=1) and 15 to 29 hours (2.3%; n=1). Amongst the study participants majority were having up to 2 years of work experience (68.2%; n=30), followed by 3 to 5 years (18.2%; n= 8), 9 to 11 years (6.8%; n=3), 6 to 8 years (2.2%; n=1), 12 to 14 years (2.2%; n=1), and 15 to 17 years (2.2%; n=1).

Table 1: Awareness of study participants about needlestick injuries

Sl. No.	Study variables	Yes (n%)
1.	Awareness on "Universal Precautions"	44 (100%)
2.	Attended educational on NSI since past one year	35 (80%)
3.	NSI protocol is displayed at the worksite	43 (98%)
4.	Proper storage of needles at the worksite	44 (100%)
5.	Adequate number of protective equipment is available at the worksite	44 (100%)
6.	Awareness of biomedical waste disposal guidelines of the hospital	43 (98%)
7.	Trained on the use of safe devices since past one year	35 (80%)
8.	Awareness of exposure control plan	39 (89%)
9.	Awareness on the procedure to follow post-NSI	41 (93%)
10.	Provision of safe devices for each procedure requiring a sharp requirement	42 (95%)

The determinants of NSIs were identified using the data obtained from the participants and they are listed below. Root cause analysis (RCA) was performed to determine the root cause of the problem. The root causes of needlestick injuries were: Invasive procedures; improper disposal of needles; while collecting the waste, and suturing.

Determinants of needlestick injury

- Long working hours
- Lengthy procedures
- Understaffing
- Overfilled sharp container
- Negligence
- Hurry in work
- Non-cooperative patients
- Not following the standard protocol
- Lack of sleep
- Accidental prick
- Talking during procedure
- Lack of safety devices
- Recapping
- Improper handling of needles
- Improper disposal of needles
- Suturing
- Invasive procedures
- Workload
- Lack of training

Failure modes and effects analysis (FMEA) is a bit by bit process to identify all potential causes in the process. A fault that disturbs the consumer or the system is termed as failure modes. FMEA aims to take appropriate actions as well as to eliminate the failures.

Here, the researcher is focusing on the prevention of needlestick injury. To prevent NSI, the root causes were studied depending on the severity of the problem. Based on this, HICC recommended certain measures to prevent NSI. They were: Continuous monitoring of the HCWs, continuous education on the safe handling of needles, and routine training programs for all the HCWs.

Discussion

Nurses are considered as the most vulnerable group amongst the HCWs. Since nurses are accountable for administering injections and intravenous fluids.[4, 7] Students and younger employees are more likely to commit mistakes as they have less working practice.[9] Therefore many occupational hazards were seen among them. A similar study has recognized the major association between age and work experience. Therefore these factors are considered as the chief cause for the NSI.[10] Various studies have shown that educational status is also a causal factor of NSI. Training programs on NSI prevention is very essential for students. Because lack of training is the most significant causative factor of NSI.[9] The head of the department of all the units in the hospital must ensure that the HCW engaged in patient care activities must attend those classes regularly.

Wards are the most familiar place where NSIs are more. Many patients will be occupied in wards with less staff (more workload). Even though they were aware of the guidelines, the NSIs were occurring due to improper disposal. This may be because of negligence, hurry in work, overloaded with work, unavailability of sharps disposing containers at their workplaces Several studies have also discussed similar outcomes.[7, 11] Mostly the ward staff will assign some procedures like checking blood sugar and connecting intravenous infusion to students or interns who are posted there. But the students are not been supervised by the ward staff while performing procedures. There should be strict monitoring of all HCWs by the infection control team. And strict actions should be taken if the wrong practices are being followed.

More number of injuries were taking place during the procedures like checking blood sugar (GRBS), taking a blood sample for laboratory investigations or arterial blood gas (ABG) analysis, suturing, connecting intravenous infusion, inserting an arterial or intravenous line. Many other studies have found that NSIs are common during invasive procedures and nursing activities.[12, 13] The morning shift is considered a busy schedule. Since most of the procedures like administering injections, collecting a blood sample, checking blood sugar after food, etc. are taken place during morning hours.[7, 14] Not many studies are done related to the work shift and

NSI. NSIs can be reduced by using retractable lancets for checking blood sugar. This study proved that there was not even a single injury after implementing this particular tool.[15, 16]

Working hour is another important cause leading to NSI. Long working hours lead to more hazards. This study suggested that HCWs working more than 40 hours are in the risk group.[7, 17] In this hospital, students will have their internship in April. As they are not well trained and prone to commit mistakes. This can be managed by assigning the students or interns under experienced staff. The participants have listed a few preventive measures. They are: To prevent these injuries staff should attend the training session on the safe handling of needles and the core staff like doctors and nurses should do the procedure cautiously, avoid talking to others while using needles, or doing invasive procedures.

Based on the findings of the study, the researchers recommended that education and training of all HCWs on universal precautions, safe handling, and disposal of needles & sharps help to prevent NSIs. Continuous assessment of all HCWs must be taken by the infection control nurses to evaluate the standard practices being followed in the hospital. The staff should have resting hours in between the night shift to avoid errors caused due to lack of sleep. Self-retractable lancets should be implemented to prevent NSIs.

Limitations

This study cannot be generalized because the study had a very less number of participants. The study duration was less and included only those HCWs who had experienced NSIs. The study would explain better outcomes if done for a longer duration and included HCWs with no NSIs from the same department. This might be helpful to discover the unexplored causes for the NSIs and develop preventive measures.

Conclusion

Needlestick injuries are of greater risk to HCWs as they transmit blood-borne pathogens due to unintentional exposure to infected blood and body fluids. HCWs had poor risk alertness, less awareness about the benefits of following standard procedures. Therefore, all HCWs must be trained to follow a standard protocol that is developed by the hospital infection control committee to prevent NSIs in their workplaces.

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