International Journal of Community Medicine and Public Health
*Sharma HC et al. Int J Community Med Public Health. 2025 Jul;12(7):3045-3050*
http://www.ijcmph.com
pISSN 2394-6032 | eISSN 2394-6040
DOI: https://dx.doi.org/10.18203/2394-6040.ijcmph20252094

**Original Research Article**

# Assessment of safe injection practices among healthcare workers in a tertiary care hospital

**H. C. Sharma[1], Manasvee Dewan[2]*, Priyanka Banerjee[2], Smriti Srivastava[2], Drishti Sagar[2], Nisha Yadav[2]**

[1]Department of Hospital Administration, Janakpuri Super Speciality Hospital, New Delhi, India
[2]Department of Microbiology, Janakpuri Super Speciality Hospital, New Delhi, India

**Received:** 26 March 2025
**Revised:** 15 May 2025
**Accepted:** 21 May 2025

***Correspondence:**
Dr. Manasvee Dewan,
E-mail: dewanmanasvee@gmail.com



## ABSTRACT

**Background:** There is dearth of documented information about safe and unsafe injection practices in both developing and developed countries. Safe injection practices are intended to prevent transmission of infectious diseases from one patient to other, or between a patient and health care personnel during preparation and injection of medications. Documented record of the daily practices would lead to efficient monitoring. This will further enhance the prevention of infection by unsafe injection practices.
**Methods:** It was cross-sectional study where healthcare workers (nursing staff, phlebotomists and doctors) were observed for safe injection practices in sample collection room, cath lab, wards and ICU. Healthcare workers were assessed by means of a pre-defined questionnaire where basic knowledge about the subject was assessed. Field training was given to the staff for safe injection practices.
**Results:** While observing the different facilities, 28.57% had loose disposable needles lying outside packaging. 42.85% facilities had sharp waste lying in a container not meant for sharp waste. All sharp containers awaiting final disposal were stored in an area away from public access. Sharp container for final disposal in one of the facilities was not completely closed; its lid was open (14.28%). All the facilities had access to soap and water while 71% facilities had access to hand sanitizers. Pre and post tests showed the gaps in the knowledge of different healthcare workers which were improved by on-spot training.
**Conclusions:** Education and training and regular audits go hand in hand in improving safe injection practices.

**Keywords:** Injection practices, Healthcare workers, Safe

## INTRODUCTION

Injection is the most common drug-delivery system worldwide especially in cases of acute emergencies and immunization. All surgical procedures involve administration of injections. Severely ill-patients, patients that are in coma and in other cases where oral administration of drugs is not possible, injections play an indispensable role. But this can also be hazardous to patients, health care workers, waste handlers and even community if used inappropriately. Appropriate disposal of waste that is generated after injection use is another important concern; if mismanaged can lead to blood borne infections.[1] As per Institute for Safe Medication Practices (ISMP) survey done 2010 and then in 2017, knowledge gaps and unsafe injection practices were very well documented.[2]

Parenteral infections like hepatitis B virus, human immunodeficiency virus (HIV), hepatitis C virus, etc. can be transmitted due to unsafe injection practices.[3] These viruses can remain "silent" in the body for a very long

period before they cause signs and symptoms leading to chronic disease. Thus, unsafe injections can lead to a 'silent epidemic' that occurs years after the original event. Keeping in mind this scenario it becomes imperative to assess the state of safe injection practices in hospitals so as to look into the scope of improvement and prevention of diseases.

We looked into similar studies from different regions.[4-7] These studies majorly focussed on the observation of practices and assessment of knowledge through questionnaire. No field training was provided and reassessment was not done after the training.

In this study, we aimed to observe the safe injection practices by healthcare staff at a tertiary care hospital in northern India, assess their knowledge of safe injection practices and to provide on-site training to the staff.

## METHODS

### *Study area*

This cross-sectional study aimed to observe healthcare workers posted in wards, intensive care units (ICU), injection room, sample collection room and cath lab of a tertiary care super specialty hospital in northern India.

### *Sample size and sampling technique*

Sample size was 60 and sampling technique was random.

Following formula was used to estimate sample size-

$$n = \frac{Z_\alpha^2 PQ}{d^2}$$

Where $Z_\alpha$= Value of standard normal variate corresponding to α level of significance

P = Likely value of parameter; Q = 1 – P

d = Margin of errors which is a measure of precision

Confidence level = 90%; precision (d) = ± 10%

With the feasibility issues, the sample size worked out to be 60.

### *Study design and inclusion criteria*

It is a cross-sectional study where healthcare workers including nursing staff, phlebotomists and doctors were observed for safe injection practices in wards, ICUs, injection room, sample collection room and cath lab.

During the observation of the injection providing procedure, each healthcare worker was observed for at least 30 minutes and in that time period, best practiced injection procedure was taken for the study.

### *Exclusion criteria*

Security personals, pharmacists, healthcare workers posted in administration block and medical record department were not included in the study.

A pre-designed, semi structured check list was adopted and modified from WHO guideline of the revised injection safety assessment tool (Tool-C) and was used for observation. Briefing was also done to the respective departments of the hospital about the study.[8]

Healthcare workers were also assessed by means of a pre-defined questionnaire where basic knowledge about the subject was evaluated.

Field training was given to the staff for safe injection practices and a post training test was conducted for evaluating training.

### *Duration of the study*

A cross-sectional study was conducted over a period of 7 working days in the month of December, 2024.

### *Standard protocols/accreditation*

NABH standards guidelines of safe injection practices.

### *Statistical analysis*

MS Excel (Microsoft Office Inc. 2010) was used for descriptive analysis to compare categorical variables pre and post intervention.

## RESULTS

### *Demography*

Among the healthcare workers included in the study, 76.6% were females while 23.3% were males (Table 1).

**Table 1: Sex distribution of the study population.**

| Gender | Frequency | | | % |
|---|---|---|---|---|
| | Doctor | Nursing staff | Phlebotomist | |
| **Female** | 10 | 32 | 4 | 76.6 |
| **Male** | 6 | 6 | 2 | 23.3 |
| **Total** | 60 | | | 100 |

### *Observation of the facilities*

All the facilities (wards, ICUs, cath lab, injection room and sample collection rooms were observed for different

parameters of safe injection practices (as per the checklist prepared for the study) for at least 30 minutes.

*Management of sharp waste*

The results showed that 2 out of 7(28.57%) facilities observed had loose disposable needles lying outside packaging while none of the facilities had loose intravenous equipment outside of packaging and none of the facilities re-used disposable injections.

3 out of 7 (42.85%) facilities had sharp waste lying in a container not meant for sharp waste.

All sharp containers awaiting final disposal were stored in an area away from public access. Sharp container for final disposal in one of the facilities was not completely closed; the lid was open (14.28%) (Figure 1).

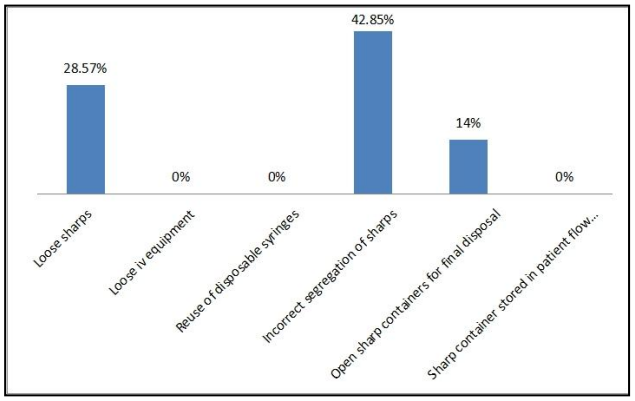


**Figure 1: Diagram showing facilities with management of sharps.**

*Availability of resources and training*

All the facilities included in the study were looked for availability of resources; whether policies are available or not and if training at joining of institution was provided or not.

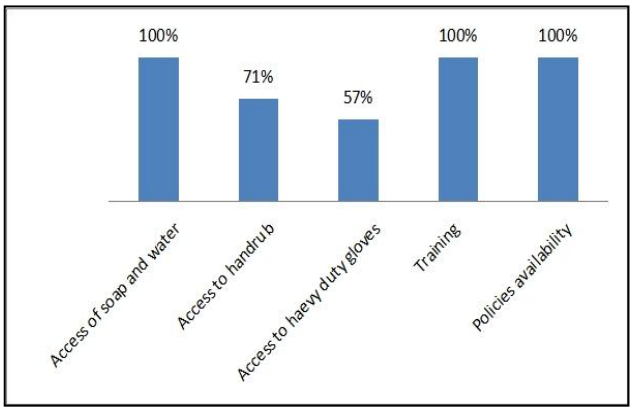


**Figure 2: Availability of resources.**

All the facilities had good access of soap and water while hand rub was available in 71% (5/7) of them. Housekeeping staff in 4 facilities out of 7 (57%) had access to heavy-duty gloves. Regular training of healthcare staff for safe injection practices was conducted at the time of joining and regular trainings are being conducted as per the schedule. Policies for waste disposal and safe injection practices were available for viewing (Figure 2).

***Knowledge analysis***

Healthcare workers were also assessed by means of a pre-defined questionnaire (pre-test) where basic knowledge about the subject was evaluated. The questionnaire had 12 questions with topics regarding definition and components of safe injection practices, multi-dose vials, knowledge about post exposure prophylaxis, vaccination of HCWs, needle stick injury (NSI) and biomedical waste management (BMW); the results of which have been summarized in Table 2.

**Table 2: Comparison of results of pre-test and post training testing.**

| Topic | Pre-test | | | Post test | | |
|---|---|---|---|---|---|---|
| | Doctor | Nurses | Phlebotomist | Doctor | Nurses | Phlebotomist |
| **Definition** | 81% | 68% | 33.30% | 96% | 92% | 83.30% |
| **Components** | 81% | 68% | 33.30% | 94% | 89% | 66.60% |
| **Infections** | 94% | 92% | 67% | 100% | 100% | 100% |
| **practices 1 (procedure: asepsis)** | 87.50% | 84% | 66.60% | 98% | 96% | 83.30% |
| **Practices 2 (use of packed sterile injection device)** | 84.50% | 72% | 33.33% | 96.90% | 87.50% | 66.60% |
| **Multi-dose vials** | 81% | 76% | 33.33% | 98% | 92.30% | 66.60% |
| **Needle stick injury (NSI)** | 88% | 82% | 17% | 100% | 95% | 67% |
| **Management of NSI** | 86% | 68% | 16.60% | 96.40% | 82.10% | 66.60% |
| **Biomedical waste management** | 69% | 66% | 17% | 88% | 84% | 50% |
| **Post exposure prophylaxis** | 87.50% | 78.90% | 33.30% | 96.40% | 89% | 66.60% |
| **Vaccination of HCW** | 100% | 100% | 100% | 100% | 100% | 100% |
| **Sharps disposal** | 86% | 81.50% | 33.30% | 98% | 96.40% | 83.30% |

### *Vaccination of HCW*

The questionnaire also analyzed knowledge of vaccination of healthcare workers. The results were compared with the observation checklist for how many who were vaccinated for the same.

The result showed only 85.1% staff (doctors, nurses and phlebotomists were vaccinated for hepatitis B while 100% of doctors, nursing staff and phlebotomists were aware of the vaccinations that are mandatory for healthcare workers. Knowledge of post exposure prophylaxis (PEP) of HIV infection was there in 87.5% doctors, 78.94% nurses and 33.3% phlebotomists (Figure 3).

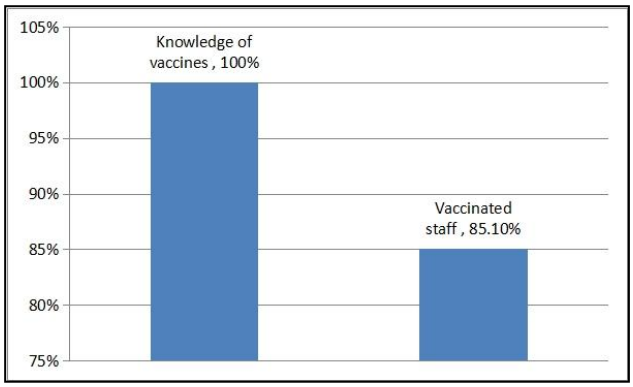


**Figure 3: Comparison of healthcare workers having knowledge and number of vaccinated staff.**

### *Training*

After evaluating all participants by means of pre-test questionnaire, on spot training was provided by infection control nurse by means of semi-formal interactive lecture and demonstration. After training, post-test was conducted. The results of comparison of pre-test and post-test shows an improvement in the scores obtained by healthcare workers (Table 2).

## DISCUSSION

A safe injection practice is one which does no harm to the patient or its provider and does not generate a waste that is harmful for the community.[9] With the increase in generation of healthcare associated waste, incidence of blood borne infections and other health hazards have also increased in the past few years.[1-4] There are no standard documents elaborating on the safe and unsafe practices both in developed and developing nations. Moreover, the policies keep on changing with the changes in disease patterns, outbreaks and practices.

In India, there is scarcity of data regarding safe and unsafe injection practices. The current study aimed to evaluate and assess knowledge and practices of safe injection practices in a tertiary care hospital in northern India. After assessment and observation, field training was provided to the staff; thereafter assessment was done and results were analysed. Due to limited staff availability, quarterly audits using the pre-designed, semi structured check list that was used for observation during study have been included in the hospital infection control practices with continued field training as and when required.

In our study, more than half of the included healthcare workers were females (76.6%) while 23.3% were males. The definition and all the components of safe injection practices was known to 81% doctors and 68% nursing staff, only 33.3% phlebotomists knew all components of safe injection practices. The results correspond to other studies as well where healthcare workers were well aware of the safe practices.[4,5,10] However, there are areas where awareness about safe injection practices is low.[6,11] Variation in knowledge has been noted among doctors, nursing staff and phlebotomists in different studies about the knowledge of safe injection practices.[4,5,12] The knowledge and awareness of doctors is usually more than other groups of healthcare workers, however, with intern doctors, it was observed that they knew little about practical aspect and safety of injections.[12]

All these differences in the knowledge might be due to different policies with no standard guidelines available, different patterns of trainings and lack of suitable training in some areas. Staffs keep on rotating and shifting for duties in different departments and it becomes difficult to keep a record of training provided in such cases. Despite differences in practical knowledge of different staff in hospital, most of the staff (93.75% doctors, 92% nurses and 66.6% phlebotomists) was well aware about the diseases that are transmitted by unsafe injection practices.

While assessing the questionnaire we noted that 87.5% (14/16) doctors, 84% (32/38) nursing staff and 66.6% (4/6) were aware that when packaging of any of the injection devices is torn even if it is unused, it has to be discarded. While in the observation period, none of the packaging was torn and each time a packed sterile injection was used for every patient. In other studies, similar results were seen with healthcare staff using sterile single use devices for injections.[6,13]

This progress can be attributed to continuous vigilance at hospitals, implementation of the standard precautions in all healthcare settings and mass awareness of public about single use disposable injections by different means of communication in the past few years.

Similarly, only one-third of phlebotomists were aware about usage and storage of used/open multi-dose vials. We noticed a knowledge gap in current literature as to what comprises best practice when it comes to use of multi-dose vials. The practice of leaving a needle in the open multi-dose vial was seen in some doctors and nurses, however, there are no recommendations supporting or refuting the same. Literature search didn't reveal any study to compare

knowledge and practice of multi-dose vials in hospitals which is an important aspect in safe injection practices and infection control. However, the use of multi-dose vials is beneficial in terms of cost-effectiveness, less biomedical waste generation and lesser cold storage cost.[14] Nevertheless, the precautions that are needed in usage, storage and disposal of multi-dose vials cannot be overlooked.

When biomedical waste management and needle stick injury measures were studied it was noted that only 68.75% doctors, 65.7% nurses and 16.6% phlebotomists were well aware of the biomedical waste management while 87.5% doctors, 81.5% nurses and 16.6% phlebotomists had knowledge about preventive measures for needle stick injury.

All the doctors, nurses and phlebotomists had knowledge about vaccinations mandatory for HCWs. However, when vaccination status was checked, only 85.1% staff (doctors, nurses and phlebotomists) were vaccinated for hepatitis B. When knowledge about HIV infection prophylaxis was tested, it was seen that 87.5% doctors, 78.94% nurses and 33.3% phlebotomists were aware about it. These results were similar to other studies.[12] Fewer completed course of vaccination amongst healthcare workers might be due to less availability of vaccines at the workplace and continuous working hours.

After knowledge analysis, training was provided by infection control nurse and post training test was conducted wherein all the participants were involved. It was seen that after training, knowledge of subject improved.

When the hospital was observed for different parameters, it was noted that 2 out of 7 (28.57%) facilities had loose disposable needles lying outside packaging while none of the facilities had loose intravenous equipment outside of packaging and none of the facilities re-used disposable injections, however, discarding needles in wrong container was fairly common.

All sharp containers awaiting final disposal were stored in an area away from public access. Sharp container for final disposal in one of the facilities was not completely closed; its lid was open (14.28%). These results are comparable to other studies wherein training as well as execution of practices was poor.[4]

All facilities had good access of soap and water while hand rub was also available in only 71% of areas.

Housekeeping staff in 4 facilities out of 7 had access to heavy gloves. This is similar to other developing nations where resources are limited.[15] Regular training of healthcare staff for safe injection practices is conducted at our hospital as per schedule. Policies for waste disposal and safe injection practices were available for viewing. There was improvement in the knowledge amongst all cadres of staff after training.

Studies have shown that the degree of unsafe injection practices was the highest (75%) in the south east Asia region.[16] In a study by Chaudhuri et al, different levels of public health centres were observed using WHO guide of revised injection safety assessment tool. The study was carried out in the state of West Bengal India, where it was noted that sterile syringes and needles were being used for giving injections in patients. Knowledge about hand hygiene practices was good and it was well implemented. All healthcare staffs were not vaccinated fully with tetanus and hepatitis B.[9] Resource-restrained regions lack puncture-proof containers. When available, they are not properly used and disposed off. In an another study in Nepal, grey areas were noted where in no training of biomedical waste management and injection safety was provided to hospital staff.[4] In a similar study in west Bengal, it was observed that only 12% of healthcare workers washed hands before administering injections and 83% of the staff didn't receive any formal training for safe injection practices.[17] The picture is more or less same in different parts of developing nations. In a study by Peethala et al, in Andhra Pradesh the hospital staff was well aware of different infection control and safe injection practices but implementation was poor.[18]

It was a single hospital observational study aimed to describe the pattern of safe injection practices among doctors, nurses and phlebotomists. A single observation might not project the regular practice among the staff. There is a possibility of bias for staff might have changed their behaviour when they were aware that they were being observed.

## CONCLUSION

There is need for added efforts to eliminate unsafe injection practices in health care settings especially in south-east Asian countries where resources are limited but need is more. With the regular training and education of healthcare workers, regular and surprise audits should be planned for better monitoring of the situation. Hospital infection control practices should be included in the under-graduate curriculum at hospitals for better awareness at the initial levels.

*Funding: No funding sources*
*Conflict of interest: None declared*
*Ethical approval: The study was approved by the Institutional Ethics Committee*

## REFERENCES

1. The Bio-Medical Waste Management Rules, 2016. Available from: https://www.hspcb.org.in/uploads/laws/BMW_Rules.pdf. Accessed on 1 February 2025.

2. ISMP Alarming Survey Results from CDC: Unsafe Injection Practices Continue ISMP Medication Safety Alert! October 5, 2017. Available from: https://www.ismp.org/resources/alarming-survey-results-cdc-unsafe-injection-practices-continue. Accessed on 1 February 2025.
3. Reid S. Preliminary results of the WHO GBD from unsafe injections. In: Report on Annual Meeting of the Safe Injection Global Network. Geneva: World Health Organization; 2010.
4. Gyawali S, Rathore DS, Kc B, Shankar PR. Study of status of safe injection practice and knowledge regarding injection safety among primary health care workers in Baglung district, western Nepal. BMC Int Health Hum Rights. 2013;13:3.
5. Anwar MM, Mohamed Lotfy AA, Alrashidy AA. Safe injection awareness and practices among nursing staff in an Egyptian and a Saudi hospital. J Egypt Public Health Assoc. 2019;94:1-8.
6. Adejumo PO, Dada FA. A comparative study on knowledge, attitude, and practice of injection safety among nurses in two hospitals in Ibadan, Nigeria. Int J Infect Control. 2013;9(1):1-6.
7. Hayashi T, Hutin YJ, Bulterys M, Altaf A, Allegranzi B. Injection practices in 2011-2015: a review using data from the demographic and health surveys (DHS). BMC Health Serv Res. 2019;19(1):600.
8. World Health Organization (WHO). Revised injection safety assessment tool (Tool CRevised). Geneva: World Health Organization; 2008.
9. Chaudhuri SB, Ray K. Safe injection practices in primary health care settings of Naxalbari Block, Darjeeling District, West Bengal. J Clin Diagn Res. 2016;10(1):LC21-4.
10. WHO. Hepatitis b. 2022. Available from: https://www.who.int/news-room/fact-sheets/detail/hepatitis-b. Accessed on 1 February 2025.
11. Hutin YJF, Hauri AM, Armstrong GL. Use of injections in healthcare settings worldwide, literature review and regional estimates. BMJ. 2000;2003(327):1075.
12. Acharya AS, Priyanka, Khandekar J, Bachani D. Assessment of knowledge and practices regarding injection safety and related biomedical waste management amongst interns in a tertiary care teaching hospital, Delhi. Int Schol Res Notices. 2014;2014(1):670861.
13. Chisevescu P, Mihailescu I, Mihailescu GP, Pasat L, Ion-Nedelcu N, Popa MI. Injection practices among nurses--Valcea Romania 1998. MMWR Morb Mortal Week Rep. 2001;50(4):59-61.
14. Heaton A, Krudwig K, Lorenson T, Burgess C, Cunningham A, Steinglass R. Doses per vaccine vial container: an understated and underestimated driver of performance that needs more evidence. Vaccine. 2017;35(17):2272-8.
15. Improving Safety of Sanitation Workers in Wai Municipal Council. 2020. Available from: https://pas.org.in/Portal/document/UrbanSanitation/uploads/Improving_Safety_of_Sanitation_Workers_in_Wai_Municipal_Council1.pdf. Accessed on 1 February 2025.
16. Riaz H, Kamal SW, Riaz T, Aziz S, Rajper J, Noorulain W. Methods of disposal of used syringes by hepatitis B and C patients at an urban and rural setting. J Pak Med Assoc. 2012;62(1):81-4.
17. Paul B, Roy S, Chattopadhyay D, Bisoi S, Misra R, Bhattacharya N, et al. A study on safe injection practices of nursing personnel in a tertiary care hospital of Kolkata, West Bengal, India. TAF Prevent Med Bull. 2011;10(6).
18. Peethala S, Garapati S. A study on assessment of safe injection practices among internees in government general hospital, Kakinada, Andhra Pradesh, India. Int J Community Med Public Health. 2017;4:4321-5.

**Cite this article as:** Sharma HC, Dewan M, Banerjee P, Srivastava S, Sagar D, Yadav N. Assessment of safe injection practices among healthcare workers in a tertiary care hospital. Int J Community Med Public Health 2025;12:3045-50.