

A Study on Knowledge, Attitude and Practices among Healthcare Workers in Intensive Care Units about Safe Injection Practices in Tier-2 City in Maharashtra

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Abstract

Background: The magnitude of problem of unsafe injections including re-use and other unsafe practices has been estimated by WHO in 2000s are approximately 16.7 billion injections are administered worldwide with estimates indicating that up to 40% were given with the used equipment and citing reuse rates as high as 75% in some countries. In view of less availability of such studies and increasing harms regarding unsafe injection practices in India among healthcare workers this study was proposed and undertaken.

Methods: This was a descriptive cross sectional study involving 200 participants. After obtaining written informed consent from the healthcare workers (HCW), they will be interviewed in the form of Self-administered questionnaire (SAQ). The SAQs had four parts: Knowledge, Attitude, Practices and Facility observation. WHO tool C was used for SAQ preparation with modification. Collected data was analyzed using Microsoft Excel & SPSS.

Results: The Knowledge, attitude and practices were found to be satisfactory among the study participants. Though some important observations were, almost (74%) of the nurses believed that HIV is the pathogen that constitute the major chunk of blood borne pathogen which can be transmitted due to unsafe injection practices. Nursing staff included in the study (48%) was of the opinion that the multi dose vials can be used for more than one patients if it enters immediate patient area. Also, we observed that proper hand hygiene, using alcohol-based hand rub or soap and water, was performed prior to preparing and administering medications only in 60% of the nursing staff.

Conclusion: In our study we observed fairly good amount of compliance among healthcare workers with respect to safe injection practices. Though, there were some lags in the practices among HCWs in few important areas. This study highlights the magnitude of the problems related to safe injection practices among HCWs.

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Introduction

Unsafe injection practices is one of the biggest problem in developing countries risking the

Patient's life and inviting hazards to the health care workers. Medical treatments are planned to save life of people and to improve the health quality. Hence it is the duty of health care workers to prevent transmission of health-care associated infections. Sticking to safe injection practices and it's related infection control is part of that professional duty.

According to WHO the number of injections given worldwide has substantially increased during the 'covid 19 pandemic', and failures regarding the safe injection practices during this pandemic era could account for significant morbidity and mortality [1]. This failure may have contributed to increase in burden on ICU during 1st and 2nd wave of covid 19 in India. Overall pandemics increases the injection safety risks, shortage of injections due to heavy patient load and lack of trained staff could add to the problem. Therefore, performing safe injection practices can increase the safety as regards to patients and health care workers too.

In developing countries, the use of injections for management of serious and even minor medical problems is common and often unnecessary and that too they may be used unsafely. The magnitude of problem of unsafe injections including reuse and other unsafe practices has been estimated by WHO in 2000s as follows: Approximately 16.7 billion injections are administered worldwide with estimates indicating that up to 40% were given with the used equipment and citing reuse rates as high as 75% in some countries [2]. In some regions of the world over 70% of the injections are considered unnecessary. Unsafe injections exposes patient to risk of disability and death. One-third of all injections in

India (31.6 %) carries a risk of transmitting the blood-borne viruses. Reuse of injection devices (needle and syringe) without adequate sterilization is of particular concern as it may transmit hepatitis B virus, Hepatitis C virus and human immunodeficiency virus attributing for 33%, 42%, and 2% of the new infections per year [3]. The burden of other infections such as abscess, muscle necrosis and transmission of other blood borne pathogens is also alarming.

Hence, safe injection practice involves administration of rational injection by a qualified and well trained person using a sterile device (syringe, needle etc.), adopting sterile technique, and discarding the used devices in a puncture-proof specially designed container for appropriate disposal as per the norms of handling biochemical waste. In view of less availability of such studies and increasing harms regarding unsafe injection practices in India among healthcare workers this study was proposed and undertaken.

Aims and Objectives:

1. To observe and assess knowledge, attitude and injection practices among Healthcare Professionals (HCPs) working in Intensive Care Units in a tertiary care hospital in tier-2 city in Maharashtra

Review of Literature:

World Health Organization (WHO) define safe injection as the one which does not harm the recipient, does not expose the provider to avoidable risk, and does not result in waste that is dangerous for the community. [4]

WHO has estimated that about 16 billion injections are administered each year in developing and transitional countries. Proportion of unsafe injections is estimated to be 39% (range 1.2–75%). In some areas of the WHO South East Asian region (which includes India) the estimate for

unsafe injection is as high as 75%. [5] It has been estimated that in India around three billion injections are administered annually and of them 1.89 billion being unsafe. [6] In developing countries, injection is regarded as a powerful tool to heal disease. Patients are pleased and may feel that they have obtained the best care when they are administered injections. Health workers get financial and status rewards by using injections. Hence a mutually reinforcing cycle exists between the patient and the injection provider which is responsible for frequent use of injections.

Each year, hundreds of thousands of health care workers are estimated to be at risk for infections like Hepatitis B and C and the human immunodeficiency virus (HIV) due to unnecessary and avoidable accidents from needle stick injuries (NSI) and mucosal exposures. [7] It has been estimated that unsafe injections lead to 40% cases of hepatitis C, 32% of hepatitis B, and 5% of human immunodeficiency virus (HIV) infections each year. The risk of transmission of infection in an unsafe injection from an infected patient to the HCP following an NSI are: -Hepatitis B- 3-10%; Hepatitis C- 3%; HIV- 0.3%. [8] Complications such as injection abscesses and nerve damage may also occur following unsafe injections. Unsafe injections are also been responsible for outbreaks of viral hepatitis like the outbreak reported of Hepatitis B in 2009 in Gujarat. [9]

Materials and Methods

- **Type of Study:** Descriptive Cross Sectional Study
- **Sample Size:** 200
- **Selection Criteria:**

Inclusion Criteria:

- ✓ Only Intensive Care Units of a tertiary care hospitals were included in the study
- ✓ Study participants included: doctors (Consultants Junior Residents (JR's) and Senior Residents (SR's)) and nurses working in the selected Intensive Care Units i.e. Medical ICU, Surgical ICU, Pediatric ICU and Trauma ICU.

Exclusion Criteria:

- ✓ Other areas like wards, outpatient departments (OPD) was not included
- **Research Instrument:** Self-administered questionnaire (SAQ)
- **Data Collection Procedure:**
After obtaining written informed consent from the healthcare workers, they were interviewed in the form of Self-administered questionnaire (SAQ). WHO tool C was used for SAQ with modification. Primary data was collected using SAQ technique from all the 200 healthcare workers. The questionnaire consisted of four parts which includes :
 - ✓ 1. Questionnaire based on facility observation
 - ✓ 2. Questionnaire based on safe injection practices
 - ✓ 3. Questionnaire based on knowledge of HCW regarding injection safety practices
 - ✓ 4. Questionnaire based on attitude of HCW regarding injection practices
- **Confidentiality:** Informed consent will be taken from all the study participants and the name of the participants were kept confidential.
- **Ethical Consideration:** Study was approved by the Institutional Ethics Committee

Results:

The final results were made by analysing the SAQ (prepared with the help of WHO tool C guide) . A prior consent was taken from all the respondents .

Primary data was collected from all the 200 HCP (22 resident doctors, 48 Interns and 130 nurses) in the form of SAQ. This data was analyzed and the responses received are presented in Table 1,2 3&4. More than one fourth of HCW stated that injection safety guidelines were available with them but researcher could not find separate guidelines on injection safety in the hospital. The hospital was covering the topic of injection safety under infection control guidelines only.

Table 1: The final results are made by analyzing self-administered questionnaire (SAQ) Knowledge Questionnaire

	Residents(%)	Interns(%)	Nursing Staff(%)
1. Have you heard of Ad Syringe? Yes No	100%	100%	59.2% 40.76%
2. What is the full form of Ad syringe? Auto Disable Applied and Disposed Autoclaved Disposable	91.6% 8.3%	21.5% 15.1% 63.1%	33.8% 48.4% 17.6%
3. In your opinion which of the following type of syringe is best for safe injection practices? Plastic syringe Glass syringe Ad syringe	100%	36.8% 63.1%	46.9% 8.4% 44.6%
4. Do you know inadequate supply of syringe can cause a problem regarding safe injection practices? * Yes No Maybe	100%	100%	72.3% 2.3% 25.3%
5. Can unsafe injection practices be a cause of medical negligence? * Yes No Sometimes	100%	100%	72.3% 6.9% 25.8%
6. Do you know performing safe injection practices can reduce the burden of healthcare associated infection covid 19 pandemic era especially in icu ? * Yes No Maybe	100%	67.0% 31.5%	72.3% 6.9% 20.7%
7. Do you know using the same fluid infusion sets like, tubings and connection to more than one patient is safe? * Yes, it is absolutely safe No Sometimes, depends on situation Don't know	91.6% 8.3%	5.2% 63.15% 31.5%	12.3% 68.4% 19.2%
8. Are you aware of Post Exposure Prophylaxis guidelines of needle stick injury at our healthcare facility? * Yes No Never noticed	100%	100%	73.8% 11.5% 14.6%
9. Which of the following blood borne pathogen constitute the major chunk of infection due to needle stick injury? Human Immunodeficiency Virus (HIV) Hepatitis B Virus (HBV) Hepatitis C Virus (HCV)	100%	100%	74.6% 23.8% 1.5%
10. Is hand hygiene important before preparing injection? Yes No	100%	100%	94.6% 5.3%

Table 2: Attitude regarding safe injection practices

	Residents(%)	Interns(%)	Nursing Staff(%)
1. Are safe injections practices important during covid pandemic era in the ICU ? *	100%	100%	100%
Yes			
No			
2. If a multidose vial enters the immediate patient treatment area, do you give it to a single-patient or many patients?	92.6%	63.1%	33.8%
Single patients			
Multiple patients	7.4%	36.9%	48.4%
Depends on situation			17.6%
3. Do you think dedicating a multidose vial to a single patient is better to avoid unsafe injections? *	66.6%	42.1%	72.3%
Yes		26.3%	2.3%
No	33.3%	31.5%	25.3%
Maybe			
4. If you are using multi dose vial to more than one patient, which of following thing you will follow to prevent contamination	91.6%	47.3%	45.3%
Multi dose vial should be restricted to centralized medication area always		10.5%	4.3%
Multi dose vial should be restricted to centralized medication area most of the times	8.3%	21.5%	12.3%
Multi dose vial should be restricted to centralized medication area some times		21.5%	1.5%
Multi dose vial should not be restricted to centralized medication			
5. Do you think all the staff members who are associated with handling of injections require training sessions regarding safe injection practices? *	100%	100%	96.2%
Yes			3.8%
No			
Maybe			
6. Can training regarding safe injections practices will reduce the chances of transmission of diseases through needles and syringes?	100%	100%	100%
Yes			
No			
Maybe			
7. Do you think there is a need of supervision on nursing management for safe injection practices?	100%	100%	84.5%
Yes			
No			15.3%
Maybe			
8. What is your thought on proper prescription of injection? *			
It is important for safety of patients	100%	100%	55.3%
It is absolutely alright if we don't have proper prscription , there is no relation between injection prscription and safety of patient			28.4%
don't know			

Table 3: Safe Injection Practices

	Residents	Interns	Nursing Staff
1. Proper hand hygiene, using alcohol-based hand rub or soap and water, is performed prior to preparing and administering medications. Yes No	100%	100%	60% 40%
2. Injections are prepared using aseptic technique in a clean area free from contamination or contact with blood, body fluids, or contaminated equipment. Yes No	100%	100%	60% 40%
3. Needles and syringes are used for only one patient (this includes manufactured prefilled syringes and cartridge devices such as insulin pens). Yes No	100%	100%	81.5% 18.4%
4. The rubber septum on a medication vial is disinfected with alcohol prior to piercing. Yes No	100%	73.6% 26.3%	60.7% 39.2%
5. Medication vials are entered with a new needle and a new syringe, even when obtaining additional doses for the same patient. Yes No	100%	68.4% 31.5%	77.6% 22.3%
6. Single-dose or single-use medication vials, ampules, and bags or bottles of intravenous solution are used for only one patient. Yes No	100%	100%	82.3% 17.6%
7. Medication administration tubing and connectors are used for only one patient. Yes No	100%	100%	77.6% 22.3%
8. Multi-dose vials are dated by healthcare when they are first opened and discarded within 28 days unless the manufacturer specifies a different (shorter or longer) date for that opened vial. Yes No	100%	73.6% 26.3%	57.6% 42.3%
9. Multi-dose vials are dedicated to individual patients whenever possible. Yes No	100%	100%	78.4 21.5
10. Multi-dose vials to be used for more than one patient are kept in a centralized medication area and do not enter the immediate patient treatment area (e.g., operating room, patient room/cubicle). Yes No	100%	89.4% 10.5%	74.6% 25.3%

Table 4: Facility Observation

	Residents	Interns	Nursing Staff
1. Did the healthcare worker dispose the loose disposable needle inside the puncture proof waste containers? * Yes No	88% 12%	85% 15%	80.7% 19.2%
2. Did the healthcare worker leave needle in place in stopper of multi-dose vial? * Yes No	0% 100%	10% 90%	28.4% 71.5%
3. Did the healthcare worker sterilize the disposable injection equipment for reuse? * Yes No	100%	100%	100%
4. Does the healthcare facility have separate waste containers in each of the injection areas for each of the following types of waste: sharps, infectious and non-infectious? * Yes We have only one container for sharps and infectious material No, we don't have separate container for each	80% 20%	79% 21%	63.8% 20% 16.1%
5. Did you ever noticed bloody swabs, dressings or cottons on the floor of the ICU you visited? * Yes, many times No No, we throw all such infectious material in appropriate container	25% 75%	84% 11% 5%	43% 39.2% 17.6%
6. Did you noticed any puncture resistant and leak proof sharps container in the ICU you visited? * Yes No	100%	100%	100%
7. How are the sharps disposed in the healthcare facility? * Burning Throwing in waste site Incinerated Pit burial	0% 8.3% 83.3% 8.3%	0% 21% 79% 0%	6.9% 16.1% 70.7% 6.1
8. In which colour coded container the needle was disposed? * White Yellow Red Black	100%	73.6% 26.3%	57.6% 42.3%
9. Did you notice any job aids or wall charts posted in the department which promotes the safe injections practices? * Yes No Did not notice	41.6% 41.6% 16.6%	53% 11% 37%	79.2% 8.4% 12.3%
10. Did you observe running water and soap facility for washing hands in your ICU? * Yes No Only wash my hands with water	100%	100%	100%

Discussion

In the Knowledge SAQ evaluation we found that almost half of the nursing staff were unaware of AD Syringes. The Indian health ministry has been using auto-disposable (AD) syringes in all immunisation programmes since many years, in a bid to improve injection safety and prevent spread of infection through reused syringes [10]. Though, most of the healthcare workers knew that there is a Post Exposure Prophylaxis guidelines of needle stick injury at their healthcare facility but when asked about it almost 80% could not recollect and explain it. Also, around 25% of nursing staff of the hospitals included in the study were not aware at all about such guidelines. Almost (74%) of the nurses believed that HIV is the pathogen that constitute the major chunk of blood borne pathogen which can be transmitted due to unsafe injection practices and not Hepatitis B.

In the Attitude SAQ evaluation we observed that the attitude of different cadres of healthcare workers was satisfactory. Though there were few important observations. Almost, half of the nursing staff included in the study (48%) was of the opinion that the multi dose vials can be used for more than one patients if it enters immediate patient area. Also, 52.% of Intern doctors and 54% of nursing staff were unaware that while using multi dose vial to more than one patient, it should be restricted to centralized medication area always to prevent contamination.

In the Safe Injection Practices SAQ evaluation also we observed that proper hand hygiene, using alcohol-based hand rub or soap and water, was performed prior to preparing and administering medications and injections were prepared using aseptic technique in a clean area free from contamination or contact with blood, body fluids, or contaminated equipment only in 60% of the nursing staff. In a study done by Siwan RM et al [12] 67.1% study participants were observed washing their

hands before administration of injection sessions. The observation of our study was found to be much better than observations in various other studies like when compared with study done by Sahu Gandhi in Chhattisgarh where they found that 70.3% study participants did not washed their hands [13]. Siwan RM et al [12] reported that in 65% of HCP, injections were prepared on clean working tray which corroborated well with our study (60%). In contrast, in a study by Sahu, Gandhi in Chhattisgarh only 33.6% injections were prepared on clean working tray [13]. Nursing staff are the major chunk of healthcare workers who are involved in the above activity and 40% of the staff not adhering to the protocol can increase the incidence of needle stick injury or contamination of medications. Also, it was observed that the rubber septum on a medication vial was not disinfected with alcohol prior to piercing among interns (26%) and nursing staff (39%). One more important observation was that 26.3% of the Intern doctors and 42.3% of nursing staff were not aware that the multi-dose vials has to be dated by healthcare when they are first opened and discarded within 28 days unless the manufacturer specifies a different (shorter or longer) date for that opened vial. [14]

According to the latest CDC guidelines, Multi-dose vials should be dedicated to a single patient whenever possible. If multi-dose vials must be used for more than one patient, they should only be kept and accessed in a dedicated clean medication preparation area also called as centralized medication area (e.g., nurses station), away from immediate patient treatment areas. If a multi-dose vial enters an immediate patient treatment area, it should be dedicated for single-patient use only [11]. Immediate patient areas include operating and procedure rooms, anesthesia and procedure carts, and patient rooms or bays. If a multi-dose has been opened or accessed

(e.g., needle-punctured) the vial should be dated and discarded within 28 days unless the manufacturer specifies a different (shorter or longer) date for that opened vial. If a multi-dose vial has not been opened or accessed (e.g., needle-punctured), it should be discarded according to the manufacturer's expiration date [11].

Staff probably knows the proper procedures for safe use of Multi-dose vials, but job stress, time constraints, and poor staffing levels can underlie a medication giver's decision to skip or omit steps in the process. Hurried or careless staff may have inadequate hand washing hygiene, reuse a single-use needle or syringe, or fail to decontaminate the vial's stopper.

In the Facility Observation SAQ evaluation, it was observed that 10% of the Intern doctors and 28.4% of the nursing staff leave needle in place in stopper of multi-dose vial. Also, the biomedical waste management (BMW) related SAQ showed that 20% of Residents, Intern doctors and nursing staff respectively either did not know about the sharp disposal BMW guidelines or were of the opinion that only one container is enough for sharps and infectious material. During the hospital observations we observed that most ICUs had the colour coded containers for biomedical waste as well as white puncture proof container for sharp disposal. 26% of Intern doctors and 42% of nursing staff believed that needles should be discarded in Red bin instead of white puncture proof container. This was a significant finding as improper segregation of biomedical waste especially sharps can lead to serious health hazards among the healthcare worker handling such waste. In the study done by Siwan RM et al [12] biomedical waste segregation at source was done as per existing guidelines in 77.7% of observations whereas in our study it was seen that 76% of Intern doctors and 57%

of nursing staff knew and followed the biomedical waste disposal related to sharps and needles at source . [15]

This finding illustrates that improper disposal of biomedical waste including may occur despite efforts to control its handling, and that needle stick injuries can occur outside of health care facilities among personnel who are handling it. Efforts are needed to increase the level of awareness among health professionals regarding their responsibility to ensure proper biomedical waste disposal at source. Also, many healthcare workers did not notice any job aids or wall charts posted in the department which promotes the safe injections practices. This is important as latest guidelines regarding safe injection practices and Biomedical waste management should be available to all the cadres of healthcare workers which is handy and easy to understand. Injection practices were satisfactory among HCP but there is lot of scope for improvement. Good practices were observed in majority of HCP like use of 100% standard disposable syringes, no attempt made to sterilize the injection equipment, availability of hand hygiene facilities, availability of colour coded bins and sharp containers for safe biomedical waste disposal.

Conclusion:

According to World Health Organization (WHO) there are more than 1.3 million needle stick related deaths worldwide each year (14). Most of these deaths are preventable. For that, there is a need to educate, train and motivate our healthcare professionals in proper method of handling injection equipments. A local policy and surveillance programme based on that guidelines latest national and international guidelines need also to be developed. Needle Stick Safety and Prevention Act, 2000 in America mandates the use of safety-engineered medical devices (SEMDs) within United States healthcare

facilities to protect the healthcare workers and patients from the risk of needle stick injuries. Such standard legal provisions are not available in India. Regular training by the hospital infection control team regarding safe injection practices along with Pre test Post test assessment should be available for all the healthcare workers. Rural areas where there is profound lack of resources needs special attention. Incidences of needle stick injuries are very common in these areas and most of the times it goes unreported. More studies are needed from these areas so that the depth of the problem resurfaces and comes in the notice of the authorities. Also, job aids or wall charts should be pasted in the all the high risk areas which promotes the safe injections practices Community participation or involvement in the form of their education and improving awareness on safe injection practices is also suggested.

This study highlights the rate of unsafe injection practices through Self Administered Questionnaire and Observation in a healthcare setting targeting the Intensive Care Units where most critical and moribund patients are admitted. During this present era of Covid-19 Pandemic already the healthcare system is overwhelmed. An unsafe injection practice only adds to it and increases the burden even more. The present study might be of some value addition in preparing and strategizing guidelines on Injection safety, Post Exposure Prophylaxis (PEP), judicious use of injections and reporting of adverse events like needle stick injury.

Limitation

Data was collected by single researcher and maximum twice in a week due to shortage of manpower and time study was only restricted in a single block. Observation of the health workers after obtaining informed consent may affect the results towards best practices due to Hawthorne effect.

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