

The Incidence of Needle Stick Injuries among Health Care Workers and its Economic Impact on a Tertiary Care Hospital in Kerala

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Abstract: *The study emphasizes the incidence of needle stick injuries among Health care workers (HCWs) belonging to different job categories as well its economic impact on organization. The objectives of the study were: 1.To assess the trend of needle stick injury among healthcare workers.2.To compare the distribution of needle stick injury among healthcare workers in different job categories .3.To estimate the related cost and forecasting for the probable loss due to needle stick injury among healthcare workers.4.To determine the effectiveness of strategy to reduce Needle stick injury among healthcare workers. Materials and Methods: A purposive sampling technique was used to study the incidence of needle stick injuries among HCWs. Results: The present study finding indicates a positive trend in needle stick injury. And it was forecasted that, approximate rate of 42 NSI events are expected by second half of the year 2015.Among all the healthcare workers, more incidence of needle stick injuries were reported among nurses. The estimated average amount per needle stick injury was found to be ₹ 2,802.00. On forecasting the expenditure of the same in future, it was found that, by the Year 2015, the hospital will have to pay ₹ 2,07,348.00.A significant reduction ($P < 0.05$ at 95% confidence level) was found in the number of NSI rates after implementation of the selected strategies. Interpretation and Conclusion: The present study addresses the trend of high occurrence of NSI among HCWs and its economic impact on the organization*

Keywords: Needle stick injury, health care workers, tertiary care hospital, economic impact

1. Introduction

Of every 100 hospitalized patients at any given time, 7 in developed and 10 in developing countries will acquire at least one health care-associated infection.¹Out of this, Needle stick injury (NSI) is one the most common cause for health care associated infection among health care workers (HCWs) around the world. These workers are at risk of occupational acquisition of blood borne pathogens such as HIV, hepatitis B and C, and other diseases. Needle stick injuries happen mainly at times of procedures like needle recapping, injuries sustained in the operating room, during blood collection or intravenous line administration, suturing, checking blood sugar, careless disposal in garbage bags, due to inadequate segregation at source, etc.

WHO reports that, out of the 35 million health-care workers, 2 million experience percutaneous exposure to infectious diseases each year. It further notes that 37.6% of Hepatitis B, 39% of Hepatitis C and 4.4% of HIV/AIDS in Health-Care Workers around the world are due to needle stick injuries.²CDC estimates that approximately 385,000 needle sticks and other sharps-related injuries is reported among hospital-based healthcare personnel each year. A survey of the Association of Occupational Health Professionals in Healthcare (AOHP) members at 157 hospitals in 32 states showed that health care workers experienced a sharps injury rate of 2.2 per 100 full-time equivalent workers in 2012. This is an increase from the 2011 rate of 1.89, prompting AOHP to suggest current rules do not adequately protect workers.³

There are indirect and direct costs associated with needle stick injuries. Costs of needle stick injuries include prophylaxis, wages and time lost by workers, quality of life, emotional distress, costs associated with drug toxicity, organizational liability, mortality, quality of patient care, and workforce reduction. Testing and follow-up treatment for healthcare workers who experienced a needle stick injury was estimated at \$5,000 in the year 2000, depending upon the medical treatment provided. The American Hospital Association found that a case of infection by blood-borne pathogens could cost \$1 million for testing, follow-up, and disability payments. An estimated \$1 billion annually is saved by preventing needle stick injuries among healthcare workers in the US, including fees associated with testing, laboratory work, counseling, and follow-up costs.⁴

Considering these factors, the present study emphasize on the incidence of needle stick injuries among HCWs belonging to different job categories as well its economic impact on the organization.

2. Objective

- 1)To assess the trend of needle stick injury and forecasting for the probable incidence of needle stick injury among healthcare workers.
- 2)To compare the distribution of needle stick injury among healthcare workers in different job categories.
- 3)To estimate the related cost and forecasting for the probable loss due to needle stick injury among healthcare workers.
- 4)To determine the effectiveness of strategy to reduce Needle stick injury among healthcare workers.

3. Hypothesis

H_0 : Proportion of needle stick injury remained same post implementation of strategies to reduce Needle stick injury among healthcare workers.

H_1 : Proportion of needle stick injury decreased post implementation of strategies to reduce Needle stick injury among healthcare workers.

4. Material and Methodology

Study design and population: A quantitative research with purposive sampling technique was used to study the incidence of needle stick injuries among HCWs. All reported NSI cases (N=48) between the month of June 2014 to July 2015 were taken as the population for the study.

Data collection: A retrospective data was used by the researcher to analyze the number of NSIs among HCWs in a selected tertiary care hospital in Kerala.

Data analysis: Frequency distribution was used to analyze the trend of NSIs among HCWs. Moving average time series model was used for forecasting the incidences of NSI event and the cost associated with the same. Two proportion test was used to test the hypothesis used for measuring the effectiveness of strategy to reduce Needle stick injury among healthcare workers.

5. Results

D) Trend of needle stick injury and forecasting for the probable incidence of needle stick injury among healthcare workers

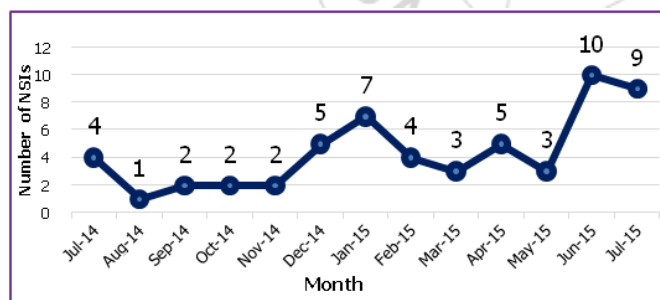


Figure 1: Distribution of sample based on incidence of Needle Stick Injury month wise N=48

The data in figure1 showcase a positive trend in needle stick injury i.e. there is increase in number of needle stick injury from 1 to 10 for the period of 10 months (August 2014 to June 2015).

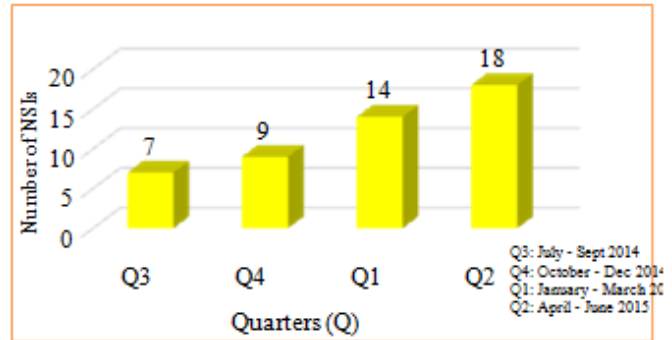


Figure 2: Distribution of sample based on incidence of Needle stick injury for every Quarter (Q) of a year (N=48)

The Figure 2 depicts an increase in number of needle stick injury from 7 in Q3 of the year 2014 to 18 in Q2 of the year 2015. Increase in trend is observed in every quarter of a year.

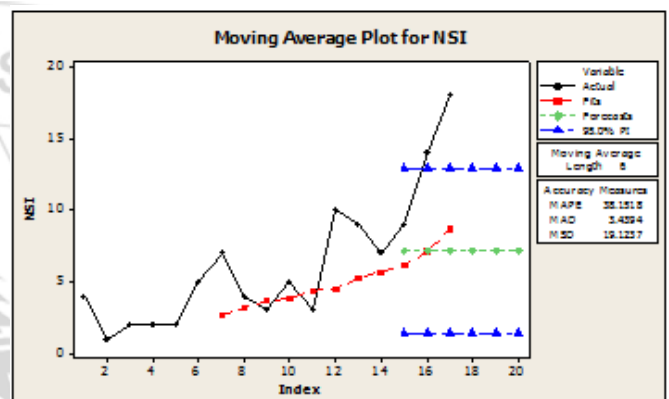


Figure 3: Distribution of sample based on Moving average plot for needle stick injury N=48.

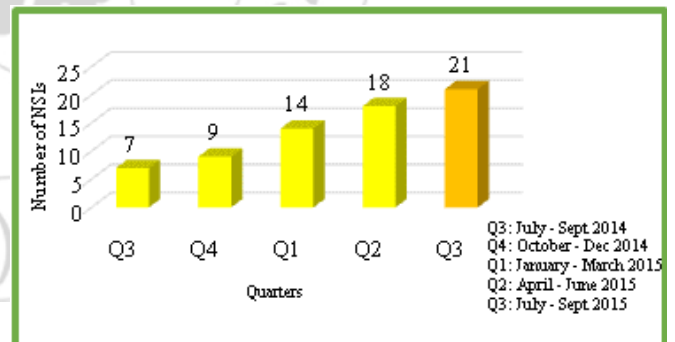
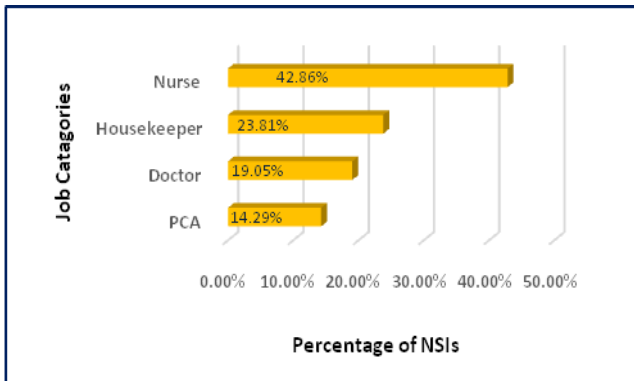


Figure 4: Distribution of sample based on forecast for Needle stick injury in quarter 3. N=48

Figure 3 and 4 gives the forecast for incidence of NSI in the forthcoming quarter, i.e. by quarter 3 of the year 2015, 21 NSI are expected and by Quarter 4 of the year 2015, 42 NSIs are expected.

II) Distribution of needle sticks injury among healthcare workers in different job categories.

Figure 5: Distribution of sample based on Percentage of Needle stick injury according to various job categories. N=48



*PCA-patient care associates

Figure 5 depicts that among all the healthcare workers, nurses (42.86%) got more number of needle stick injuries followed by housekeepers (23.81%), doctors (19.05%) and PCA (14.29%).

Table 1 exhibits the distribution of needle stick injury among various categories of healthcare workers and the location where the incidence of NSI occurred. The maximum number of injuries (11 out of 48) occurred among nurse's patient rooms.

Table 1: Distribution of sample based on Location of needle stick injury healthcare worker category wise.

HCWs	Location	Frequency	Total
Doctors	Emergency Department	2	8
	Intensive/critical care unit specify type:	2	
	Operating room	4	
House keeper	Biomedical waste final Disposal Area	2	10
	Clean utility	1	
	Emergency Department	1	
	Labor and delivery room	1	
	Operating room	1	
	Outpatient Clinic/office	1	
	Outside patient room (hallway, nurse station, etc.)	2	
	Wellness Clinic	1	
	Nurse	Emergency Department	
Intensive/critical care unit: specify type:		1	
Operating room		1	
Outpatient Clinic/office		3	
Patient Room		11	
PCA*	Dialysis facility (hemodialysis and peritoneal dialysis)	1	6
	Emergency Department	1	
	Intensive/critical care unit: Specify type	1	
	Outside patient room(hallway, nurse station, etc.)	1	
	Service/utility area(laundry, central supply, loading dock, etc.)	2	

*PCA: Patient care associate

III) Related cost and forecasting for the probable loss due to needle stick injury among healthcare workers.

Table 2: Cost impact on hospital due to Needle stick injury among healthcare workers.

Duration- →	Day 0	4 Weeks	6 Weeks	12 Weeks	6 Months	
Diagnostic Investigation	Estimated Cost (in rupees)					
HBs AG ELISA	210	-	210	-	-	-
HIV 1&2 ELISA	330	-	330	-	-	-
HCV Ab (ELISA)	600	-	600	600	-	-
Vaccination	Estimated Cost (in rupees)					
Tetanus Toxoid (if not vaccinated in last 5 years)	12	12	-	-	-	-
Vaccination -Inj Genevac/B	80	80	-	-	80	-
TOTAL (for HCWs who were not vaccinated)	1232	92	1140	600	80	3144
TOTAL (for HCWs who were vaccinated)	1140	-	1140	600	-	2880

Table 2 represents cost impact on hospital due to NSI among healthcare workers. Amount involved in diagnostic investigation and vaccinations are ₹ 2,880.00 and ₹264.00 respectively. If a healthcare worker gets NSI, maximum amount involved is ₹3,144.00 for those who are not vaccinated and ₹2,460.00 for those who are vaccinated. Thus, average amount per needle stick injury is ₹ 2,802.00.



Figure 6: Amount paid for Needle stick injury per quarter and amount forecasted for next quarter.

Figure 6 depicts the amount spends in each quarter for NSI. Organization already paid ₹ 1, 34,496.00 for a period of one year (from July 2014 to June 2015) and paid ₹89,664 for a period of 6 months (January to June 2015). If same continues, by July to December the organization will have to pay ₹1, 17,684. i.e.; for the year 2015, hospital will have to pay ₹ 2, 07,348.00. (Excludes cost of absenteeism, if employee remain absent due to injury along with loss of time)

IV) Effectiveness of action taken for Needle stick injury

It was suspected that, the proportion of needle stick injury remain same post implementation of strategies. Two proportion test was implemented to ascertain the same. But, null hypothesis was rejected as the p-value was found to be below 0.05 at 95% confidence level.

6. Discussion

The present study finding indicates a positive trend in needle stick injury. An increase in the number of needle stick injury from 1 to 10 was reported within a period of 10 months. Increase in trend was observed in every quarter (Q) i.e; from 7 in Q3 of the year 2014 to 18 in Q2 of the year 2015, which is a concerning number. A similar result was found in a study by *Sharma R et al*, where, 93 incidents of NSI occurred among 322 HCWs within their study period, giving an occurrence rate of about 3.47% per annum⁵. Whereas, the prevalence of needle stick injuries in a study by *Bhardwaj A et al* was found to be only 20.9%. But limitation discussed was mentioned as an apparent underreporting of NSIs in their setting.⁶

Reporting of NSI is purely on voluntary basis. Hence if we consider the unreported numbers of NSI, the prevalence rate of current study might be higher than the estimated number. Hence, it is important, to look into the future incidence of NSI in the present setting. Considering this, a forecast in the number of NSI for the next quarter was analysed using Time series model. And it was found that, approximate rate of 42 NSI events are expected by second half of the year 2015, which is undoubtedly an alarming rate. This data forecast on strengthening the current infection control practice within the hospital setting to prevent such incidence and the need for further exploratory study on the risk factors and preventive measures required to reduce the NSIs.

Further investigating, it was found that, among all the healthcare workers, nurses (42.86%) got more number of needle stick injuries followed by housekeeping staff (23.81%), doctors (19.05%) and patient care associates (14.29%). The maximum number of injuries (11 out of 48) occurred among nurse's patient rooms.

NSIs generate substantial costs for the healthcare system, the costs associated with the prevention and treatment of complications related to NSI. Considering the high prevalence of NSI in the present setting, it is necessary to understand the estimated cost the hospital has to spend per NSI event. The present study is limited to cost related to vaccination and diagnostic investigation only, as the estimated cost involved in treating underlying disease condition varies among individuals.

The cost impact on hospital due to Needle stick injury among HCWs was found to be ₹ 2,880.00 for diagnostic and ₹264.00 for vaccination in the present study. If a HCW gets needle stick injury, the maximum amount involved is ₹3,144.00, for those who are not vaccinated and ₹2,460.00 for those who are vaccinated. Average amount per needle stick injury was found to be ₹ 2,802.00. On forecasting the expenditure for the same in future, it was found that, by the Year 2015, the hospital will have to pay ₹ 2, 07,348.00. (Excludes cost of absenteeism, if employee remain absent due to injury along with loss of time). Whereas, in the previous year organization spend only ₹ 1, 34,496.00.

CDC (2004) estimates that the direct costs associated with initial follow-up and treatment of healthcare workers who

sustain a needlestick injury range from \$500 to \$3,000 depending upon the type of treatments provided. Lee et al. (2005) estimated that the total mean annual cost of needlestick injuries for the 110 nurses (out of 400) who experienced at least one needlestick injury within 12 months of participating in the study was \$28,492, or approximately \$259 spent annually per injured nurse. Altogether, assuming 700,000 needlestick injuries occur each year and 58% of those who sustain a needlestick injury are nurses, the national economic burden of needlestick injuries is estimated to be \$65 million.⁷

All these study findings indicate that, the magnitude of NSI cost is clearly large enough to warrant considerable attention from the higher authorities of the organization and give extreme importance to prevent further NSI events. Even though the present setting has a well-established infection control department and regular training programs, the prevalence rate seems to be persisting. Hence it is important to come up with stringent strategies to reduce the NSI rates as well as related economic loss to the organization.

The strategies implemented by the researcher were:

- 1) Disciplinary actions to Increase accountability i.e; financial liability to leaders of concerned department in case of incorrect practices by the HCWs.
- 2) Rechecks by Nursing officers for waste segregations in their department on regular basis.

A significant reduction ($P < 0.05$ at 95% confidence level) was found in the number of NSI rates after implementation of these strategies. It may be argued that this reduction could be due to decrease in number of reported NSI. But, the disciplinary actions were taken only on higher authorities and the health care workers were not liable for the same. The HCWs were permitted to directly raise incident reports in case of an NSI event. Thereby, the rate of underreporting of the NSI events is expected to be less.

7. Conclusion

The present study addresses the trend of high occurrence of NSI among HCWs and its economic impact on the organization. Along with the various education methods and infection control practices, it is recommended to bring up accountability among higher authorities by implementing stringent strategies to reduce the NSI rate as well as related economic loss to the organization.

8. Acknowledgement

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