RESEARCH ARTICLE

# DETERMINANTS OF OCCUPATIONAL EXPOSURE TO BLOOD BORNE PATHOGENS AMONG RESIDENT DOCTORS IN A TERTIARY CARE HOSPITAL IN THE CITY OF MUMBAI

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**ABSTRACT**

**Background:** Occupational blood exposure is a major concern for the hospital staff.

**Aims & Objective:** To assess the prevalence and pattern of occupational blood exposure among resident doctors.

**Materials and Methods:** This was a cross sectional study carried out on Resident doctors in a tertiary care hospital in the city of Mumbai. Statistical analysis was done using proportions and chi square.

**Results:** 112 out of 273 resident doctors (41%) had an occupational exposure in the past 1 year. Among the exposed 57(51%) had more than 1 exposure. The number of exposures per person per year is 2.08. Maximum number of exposures was of the percutaneous type. 40% of exposures occurred during operative procedures. 40 out of 112 residents underwent laboratory investigations and 34 were started on post exposure.

**Conclusion:** Occurrence of occupational exposure is a common phenomenon. Prevention of injuries is prophylaxis. Out of 273 residents 205 had taken 3 or more Hepatitis B vaccination, an integral part of prevention program at any work place. Training is an integral part of prevention program at any work place. Training of resident doctors should be undertaken at regular basis. Newer innovations in the technique of use of sharps should be devised so as to reduce the risk of exposure.

**Key Words:** Occupational Exposure; Needle Stick Injury; Resident Doctors; Tertiary Care Hospital

## Introduction

Occupational exposure is defined as an exposure that places a health care worker at risk for HBV, HCV, HIV and other blood borne pathogens, by bringing them in contact with potentially infectious blood, tissue or body fluids. The occupational exposure to these infections most commonly occurs through needle sticks or sharps. These preventable injuries expose workers to 20 different blood borne pathogens and result in many infections the most common being Hepatitis B, Hepatitis C and HIV.[1] According to WHO Report 2002, 2.5% HIV cases among health care workers and 40% HBV &HCV cases are the result of occupational exposure.[2]

This study was conducted in a teaching tertiary care hospital and college run by the Brihanmumbai Municipal Corporation. With about 390 staff physicians and 550 resident doctors, the 1800 bedded hospital treats about 1.8 million out-patients and 85,000 in-patients annually and provides both basic care and advanced treatment facilities in all fields of medicine and surgery.[3] Resident doctors are the backbone of this entire and obviously overloaded system. Those in clinical departments have to work round the clock 24 x 7. Resident doctors are constantly in contact with a large number of patients who have different conditions that vary in complexities. They bear the maximum burden of patient care at a tertiary centre. Thus these doctors are exposed to high risk of blood borne pathogens and nosocomial infections at the work place. The emotional toll of an occupational exposure on the resident doctor is another serious consequence, where in colleagues and family members may also suffer.

There are no reliable surveillance data regarding occupational exposure in our country. Safety of health care staff is not given much importance. The establishment of effective infection control program requires information on occupational exposure and the prevalence of the disease and factors related to it. Such surveillance data is essential for developing and revising infection control policies and procedures.

This study is an attempt to find out the exact magnitude of the problem of occupational exposure, the circumstances of its occurrence and the response among resident doctors, an important part of the work-force at a tertiary care institute.

## Materials and Methods

This cross sectional study was conducted at a tertiary care hospital catering to millions of patients annually. The resident doctors working in the institute were the participants. The participants were asked about history of occupational exposure to blood borne pathogens in the past 1 year. Prior permission from the hospital and college authorities was sought; the project was also approved by the medical research ethics committee of the institute. The total number of residents in the college was 550. Fifty percent of the residents were included in the study using stratified random sampling method. All the departments of the hospital i.e. clinical and college i.e. pre and para-clinical were included in the study. The department wise list of post graduate students was obtained from the college establishment. Alternate resident was selected from the list of each department. The first resident in each list was chosen using the lottery method. Data was collected using simple interview technique. Residents were administered a semi-open questionnaire after explaining the rationale behind the study and taking verbal informed consent. Data was collected from 273 residents. To maintain the confidentiality of the data the questionnaire was anonymous so that the identity of the participants is not revealed. All the residents were included in the study. Residents working in the super specialty also those participants who had worked for less than six months in the institute were excluded.

A resident doctor, also called a registrar in the United Kingdom and several common wealth countries was defined as a person who has received a medical degree and who practices medicine under the supervision of fully licensed physicians, usually in a hospital or clinic. Data was entered in MS excel and was analyzed using SPSS 16 software. The statistical test applied included proportion and chi-square for significance of association. P value less than 0.05 was considered significant.

## Results

The study was conducted in a tertiary care hospital in Mumbai over a period of one year. The respondents included 273 resident doctors from all the departments of the medical college and hospital. 112 of 273 reported an occupational exposure in the past 1 year. Thus the prevalence of NSI is 41% for the year.

Among the 112 residents who reported an occupational exposure in the past 1 year, 55 (49%) residents had one occupational exposure to needle stick and sharps. 57 (51%) had more than 1 exposure. Maximum number of exposures in one person is seven. Maximum exposure 219 out of 233 (94%) was of the percutaneous type. Mucous membrane including conjunctiva was involved in 7 (3.1%) cases and rest was to non-intact skin.

Out of 233 total exposures 82 (35%) occurred during operative procedures, 56 (24%) occurred during putting IV lines and giving injections, 51 (22%) and 44 (19%) exposures occurred during taking blood samples and recapping respectively. 125 (57%) NSI were due to solid needle and 94 NSI (43%) happened with hollow needles.

Forty (35%) residents who got a needle stick injury underwent laboratory investigation during period of 3 months. 34 residents were started on post exposure prophylaxis (PEP) among which in 30 residents it was started within 6 hours of a needle stick injury. 15 took the PEP for a duration of 28 days while the rest left it after taking it for a period ranging from 2-15 days. These may be those residents which got a percutaneous high risk injury but left PEP after knowing that the patient is seronegative. Few may have left the regimen after experiencing the intolerable side effects of the drugs in PEP. In all residents PEP was started within 72 hours of occupational exposure as recommended.

Regarding Hepatitis B vaccination, Out of the 273 residents 205(75%) had taken 3 or more HEPATITIS B doses, 36 residents had not taken a single dose of vaccine, 32 residents had taken 1 or 2 doses.

Inquiries were made regarding factors leading to needle stick injury. Questions were asked about duration of sleep, fatigue, perceived stress at work place. As seen in Table 1, Occupational exposure was significantly associated with surgical branch, lack of sleep, fatigue and stress at work. Gender and year of post-graduation did not have significant association. We used logistic regression analysis to determine predictors of needle stick injury. All variables were entered in model by using ENTER method in SPSS. Omnibus test for model coefficients was significant (P-value < 0.001). Hosmer Lemeshow goodness of fit test was non-significant (P=0.556) indicating that model fits the data. As seen in Table 2 the predictors for Needle stick injury in study participants were stress and branch of post-graduation at P<0.05. Residents of the clinical branches are five times more prone to needle stick injury. Stress in

resident doctors is also a predicting factor for needle stick injury. Those who are stressed are 1.8 times likely to suffer a needle stick injury.

**Table-1: Determinants of occupational exposure among resident doctors**

| Determinant | | Occupational Exposure | | | $\chi^2$ | P value |
|---|---|---|---|---|---|---|
| | | Present (n=112) | Absent (n=161) | Total (n=273) | | |
| Gender | Male | 69 | 102 | 171 | 0.9 | 0.77 |
| | Female | 43 | 59 | 102 | | |
| Year of post graduation | First | 40 | 53 | 93 | 0.3 | 0.87 |
| | Second | 35 | 54 | 89 | | |
| | Third | 37 | 54 | 91 | | |
| Sleep duration | < 6 hours | 52 | 104 | 112 | 8.9 | 0.003* |
| | ≥ 6 hours | 60 | 57 | 161 | | |
| Branch of Post graduation# | Surgical | 65 | 49 | 114 | 4.2 | 0.03* |
| | Medical | 34 | 47 | 81 | | |
| Fatigue | Yes | 27 | 23 | 50 | 4.3 | 0.03* |
| | No | 85 | 138 | 223 | | |
| Stress | Yes | 54 | 48 | 102 | 9.5 | 0.002* |
| | No | 58 | 113 | 171 | | |

* < 0.05 is significant; # excluding pre and para clinical branches

**Table-2: Predictors of needle stick injury in resident doctors**

| Variables | B | S.E. | Sig. | Exp (B) | 95.0% C.I. for Exp (B) | |
|---|---|---|---|---|---|---|
| | | | | | Lower | Upper |
| Gender | -0.421 | 0.290 | 0.147 | 0.656 | 0.371 | 1.159 |
| Stress | 0.628 | 0.273 | 0.021 | 1.873 | 1.097 | 3.197 |
| Branch | 1.689 | 0.344 | 0.000 | 5.415 | 2.759 | 10.627 |
| Sleep deprived | 0.239 | 0.276 | 0.386 | 1.270 | 0.740 | 2.182 |

## Discussion

The average age of resident medical officers participating in the study was 26.52.Out of the 273 respondents 171 (62%) of the participants were males and 102 (37%) were females. The challenge of NSI is mainly faced by the young work force at a tertiary care hospital. The residents were evenly distributed in the three years of post-graduation, 34.07% residents were from first year, 32.60% from second year and 33.33% from third year.

In our study the prevalence of occupational exposure was 112 among 273, i.e. 41.03 percent residents per year, were exposed to blood borne pathogens transmitted by needle stick injury. In a similar cross sectional study done at a tertiary care hospital by singru et al.[4] among health care workers in a teaching hospital, the occupational exposure to blood and body fluids in the preceding twelve months was reported to be 32.7%. The total number of exposures was 233 in 112 individuals which come to 2.08/exp/person/year. A study in a Ugandan hospital by Newsom et al.[5] evaluated the frequency of NSI and explored the circumstances surrounding injury. The total number of NSI reported 336 represented prevalence of 1.86 NSI/HCW-year. The findings of this study are similar to the findings of our study.

Our study describes the various circumstances causing needle stick injury. Maximum number of exposures occurred during operative procedures (40%). 34% exposures occurred during putting IV lines and giving injections.32% and23% exposures occurred during taking blood samples and recapping respectively. The operative procedures include major and minor operations in the operation theatres, conducting labor in labor rooms and minor procedures conducted in the wards.

In a study done by Heald et al.[6] the causes of injury were assessed in detail in a sample of the 157 most recent needle stick injuries. Suturing was the cause in 35 of 61 (57%) surgical residents, while recapping needles was the cause in 36 of 96 (38%) non-surgical residents. The prevalence of Recapping (23%) was similar to our study. Needle injury with solid needle is more common in both the studies.

Our study describes the number of residents undergoing investigation and the type of investigation. 35% (40) of those residents who got a needle stick injury underwent lab investigation. 26 residents underwent an ELISA test, 3 were investigated for HbsAg, Western Blot and all 3 investigations. All health care workers who get a needle stick injury are advised a baseline ELISA test if the source of injury is a high risk patient and the exposure was prolonged and deep in nature.

In our study the number of residents taking PEP was analysed. 24 residents it was started within 2 hours of a needle stick injury while in 4 it was started the next day. 15 residents took PEP for 30 days, 15 took it for less than a week.

In our study 57%of the needle stick injuries were not reported. In a similar study by Martin A Makary et al.[7] which studied needle stick injuries among surgeons in training, 297 of 578 (51%) were not reported. Reporting of NSI ranged from 76% by singru et al.[4] to 17.5% by Shehan Hettiaratchy et al.[8] This difference could be due to different administrative set up and policies of different hospitals. It also depends on the risk of transmission of blood borne pathogens perceived by the residents. Reporting the injury to an employee health service enables counselling regarding the risk of exposure and prevention of secondary transmission, including possible transmission to patients, and may alleviate associated

anxiety. It also allows medical evaluation, including testing and, if warranted, antiretroviral therapy or administration of the HBV vaccine containing hepatitis B immune globulin. Antiretroviral therapy administered within 24 to 36 hours after exposure has been associated with an 81% reduction in HIV infection. Although no post exposure prophylaxis is available for HCV, testing with HCV RNA can identify HCV infection at an early stage, during which treatment is highly effective in preventing chronicity. Furthermore, reporting of needle stick injuries may be required to establish the causal relationship of the exposure and subsequent complications.

In our study the hepatitis B vaccination in the resident doctors was studied. 75.09%had taken 3 or more vaccine doses. 13.19% had not taken a single dose of hepatitis B.
In our study the predictors for needle stick injury were analyzed using logistic regression. The predictors for needle stick injury were stress and branch. In a similar study by Zafar A et al.[9] they studied needle stick injury in a tertiary care hospital. About 45% HCWs reported having a needle stick injury in the past. Frequency of injury was significantly higher among doctors ($p < 0.001$). The most common reason identified was stress or being overburdened followed by careless attitude.

There is a need for standardized procedures and interventions to minimize the exposure and avert accidental needle stick injury. Prompt post-exposure prophylaxis and counselling should be available to all health care workers. All residents should undergo regular training in universal safety precautions, prevention of needle stick injury and post-exposure prophylaxis. Drugs for post exposure prophylaxis for HIV, Hepatitis B Vaccine and Hepatitis B Immunoglobulin should be available at one particular designated site round the clock. The hospital authority should notify all health care workers regarding the site and person to be contacted in a case of needle stick injury. Reporting of needle stick injury should be mandatory and efforts should be undertaken to raise awareness of the health-care workers and hospital administrators. New safer techniques of needle and sharps use should be devised to minimize the risk of accidental exposure to blood borne pathogens.

## Conclusion

Occurrence of occupational exposure is a common phenomenon. Prevention of injuries is prophylaxis. Out of 273 residents 205 had taken 3 or more Hepatitis B vaccination, an integral part of prevention program at any work place. Training of resident doctors should be undertaken at regular basis. Newer innovations in the technique of use of sharps should be devised so as to reduce the risk of exposure.

## References


1. International Health Care Worker Safety Center. Estimated Annual Number of U.S. Occupational Percutaneous Injuries and Mucocutaneous Exposures to Blood or Potentially Infective Biological Substances. Adv Exposure Prevent 1998;4:3.
2. World Health Report. Reducing Risks, promoting healthy life. WHO: Geneva; 2002.
3. Department and Staff. King Edward Memorial Hospital. Seth Gordhandas Sunderdas Medical College. Available from: URL: http://www.kem.edu/departments/
4. Singru SA, Banerjee A. Occupational exposure to blood and body fluids among health care workers in a teaching hospital in Mumbai, India. Indian J Community Med 2008;33:26-30.
5. Newsom DH, Kiwanuka JP. Needle-stick injuries in an Ugandan teaching hospital. Ann Trop Med Parasitol 2002;96:517-22.
6. Heald AE, Ransohoff DF. Needlestick injuries among resident physicians. J Gen Intern Med 1990;5:389-93.
7. Makary MA, Al-Attar A, Holzmueller CG, Sexton JB, Syin D, Gilson MM, et al. Needlestick Injuries among Surgeons in Training. N Engl J Med 2007;356:2693-9.
8. Hettiaratchy S, Hassall O, Watson C, Wallis D, Williams D. Glove usage and reporting of needlestick injuries by junior hospital medical staff. Ann R Coll Surg Engl 1998;80:439–41.
9. Zafar A, Aslam N, Nasir N, Meraj R, Mehraj V. Knowledge, attitudes and practices of health care workers regarding needlestick injuries at a tertiary care hospital in Pakistan. J Pak Med Assoc 2008;58:57-60.


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