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December 2009

Online at <https://mpra.ub.uni-muenchen.de/37830/>

MPRA Paper No. 37830, posted 11 Apr 2012 13:44 UTC

**PREVALENCE OF NON-STERILE
INJURIES AMONG MODERN MEDICINE STUDENTS
OF ASSAM**

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December 2009

ABSTRACT

Objectives: To study the prevalence and associated factors of non-sterile occupational injuries among students of modern medicine in Assam.

Methodology: A cross sectional survey was conducted using a self-administered, pre-tested, structured questionnaire in English language adapted from the CDC workbook for designing, implementing and evaluating a sharps injury prevention program 2008. All the final year medical, dental and nursing students from the three medical colleges and one dental college in Assam were included in the study. Univariate, bivariate and multivariate analysis were done using SPSS version 17.0.

Results: Sharp injuries were highest among nursing students (50.5 percent) followed by dental (45.2 percent) and medical (30.0 percent) students whereas body fluid contact were highest among medical students (37.7 percent) followed by dental (32.3 percent) and nursing (30.3 percent) students. Gender, discipline, residence, procedure, perception of risk for infections and recapping of needle were the predictors for sharp injuries and when adjusted for other independent variables, procedure and recapping of needle were the most important predictors of sharp injuries whereas procedure, awareness about transmission of infection, perception of risk for infections, type of exposure and use of doctor's apron were the predictors for body fluid contact and after adjusting for other independent variables, procedure and use of doctor's apron were the most important predictors for body fluid contact.

Conclusion: Non-sterile occupational injuries among the students of modern medicine are associated with factors which can be modified by intensive education and training of the students. Policy changes at the institute level can help in this direction.

INTRODUCTION

The healthcare providers across the world suffer from the problem of needlestick injuries and exposure to infectious blood and body fluid which puts them at risk for various blood-borne infections like hepatitis B, hepatitis C, HIV. Since the 1980s, there has been an increase in the reported incidence of blood-borne infections amongst healthcare workers (HCWs) and a concomitant enhanced awareness of the occupational risks of blood-borne virus transmission. The risk of transmission of infection after needlestick injuries is reported to be 6–30 percent for hepatitis B, 2–3 percent for hepatitis C and 0.3 percent for HIV.¹⁻³ The risk of transmission for HIV after mucous membrane exposure is reported to be 0.09 percent.⁴

The prevalence of needlestick injuries and exposure to blood and body fluids have been reported from across the globe in various healthcare settings. It is believed that only one out of three needlestick injuries are reported in the US, while these injuries virtually go undocumented in many developing countries.⁵ About 35.7 million healthcare workers face the risk of sustaining a needle stick injury worldwide. The annual number of injuries per healthcare worker varies by country (0.2–4.7/year).⁶⁻⁷ A review of recent studies of sharps injuries illustrates that the overall sharps injury rate per 10,000 healthcare workers per year ranged from 113 (1 percent) to 623 (6.2 percent), with a mean of 405 (4 percent). However, underestimate the actual risk because many exposures are not reported.⁸

Healthcare students are thought to be at higher risk of needlestick injuries than healthcare workers as they lack experience, may be responsible for taking a large number of blood samples, and have poor knowledge of precautionary measures and of correct post-exposure behaviour.⁹⁻¹¹ In a survey done in USA, 48 percent of all graduating medical students recalled being exposed at least once to potentially infectious body fluids during their last two years of medical school.¹² In a survey done in Canada, non-sterile occupational

injuries were reported by 82 percent of dental, 57 percent of medical and 27 percent of nursing students. Percutaneous injuries were more frequently reported than blood splashes to the eyes, nose or mouth.¹³

In India very few studies have been done to look at the prevalence of sharp injuries and body fluid exposure in healthcare settings and particularly among healthcare students. In a survey done in New Delhi, 61 percent of the medical students reported being injured during various procedures during their clinical training.¹⁰ A study from south India done among healthcare workers, medical and nursing students in three tertiary hospitals reported that 65 percent of the medical students were exposed at least once in the last twelve months. The nursing students also reported similar percentage of exposure.¹⁴

Healthcare students are prone to accidental exposure to blood borne pathogens (BBP) and body fluids because multitude of reasons such as, nature of their work, which involve extensive contact with the sick patients, specimen handling, lack of experience and skill, eagerness to learn new things and material, lack of awareness about policies and procedures to avoid the same, i.e., universal precautions, and so on.¹⁵ A study from Malaysia on final year medical students studied the factors such as knowledge of blood-borne diseases, knowledge of universal precautions, risk perceptions among student and practice of universal precautions, etc. which may be associated with needle stick injury. Among them statistical significance was found between practice of universal precautions and needle stick injuries, i.e. the higher the score for practice of universal precautions, the lower the number of episodes.¹⁶ The level of knowledge about sharp injuries among the healthcare students also has an important impact on the rate of injury. In a longitudinal study done in Birmingham among medical students, it was seen that the injury rate dropped from 14.6 to 5.3 percent over a period of four years after sustained efforts were made to improve the knowledge of the medical students.¹⁷ A study from New Delhi conducted on medical students reported that

only 35.5 percent of the medical students used gloves. Resheathing the needle was responsible for causing injury to 69 percent of the students, which was significantly higher than injuries occurring while entry into the vein or withdrawing the needle.¹⁰ Another study from Mumbai in 2002 highlighted the lack of awareness about universal precaution measures among medical and nursing students. Besides, the study also revealed that only 26.3 percent of the medical students had taken three doses of hepatitis B vaccination.¹⁸ In a cross-sectional survey done among healthcare workers, medical students and nursing students in three tertiary care hospitals of south India, occupation, experience, sex, training and concern for blood borne infections were found to be associated with needlestick injury. The students who had attended the needle training program reported less number of injuries.¹⁴

There are relatively few studies done across India and particularly in Northeast India to find the prevalence of non-sterile occupational injuries among healthcare workers and students. The north-eastern states of India have reported high prevalence of hepatitis B and hepatitis C infection.¹⁹⁻²² Likewise the prevalence of HIV is also high in some states.²⁴ The Medical Colleges of Assam provides tertiary healthcare services to all the other North-eastern states as they seek tertiary healthcare from Assam due to shortage of tertiary health infrastructure in their respective states. So there is a need to study the prevalence of occupational injuries among the healthcare students exposed to these populations.

OBJECTIVES OF THE STUDY

1. To study the prevalence of non-sterile occupational injuries among final year medical, dental and nursing students.
2. To study the factors associated with the non-sterile occupational injuries.

3. To study the difference in the factors across medical, dental and nursing students.

METHODOLOGY

A cross-sectional survey was conducted in the three medical, nursing and one dental colleges of Assam. All the 606 final year medical, nursing and dental students were included in the study. Primary data was collected using a structured, self-administered questionnaire in English language adapted from the workbook for Designing, Implementing, and Evaluating a Sharps Injury Prevention Program. United States developed by the Centre for Disease Control and Prevention, February 2004. Approval from the Institutional Ethics Committee, Sree Chitra Tirunal Institute for Medical Sciences and Technology (SCTIMST) was obtained before the start of the study. Prior permission from Director of Medical Education (DME), Assam was taken for conducting the study in the Medical, Nursing and Dental Colleges of Assam. Overall 468 questionnaires were received by the investigator with a response rate of 77.2 percent. The data collected was entered into Epidata 3.1 software and Univariate and bivariate analysis were done using SPSS version 17.0 software. Univariate analysis was done to identify the baseline characteristics of the study population. It was followed by bivariate analysis using cross tabulation and Chi-square test, to identify association between non-sterile occupational injuries and the independent variables. Factors found to have significant association with non-sterile occupational injuries during bivariate analysis were further analyzed using Multiple Logistic Regression to identify the most significant predictors after adjusting for other variables.

RESULTS

The mean age for medical, dental and nursing students was 22.48 years (SD 0.922 years), 21.84 years (SD 0.920 years) and 23.42 years (SD 1.25 years) respectively. Table 1 shows the other Sociodemographic characteristics of the study population.

Table 1. Sociodemographic characteristics

| VARIABLE | MEDICAL | | DENTAL | | NURSING | | TOTAL |
|-----------------------|-----------|---------|-----------|---------|-----------|---------|-------|
| | Frequency | Percent | Frequency | Percent | Frequency | Percent | |
| Gender | | | | | | | |
| Male | 163 | 65.7 | 19 | 59.4 | | | 182 |
| Female | 85 | 34.3 | 13 | 40.6 | 188 | 100.0 | 286 |
| TOTAL | 248 | 100.0 | 32 | 100.0 | 188 | 100.0 | 468 |
| Marital status | | | | | | | |
| Married | 5 | 2.0 | 1 | 3.1 | 4 | 2.1 | 10 |
| Unmarried | 243 | 98.0 | 31 | 96.9 | 184 | 97.9 | 458 |
| TOTAL | 248 | 100.0 | 32 | 100.0 | 188 | 100.0 | 468 |
| Residence | | | | | | | |
| Rural | 55 | 22.2 | 4 | 12.9 | 70 | 37.4 | 129 |
| Urban | 193 | 77.8 | 27 | 87.1 | 117 | 62.6 | 337 |
| TOTAL | 248 | 100.0 | 31 | 100.0 | 187 | 100.0 | 466 |

30 percent of medical students, 45.2 percent of dental students and 50.5 percent of nursing students were injured at least once in the past twelve months by a sharp object like needle or scalpel while 37.7 percent of medical students, 32.3 percent of dental students and

30.3 percent of nursing students had at least one contact with blood or body fluid in the past twelve months.

Majority of the sharp injuries occurred in the Medicine department while giving injections while Maximum body fluid contact occurred in the Obstetrics and Gynaecology department while doing Venepuncture.

Majority of the medical and dental students perceived that they are at risk for hepatitis B, hepatitis C, HIV and herpes infection while the perception of risk was found to be very low among nursing students with 51.7 percent, 27.7 percent, 54.0 percent and 19.2 percent of nursing students thinking that they are at risk for hepatitis B, hepatitis C, HIV and herpes infection respectively.

29.4 percent of medical students were not vaccinated for hepatitis B while 45.2 percent of medical students reported taking three doses of hepatitis B vaccine. Among dental students, 40.6 percent were not vaccinated for hepatitis B while 34.4 percent reported taking three doses of vaccine. 35.6 percent of nursing students were not vaccinated for hepatitis B and 33.0 percent reported taking three doses of the vaccine.

43.3 percent of medical students, 12.5 percent of dental students and 26.9 percent of nursing students were aware that their college have a protocol for reporting exposure to blood and body fluids. 62.5 percent of medical students, 12.5 percent of dental students and 21.0 percent of nursing students were aware that their institute provides post-exposure prophylaxis.

Majority of the students from all the three groups reported using the doctor's apron and hand gloves while treating patients. 68.3 percent medical students reported washing their hands before donning gloves. Among dental students, 46.9 percent said that they wash their

hand before donning gloves. Majority of the nursing students (93.6 percent) also reported washing of hands before donning gloves. Majority of the medical (94.6 percent), dental (86.7 percent) and nursing (82.4 percent) students reported using soap for washing their hand.

Majority of the medical (71.7 percent), dental (96.9 percent) and nursing (97.9 percent) students reported using disposable syringe during their clinical training. Recapping of needle was practiced by 90.5 percent of medical students, all the dental students and 80.0 percent of the nursing students. 54.4 percent of the medical students used the harmful double handed technique of recapping of needle while 34.3 percent practiced the single handed technique.

BIVARIATE ANALYSIS:

Bivariate analysis was done separately between sharp injuries and the independent variables and between body fluid contact and the independent variables. Table 2 shows the independent variables which were found to have significant association with sharp injuries.

Table 2: Bivariate analysis of sharp injuries

| INDEPENDENT VARIABLE | | SHARP INJURIES | | P-VALUE |
|----------------------|-----------|----------------|------------|---------|
| | | Yes (%) | Others (%) | |
| GENDER | Male | 57 (31.5) | 124 (68.5) | 0.006 |
| | Female | 125 (44.2) | 158 (55.8) | |
| DISCIPLINE | Medical | 74 (30.0) | 173 (70.0) | 0.000 |
| | Dental | 14 (45.2) | 17 (54.8) | |
| | Nursing | 94 (50.5) | 92 (49.5) | |
| | Unmarried | 180 (39.2) | 274 (60.4) | |

| | | | | |
|------------------|-------|------------|------------|--------------|
| RESIDENCE | Rural | 61 (47.7) | 67 (52.3) | 0.018 |
| | Urban | 119 (35.6) | 215 (64.4) | |

| INDEPENDENT VARIABLE | | SHARP INJURIES | | P-VALUE |
|--------------------------------------|--------------------|----------------|------------|---------|
| | | Yes (%) | No (%) | |
| PLACE OF INJURY | Medicine | 66(79.5) | 17(20.5) | 0.00 |
| | Surgery | 29(72.5) | 11(27.5) | |
| | Obstet & Gynae | 61(46.9) | 69(53.1) | |
| | Others | 13(56.5) | 10(43.5) | |
| | Dentistry | 13(81.3) | 3(18.8) | |
| PROCEDURE | Venepuncture | 28(39.4) | 43(60.6) | 0.000 |
| | Setting up IV drip | 39(57.4) | 29(42.6) | |
| | Giving injections | 115(74.7) | 39(25.3) | |
| RISK OF HEPATITIS B INFECTION | Yes | 120 (37.4) | 201 (62.6) | 0.000 |
| | No | 17 (25.0) | 51 (75.0) | |
| | Don't know | 39 (66.1) | 20 (33.9) | |
| RISK OF HEPATITIS C INFECTION | Yes | 74 (32.6) | 153 (67.4) | 0.000 |
| | No | 23 (32.4) | 48 (67.6) | |
| | Don't know | 53 (58.9) | 37 (41.1) | |
| RISK OF HIV INFECTION | Yes | 122 (36.3) | 214 (63.7) | 0.001 |
| | No | 12 (28.6) | 30 (71.4) | |
| | Don't know | 35 (59.3) | 24 (40.7) | |
| RISK OF HERPES INFECTION | Yes | 47 (38.2) | 76 (61.8) | 0.009 |
| | No | 32 (30.2) | 74 (69.8) | |
| | Don't know | 70 (49.3) | 72 (50.7) | |

| | | | | |
|--------------------------------|---------------|------------|------------|-------|
| HEPATITIS B VACCINATION | No | 72 (47.7) | 79 (52.3) | 0.012 |
| | One dose | 10 (41.7) | 14 (58.3) | |
| | Two doses | 35 (46.1) | 41 (53.9) | |
| | Three doses | 56 (30.4) | 128 (69.6) | |
| | Booster doses | 9 (31.0) | 20 (69.0) | |
| USE OF DOCTOR'S APRON | Yes | 122 (34.6) | 231 (65.4) | 0.000 |
| | No | 58 (53.2) | 51 (46.8) | |
| RECAPPING OF NEEDLE | Yes | 163 (41.5) | 230 (58.5) | 0.002 |
| | No | 12 (20.7) | 46 (79.3) | |

Similarly bivariate analysis was done between body fluid contact and the independent variables. Table 3 shows the independent variables which were found to statistically significant with body fluid contact.

Table 3: Bivariate analysis of body fluid contact

| INDEPENDENT VARIABLE | | BODY FLUID CONTACT | | P-VALUE |
|------------------------------------|--------------------|---------------------------|-------------------|----------------|
| | | Yes (%) | Others (%) | |
| PLACE OF INJURY | Medicine | 26 (31.3) | 57 (68.7) | 0.000 |
| | Surgery | 19 (46.3) | 22 (53.7) | |
| | Obstet & Gynae | 89 (68.5) | 41 (31.5) | |
| | Others | 16 (66.7) | 8 (33.3) | |
| | Dentistry | 8 (50.0) | 8 (50.0) | |
| PROCEDURE RELATED TO INJURY | Venepuncture | 53 (74.6) | 18 (25.4) | 0.000 |
| | Setting up IV drip | 36 (52.9) | 32 (47.1) | |

| | | | | |
|--------------------------------------|-------------------|------------|------------|-------|
| | Giving injections | 69 (44.2) | 87 (55.8) | |
| TRANSMISSION OF INFECTION | Yes | 143 (35.9) | 255 (64.1) | 0.039 |
| | No | 12 (21.8) | 43 (78.2) | |
| RISK OF HEPATITIS B INFECTION | Yes | 123 (38.4) | 197 (61.6) | 0.010 |
| | No | 19 (27.5) | 50 (72.5) | |
| | Don't know | 12 (20.0) | 48 (80.0) | |
| RISK OF HIV INFECTION | Yes | 127 (37.8) | 209 (62.2) | 0.037 |
| | No | 12 (28.6) | 30 (71.4) | |
| | Don't know | 13 (21.7) | 47 (78.3) | |
| DON'T KNOW PROCEDURE | Yes | 38 (34.5) | 72 (65.5) | 0.013 |
| | No | 89 (49.4) | 91 (50.6) | |
| TYPE OF EXPOSURE LOW RISK | Yes | 45 (57.7) | 33 (42.3) | 0.004 |
| | No | 82 (38.7) | 130 (61.3) | |
| USE OF APRON | Yes | 135 (38.2) | 218 (61.8) | 0.002 |
| | No | 25 (22.5) | 86 (77.5) | |

MULTIVARIATE ANALYSIS:

After doing bivariate analysis , Multiple Logistic Regression was carried out to estimate the predictors in context of non-sterile occupational injuries, is provided in Table 4. The analysis measures the effect of change in variation of one of the variable (independent) on the variation of the other variable (dependent) adjusted for other independent variables in the model. The analysis was done by backward stepwise (likelihood ratio) model in SPSS for Windows version 17.0.

Table 4. Significant variables found in multivariate analysis

| VARIABLE | | ADJUSTED OR | OR (95% CI) | | P-VALUE |
|--|--------------------|-------------|-------------|-------------|--------------|
| | | | Lower limit | Upper limit | |
| PROCEDURE RELATED TO SHARP INJURY | Venepuncture# | 1.00 | 1.00 | 1.00 | |
| | Setting up IV drip | 2.04 | 0.917 | 4.54 | 0.081 |
| | Giving injection | 5.22 | 2.46 | 11.05 | 0.000 |
| RECAPPING OF NEEDLE | | 2.71 | 1.39 | 5.28 | 0.003 |
| PROCEDURE RELATED TO BODY FLUID CONTACT | Giving injection # | 1.00 | 1.00 | 1.00 | |
| | Venepuncture | 2.23 | 1.05 | 4.75 | 0.037 |
| | Setting up IV drip | 0.88 | 0.42 | 1.81 | 0.729 |
| USE OF DOCTOR'S APRON | | 0.26 | 0.12 | 0.55 | 0.000 |

OR: odds ratio, #: Reference category

DISCUSSION:

Sharp injuries (39.2 percent) were more frequently reported than blood and body fluid contacts (34.3 percent). This finding is in same line with another study from Canada.¹³ The study found that the prevalence of sharp injuries was highest among the nursing students (50.7 percent) and the prevalence of body fluid contacts was highest among the medical students (37.7 percent). Studies from Singapore and sub-Saharan Africa show similar rates of injury among medical and nursing students.²⁵⁻²⁶ Our study found that the mean number of sharp injuries and body fluid contacts was highest among nursing students. According to WHO, nurses are the group most at risk at any healthcare setting²⁷ and our study also showed similar findings. A study from Canada reported highest number of injuries among dental

students.¹³ In contrast, our study found out that the prevalence of injuries was high among nursing and medical students.

Majority of sharp injuries had occurred in the medicine department while administering injections. This finding is in agreement with a study done among medical students in Singapore.²⁶ Female, nursing students, rural residence, those who did not perceive risk for hepatitis B, hepatitis C, HIV and herpes infection, students not immunised against hepatitis B virus infection and students who practised recapping of needle had more number of sharp injuries. In contrast, in a study from south India done among healthcare providers reported that males and those immunised against hepatitis B virus infection had more number of sharp injuries.¹⁴ Recapping of needle was found to be a predictor for sharp injuries. About 42 percent of students practising recapping had sharp injuries. This is in line with studies from India, Taiwan and sub-Saharan Africa done among medical and nursing students and healthcare workers which also found similar findings.

Majority of the body fluid contacts had occurred in the Department of Obstetrics and Gynaecology while doing Venepuncture. A cross-sectional study done in USA among healthcare workers and students have also reported similar findings.²⁸ Our study also found the use of doctor's apron to be protective against body fluid contact. This finding is in line with a study done among healthcare workers in rural north India, which also reported similar findings.²⁹

Non-sterile occupational injuries among the students of modern medicine are associated with factors which can be modified by intensive education and training of the students. Policy changes at the institute level can help in this direction.

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