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ORIGINAL ARTICLE

Evaluating Knowledge, Attitude, and Perception on Needle Stick Injuries among Medical Students in a Tertiary Care Centre: A Cross-sectional Observational Study

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Abstract

Introduction: Despite all the advancements in the field of healthcare, medical students and personnel are still at risk of needle stick injuries (NSIs). People are put at risk of acquiring infections of blood-borne pathogens like HBV, HCV, HIV infection due to these injuries. Early clinical exposure, incompetence in performing tasks, and non-standardized reporting mechanisms are among some of the reasons which increase their vulnerability to such injuries. **Objective:** The purpose of this research paper is to determine the KAP of second-year MBBS students about NSIs and find out any risk factors and underreporting. **Material and Methods:** The current study was an observational study among second-year MBBS students at ACS Medical College and Hospital, Chennai, during June and August 2025. Questionnaires containing information related to demography, knowledge, attitude, and perception towards NSIs were administered among these students. Descriptive and inferential statistics were performed with the use of SPSS version 28. **Results:** In total, among the 216 participants, 53.4% had adequate knowledge about NSIs while 46.6% of the respondents had inadequate knowledge. However, there was no association between knowledge and gender, although there was a statistical difference in perceptions of knowledge based on gender ($P = 0.016$). The prevalence rate of NSIs was significantly higher among respondents having inadequate knowledge (23.5%) compared to those having adequate knowledge (6.8%) ($P = 0.001$). There was a significant positive association of knowledge with attitude but not with perceptions ($P<0.05$). Underreporting of injuries and incomplete vaccination coverage against hepatitis B were noted. **Conclusion:** Needle Stick Injury is an impending health hazard for medical students, particularly those lacking adequate knowledge about the condition. The acquisition of knowledge, attitude, vaccination and reporting should be made top priority to reduce the prevalence of injuries among trainees.

Keywords: Needle stick injuries, Medical students, Occupational hazard, Reporting behaviour

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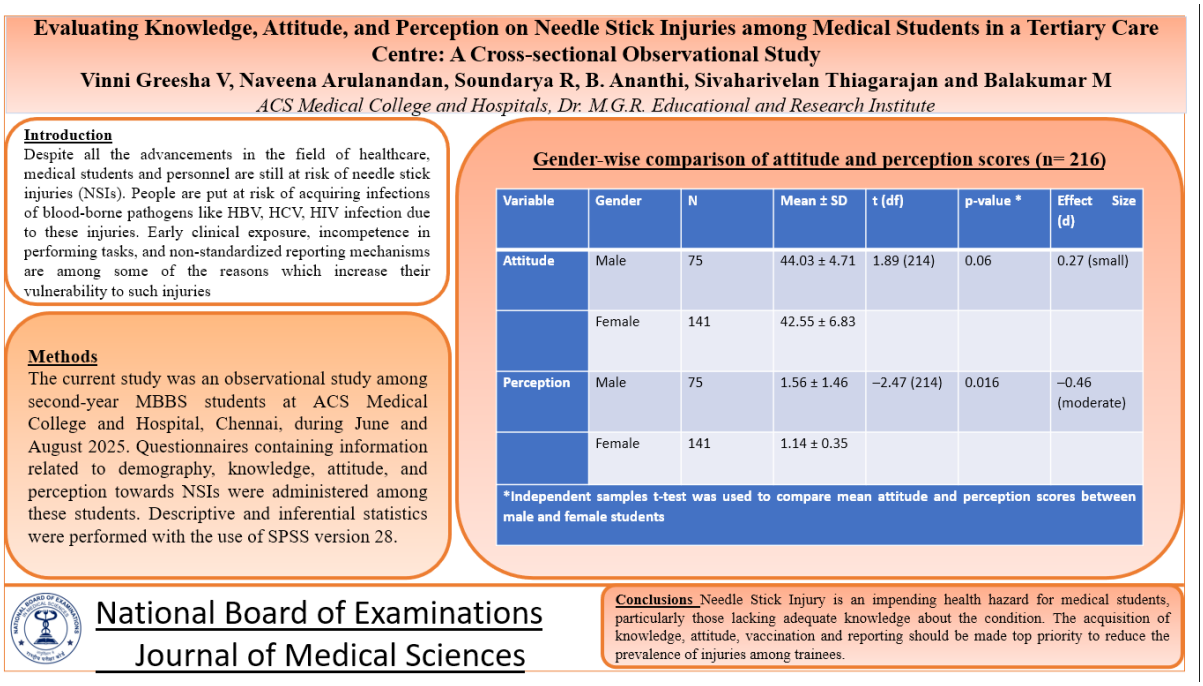
Graphical Abstract



Introduction

Needle Stick Injury (NSI) can be termed as one of the frequent hazards experienced in the work environment by healthcare professionals. The frequency of this risk is higher in underdeveloped countries owing to the absence of an internationally accepted protocol that can help prevent these risks. According to the World Health Organization (WHO) statistics, about three million health care professionals suffer from NSIs every year, exposing themselves to the risk of blood-borne infections like HBV, HCV, and HIV infection [1].

Being inexperienced, unmonitored, and ashamed of their mistakes make medical students particularly susceptible to NSIs. These students have to carry out invasive procedures on patients as part of their initial training which makes them even more vulnerable to NSIs, hence reducing the likelihood of reporting them. As a result, the utilization of post-exposure prophylaxis becomes impossible. However, aside from the physical impact of NSIs, other repercussions of NSIs include stress and decreased confidence in carrying out clinical procedures [14-17].

Knowledge, attitudes, and perception (KAP) have a profound effect on safety results. Knowledge can be defined as awareness concerning modes of transmission, precautionary measures, vaccines, and post-exposure treatment. Although guidelines have been set by the WHO and CDC, the level of knowledge is still relatively low [3]. Attitudes dictate whether students will comply with safety protocols; however, some students exhibit dangerous behavior such as recapitulating needles and not using gloves. Perception affects reporting practices and research indicates that students fear stigmatization and distrusting the reporting process cause underreporting [3,4].

Infection due to NSIs occurs frequently across the globe. In India, it is

estimated that one out of three students experience an accidental prick wound during training. The problem is further aggravated in resource-poor settings because of poor waste disposal. KAP evaluation can assist in addressing problems, modifying curriculum, and fostering proactive safety measures. Measures such as workshops and vaccine drives can create a conducive atmosphere for safe practice [5].

What sets this research apart from the others is that it considers the second-year medical students as its target population when they are still at the initial stages of exposure to clinical practice, which makes it relatively easier to determine the risk factors in these situations, even before the bad practices become habitual among them.

This study is the first to capture KAP during the early stages of training; much of the material currently in print focuses on interns and senior workers. The KAP paradigm was adopted because NSIs are caused by a combination of perceptual limitations, attitude inadequacies, and knowledge gaps. A cross-sectional design was selected as appropriate for a prevalence and KAP survey, according to Alsabaani et al. (2022) and Datar et al. (2022) [3,4].

The primary purpose of the current study is to estimate the frequency and risk factors of these events and to assess the knowledge, attitude, and perceptions of the second-year MBBS students.

Principal Objective

Evaluation of the knowledge, attitude, and perception of second-year MBBS students towards needle stick injury.

Secondary Objectives

1. Estimating the prevalence rate of needle stick injury among second-year MBBS students.
2. Investigation into the relationship between the frequency of needle stick injury and knowledge level.
3. Relationship investigation of demography factors like age and gender in relation to knowledge, attitude, and perception.
4. Hepatitis B vaccination evaluation of subjects under study.

Materials and Methods

A cross-sectional descriptive study was carried out for a duration of three months from June 2025 to August 2025 in ACS Medical College and Hospital in Chennai. A stratified sampling method was employed, which resulted in a sample size of 216 second-year MBBS students. Before carrying out the process of data collection, informed consent was taken from all participants, and permission for the study was granted by the Institutional Human Ethics Committee of ACS Medical College and Hospital, Chennai (IEC approval no.: No.110/2025/IEC/ACSMCH dt22.07.2025).

Inclusion Criteria

Second-year MBBS students who volunteered to participate in the study (n=216). Second-year MBBS students were selected for the study as they represent one of the initial stages of clinical experience which is relevant for assessing the knowledge, attitudes, and perceptions amongst various stages of clinical training; whereas other stages of MBBS, CRRIs, and paramedical students were not considered for the study.

Exclusion Criteria

First-year, third-year, and fourth-year MBBS students, CRRIs, and paramedical students were not considered for the study.

The survey was conducted with the help of a well-prepared, structured questionnaire after conducting a thorough literature search. The total number of questions used in the questionnaire was thirty, ten being based on knowledge in multiple choice form, ten on attitudes using five-point Likert scale, and ten on perception either yes/no or frequency type. The questionnaire was designed by the researchers after literature review and considering the suggestions of subject matter experts from the fields of Community Medicine and Microbiology to ensure inclusion of only relevant questions. Content validity was established through expert assessment. Prior to the major data collection, a pilot study was carried out to evaluate feasibility and clarity; small changes were made in response to comments.

The principal investigator of this research is a post-graduate in the field of Microbiology who is experienced in questionnaire-based researches; the language of the questionnaire is English.

Statistical Package for Social Sciences (SPSS) version 27 was used for analysis, where the data were entered into an Excel sheet. The data analysis was done using descriptive statistics, where the results were summarized by frequency, percentage, mean, and standard deviation. Inferential statistics were done by the Chi-Square test to show the relationship between demographics and knowledge, attitude, and perception scores. Statistical significance level was considered as p-value < 0.05.

Results

The maximum number of respondents belongs to the age range between 15 and 20 years old that formed 68.1% of the total respondents (n = 147). The next age range is between 21 and 25 years old, constituting 31.1% (n = 68) of the total respondents. There was only one respondent belonging to the age range between 26 and 30 years old (Table 1).

Table 1. Age Distribution of Participants (n= 216)

Age	Frequency	Percent (%)
15-20	147	68.1
21-25	69	31.9
Total	216	100.0

Table 2. Descriptive statistics of age and gender distribution of participants (n= 216)

Variable	Category	Value
Age (years)	Mean ± SD	20.47 ± 1.89
	Minimum	18
	Maximum	30
Gender	Female	141 (65.28%)
	Male	75 (35.72%)
	Total	216 (100.0%)

The participants were 216 second-year MBBS students, whose mean age was 20.47±1.89 years, reflecting a smaller age range than normally observed in undergraduate medical students. The minimum age of the participants was 18 years, while the maximum age was 30 years. In terms of gender distribution, females were more in number compared to males, accounting for 65.8% and 35.2%, respectively (Table 2).

Table 3. Knowledge levels by gender among study participants (n = 216)

Gender	Inadequate Knowledge n (%)	Adequate Knowledge n (%)	Total n (%)
Female (n = 141)	67 (47.52%)	74 (52.48%)	141 (65.28%)
Male (n = 75)	34 (45.33%)	41 (54.67%)	75 (34.72%)
Total (n = 216)	101 (46.76%)	115 (53.24%)	216 (100.00%)

From a total of 216 respondents, 53.24% of them had sufficient knowledge regarding needle-sticks injury whereas 46.76% of them had insufficient knowledge. The proportion of females who had sufficient knowledge was 52.48% whereas those with insufficient knowledge comprised 47.52%. The same was true for males; 54.67% of them had sufficient knowledge and 45.33% had insufficient knowledge. It is evident from the above data that both genders had equal knowledge levels. Therefore, statistically there was no difference between sex and knowledge level (Table 3).

Table 4. Gender-wise comparison of attitude and perception scores (n= 216)

Variable	Gender	N	Mean ± SD	t (df)	p-value *	Effect Size (d)
Attitude	**Male**	**75**	**44.03 ± 4.71**	**1.89 (214)**	**0.06**	**0.27 (small)**
	Female	**141**	**42.55 ± 6.83**			
Perception	**Male**	**75**	**1.56 ± 1.46**	**–2.47 (214)**	**0.016**	**–0.46 (moderate)**
	Female	**141**	**1.14 ± 0.35**			
*Independent samples t-test was used to compare mean attitude and perception scores between male and female students						

The mean score of attitudes was greater among the male students (44.03 ± 4.71) compared to the female students (42.55 ± 6.83), but there was no statistical significance in their means (t = 1.89, df = 214, p = 0.06). Contrarily, there was statistical significance in the mean score of perception, whereby men performed better with the mean score of 1.56 ± 1.46 compared to women with mean score 1.14 ± 0.35 (t = -2.47, df = 214, p = 0.016), which is a moderate effect size (Table 4).

Table 5. Age-wise comparison of attitude and perception scores (n= 216)

Age Group (Years)	n (%)	Attitude Score (M±SD)	Perception Score* (M±SD)
15–20	147 (68.1%)	43.26 ± 5.17	12.50 ±10.90
21-30	69 (31.9%)	43.85 ± 6.35	13.60 ± 4.90
Total	**216 (100%)**	**43.49 ± 5.58**	**12.90 ± 9.30**
t-statistic (df)		t (214) = -0.715	t (214) = -0.812
p-value		0.475	0.417

There was no statistical significance in terms of attitude between the age groups of 15-20 years (43.26 ± 5.17) and the age group of 21-30 years (43.85 ± 6.35). This is evident from the t-statistic (-0.715), degree of freedom (214), and probability value (0.475). In addition, there was also no statistical significance in the mean scores of perceptions between the two age groups. The mean scores of the perceptions among the respondents aged between 15-20 years were 12.50 ± 10.90 compared to the mean score of the perceptions among the respondents aged between 21-30 years which were 13.60 ± 4.90 (Table 5).

Table 6. Correlation between knowledge level, attitude score, and perception score (n = 216)

S.No	Variable	Mean ± SD	1	2	3
1.	Knowledge (Categorical)	N/A*	1		
2.	Attitude Score	43.51 ± 5.57	r_{pb} = .281**	1	
3.	Perception Score	12.90 ± 9.30	r_{pb} = .092	r =.159*	1

Knowledge is reported as a categorical variable; Mean/SD is omitted as it is non-continuous. **Correlation is significant at the 0.01 level (2-tailed). *Correlation is significant at the 0.05 level (2-tailed). r = Pearson's correlation coefficient (for continuous variables); r_{pb} used for associations with Knowledge.

There was a positive relationship between knowledge and attitude scores (rpb=0.281; p<0.01), which means that knowledgeable individuals held positive attitudes towards preventing needlestick injuries. There was no relationship between knowledge and perception scores (rpb=0.092). A significant yet weak correlation was observed between attitude and perception scores (r=0.159; p<0.05). Based on the results above, there is evidence to suggest that improving knowledge levels can have a positive effect on attitudes, but other variables may affect perceptions and reporting behaviors (Table 6).

Table 7. Association of Knowledge with Prevalence of Needle Stick Injuries (n= 216)

Knowledge Category	NSI: Yes (n, %)	NSI: No (n, %)	Total (n)
Inadequate	**24 (23.5%)**	**78 (76.5%)**	**102**
Adequate	**8 (7.0%)**	**106 (93.0%)**	**114**
Total	**32 (14.8%)**	**184 (85.2%)**	**216**
Statistical Test		**χ^2 = 11.58**	**p < 0.001***
* p value < 0.05 is statistically significant			

In terms of the frequency of needle-stick injury among the respondents, a significantly higher proportion of students with low knowledge (23.5%) were recorded compared to those with high knowledge (7%). There was also a significantly significant association between knowledge level and needle stick injury (χ^2 = 11.58; df = 1; p < 0.001) (Table 7).

Discussion

This study was conducted among second-year MBBS students and shows that more than half the respondents had adequate knowledge concerning needlestick injuries (NSIs). However, there were also a considerable number of students who showed inadequate knowledge about NSIs. This suggests that even in the very early stages of clinical practice, there is a significant lack of knowledge concerning NSIs, which can cause health complications in the future. Previous studies have shown similar findings among medical students from India and other developing nations, who are exposed to invasive procedures prior to receiving formal training in infection control.

Bhattarai et al. (2014) and Sharma et al. (2010) reported similar levels of expertise [5,8]. Our 14.8% NSI prevalence is in line with studies conducted in India (Salelkar et al., 2010; Giri et al., 2013) [6,18]. The modest correlation (r=0.159) between attitude and perception suggests that stigma and institutional barriers affect perceptions in addition to attitude.

Our finding that 53.24% of participants had sufficient knowledge on NSIs is consistent with prior data from developing nations like India. Similar trends were found by Bhattarai et al. (2014) [8] among Nepali medical students, while Sharma et al. (2010) [5] found that healthcare personnel in a Delhi tertiary care facility had modest levels of expertise. Although it is lower than global meta-analytic estimates (Auta et al., 2018) [22], the prevalence of NSIs in our study (14.8%) is consistent with estimates from similar cross-sectional studies in India (Salelkar et al., 2010; Giri et al., 2013) [6,18], which may reflect the early-stage clinical exposure of second-year students. The substantial positive association between knowledge and attitude ($r_s b = 0.281$, $p < 0.01$) supports the findings of Datar et al. (2022) [4] and Alsabaani et al. (2022) [3], who also discovered that knowledge significantly influenced safe attitudes. The results of our study regarding underreporting of NSIs and inadequate hepatitis B immunization are in line with other South Asian contexts (Bekele et al., 2015; Kessler et al., 2011) [16,21].

The weak but statistically significant relationship ($r = 0.159$, $p < 0.05$) between attitude and perception evaluations is an interesting and complicated discovery. This can be explained by the fact that different underlying variables drive attitudes, which indicate intention and value-based ideas about safety, and perceptions, which represent subjective risk interpretation and reporting behaviour. Even though a student might be in favour of wearing gloves and following standard precautions, they might misjudge the severity of an accidental needle prick or be terrified of the social stigma associated with reporting it (perception). This distinction between attitude and perception has been noted in several occupational health studies, highlighting the need for behavioural interventions to address perceptual social barriers to safe reporting in addition to altering attitudes.

Based on the findings regarding the comparison of different age groups, it became clear that there was no difference between younger and older individuals regarding attitude and perception measures. This may be explained by the fact that a small range of age groups were chosen for the study and had similar levels of involvement in practicing medicine. Other studies conducted with a greater number of

respondents, including interns and senior medical students, reported a lot of differences between perception and attitude levels of respondents based on their experience in the field.

It is evident from the results of correlation analysis that a statistically significant relationship exists between the variables knowledge and attitude, which implies that the more knowledge there is, the more positive attitude towards NSI prevention will exist among healthcare students. This conclusion is based on the evidence provided by the studies carried out by Datar et al. (2022) [4] and Alsabaani et al. (2022) [3], who found that awareness of the risks associated with transmission and the corresponding preventive measures affects positively the adherence to standard precautions. However, since no significant correlation was found between attitude and perception, it is clear that the latter may be influenced by other factors apart from knowledge.

A relationship existed in that the prevalence of NSIs was significantly high in people having inadequate knowledge as compared to those with adequate knowledge. The same relationship could be seen from various studies that have been done in countries like India, Pakistan, and Nepal. According to these findings, a lack of adequate knowledge on the risk of hepatitis B vaccination and non-completion of vaccination were major reasons for NSIs and their under-reporting. There is need for adopting measures like compulsory hepatitis B vaccination, education on handling sharp objects, and reporting of the injuries within the medical colleges.

Conclusion

Needle stick injury continues to pose a significant occupational danger to medical students, particularly during their initial encounters in practical settings. In this investigation, roughly fifty percent of the subjects possessed adequate knowledge about the topic; nevertheless, many were found to have inadequate knowledge on the same, as well as insufficient knowledge regarding the proper procedures for reporting and managing needle stick injuries. Students who possess minimal knowledge are more prone to being injured; therefore, knowledge affects the degree of safety measures adopted. Although no gender difference was observed in relation to knowledge levels among the students, various perspectives emerged, which could affect safety practices. It is imperative that such safety measures are adopted to enhance safety among the students.

Recommendation

In light of the results of the current study, we recommend the following lines of investigation for more research:

1. Longitudinal or prospective cohort studies that track changes in KAP and NSI incidence during all clinical years of MBBS training could establish causal links.
2. Research carried out at several institutions in diverse institutional and geographical settings would improve generalizability outside of a single tertiary care center.
3. Interventional research evaluating the effectiveness of targeted educational seminars, simulation-based training, and structured reporting systems would provide evidence for best practices.
4. Qualitative research investigating the reasons for underreporting, such as institutional barriers, fear of stigma, or ignorance about post-exposure

prophylaxis, would improve the quantitative results of this study.

Limitations

1. Cross-sectional design: The study cannot establish a causal relationship between KAP variables and the incidence of NSI because it only examines a single point in time.
2. Single-institution setting: Because the study was conducted exclusively at ACS Medical College and Hospital in Chennai, its application to other healthcare institutions, regions, and systems is restricted.
3. Self-reported data: Responses are prone to recall bias and social desirability bias because participants may have overreported knowledge or underreported NSI incidents and risky behaviors.
4. Limited study population: Our understanding of how KAP changes during clinical training was limited since only second-year MBBS students were included, making it impossible to compare data across academic years.

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Ethical Approval

Ethics Committee approval received from ACS Medical College and Hospital, Chennai (IEC approval no.: No.110/2025/IEC/ACSMCH dt22.07.2025).

Conflicts of interest

The authors declare that they do not have conflict of interest.

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