Original Article

Knowledge on and Compliance with Standard Precautions among Medical Students in Jharkhand, India: A Cross-Sectional Study

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Abstract

Objective: To assess the knowledge, attitude, and compliance with standard precautions among medical students in a tertiary care hospital in Jharkhand, India.

Methods: A total of 280 medical students, including phase I and phase II MBBS students, participated in the study. Phase I comprised an introduction to standard precautions in four-hour classes while the Phase II comprised of 8 hours of theory and three skill assessments on standard precautions according to the CBME curriculum and pandemic module. A structured validated questionnaire was used to collect data on the student's knowledge, attitude, and practice related to standard precautions. The questionnaire included items assessing various aspects of standard precautions, and scoring criteria were used to evaluate student performance. The overall level of knowledge, attitude, and practice was classified as poor (<50% score), moderate (50–79% score), and good (≥80% score).

Results: Among the phase I students, 32.8% got a good score. In contrast, in the phase II, 56.6% demonstrated good performance in adhering to standard precautions. The median total score was 68 (interquartile range 62–71) of 85, indicating a satisfactory level of understanding and compliance with standard precautions. However, areas such as needing to remove PPE before leaving the patient's environment and not recapping needles showed rooms for improvement.

Conclusion: Students showed good knowledge and compliance with standard precautions. Phase II students demonstrated a better understanding of standard precautions compared to their phase I counterparts. This highlights the positive impact of practical hands-on training as particularly emphasized in the phase II curriculum.

Keywords: Attitude, infection control, knowledge, medical education, medical students, standard precautions

Introduction

Healthcare-acquired infections (HAIs) are not typically present or in incubation at the time of admission. These infections are usually acquired 48 hours after the admission to the hospital.[1]

These infections pose significant morbidity and mortality among hospitalized patients worldwide. On average at any given time, 7% of total hospitalized patients in developed countries and 10% in developing countries acquire at least one HAIs. Death occurs in about 10% of affected patients.[2]

In 1996, the US Centers for Disease Control and Prevention (US CDC) introduced the Standard Precautions guidelines that summarize strategies to prevent infection transmission in healthcare settings. The standard precautions assume blood and body substances of all patients as potential infection sources, regardless the diagnosis or

presumed infectious status. The components of standard precautions include hand hygiene, injection safety, use of personal protective equipment (PPE), environmental cleanliness, waste management, respiratory hygiene, and cough etiquette.[3] All these precautions are also included in the minimum requirements for infection prevention and control programs. However, despite the fact that the Standard Precautions are implemented widely by health organizations, gaps in their implementation have been noted. Studies have revealed that medical students in teaching hospitals also spread infections because they are not aware of these precautions.[4-7]

Currently, early clinical exposure (ECE) and pandemic modules in the Competency-Based Medical Education (CBME) curriculum are being introduced in order to enhance the students' knowledge and practice of standard precautions. In this study, the knowledge and compliance of standard precautions among medical students in a tertiary care hospital, as well as the importance of teaching pandemic modules to students, was studied.

Methods

This was a cross-sectional study done within a period of three months (May to July 2023) in Manipal Tata Medical College. Phase I and Phase II MBBS students of the tertiary care hospital were assessed for their knowledge, attitude, and practice (KAP) of standard precautions, including hand hygiene, injection safety, use of personal protective equipment, respiratory hygiene, and cough etiquette, using a researcher-made, self-administered questionnaire that was developed based on the US CDC and WHO guidelines.[8-10]

The questionnaire was disseminated online through a professional network using Microsoft Teams forms with a single registration for each student. The questionnaire included a knowledge domain with 17 items with yes/no answer options; an attitude domain with 11 items, using a likert scale with five options: "strongly disagree (1)," "disagree (2)," "neutral (3)," "agree (4)," and "strongly agree (5)"; and the practice domain included 13 items with yes/no/not applicable options. The questionnaire was pre-validated by four experts with more than 5 years of experience in medical education. Construct and chances of misinterpretation were taken into account during validation. A disclaimer was given with the questionnaire that the marks of this study would not be disclosed. Filling out the form

would be taken as consent. The participation in the study was voluntary, and a pilot testing was done on ten students to check the comprehensiveness of the questionnaire.

The non-probability sampling technique was applied and all MBBS Phase I and Phase II students were included in this study (n=298). Students who did not submit answers to the questionnaire were excluded. Eventually, 137 students of Phase I and 143 students of Phase II MBBS filled out the complete form, making a sample size of 280. Phase I was introduced to standard precautions in four-hour classes, while Phase II was given approximately eight (8) hours of theory and three skill assessments on standard precautions according to the CBME curriculum and pandemic module.

Ethical clearance was obtained from the institutional ethical committee under the ethical clearance no. MTMC/IEC/2023/03. Data were analyzed using Jamovi 2.3.24, and descriptive analysis results were presented in tables reporting percentages for categorical data and median with interquartile range for continuous data. The overall level of knowledge, attitude, and practice was classified as poor (<50% score), moderate (50–79% correct answers), and good (80–100% score).

Results

A total of 280 medical students participated in this study, which accounted for 94% of the total population of eligible students. Among these respondents, 60% were female and 40% were male, with a median age of 21 years (ranging from 18 to 25 years). In terms of knowledge of standard precautions, 44.6% of the students correctly answered ≥80% of the knowledge statements. Examples of questions and the percentage of students who gave correct answers are shown in Fig. 1 and 2.

In terms of attitude, the majority of students strongly agreed that "hand hygiene should be done before and after patient interventions" (85.3%), "standard precautions are effective in preventing infection spread" (82.5%), and "healthcare providers should keep adequate protective barriers" (86.0%). Nevertheless, only 61.1 % of students strongly agreed that "standard precautions are easy to follow" and few students thought that "PPE should not be used while there are emergencies" (15.7%). Some students strongly agreed that "PPE may harm patients psychologically" (10.3%) and "it is not logical to assume all patients are contagious unless infection is confirmed"
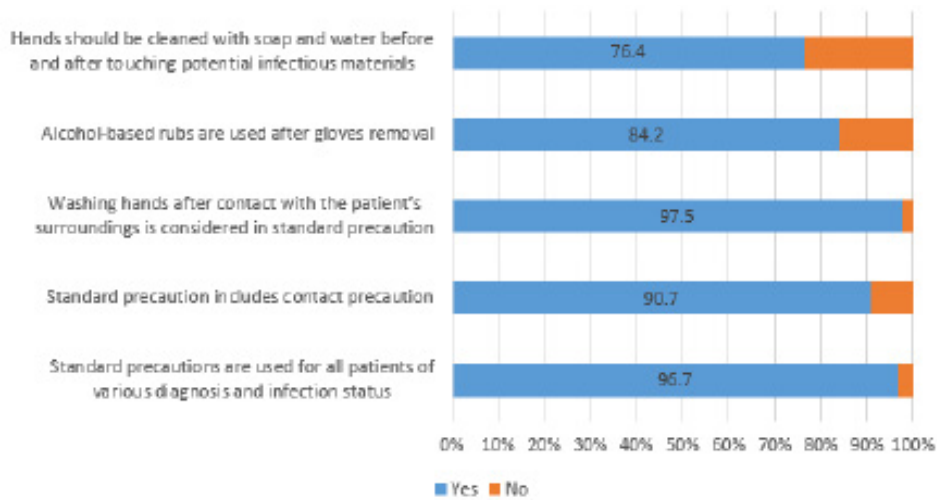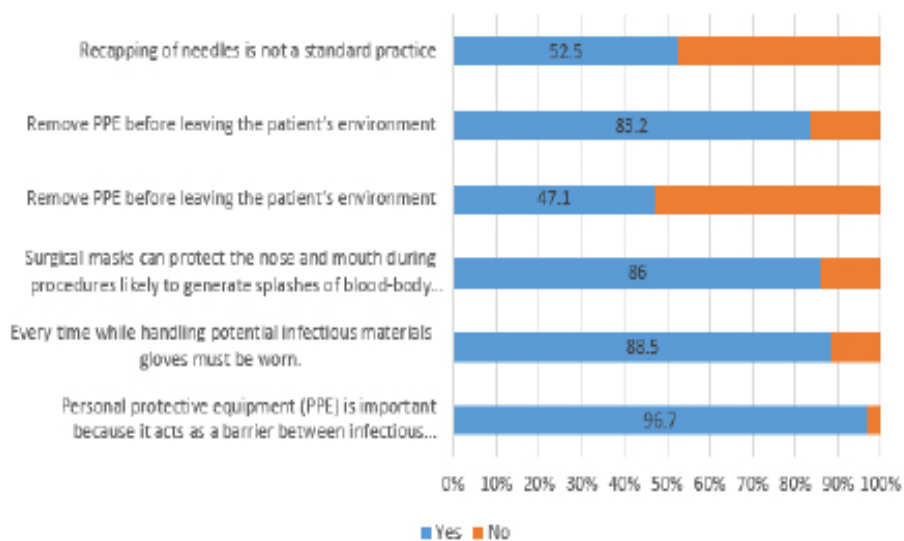
Fig. 1 Example of Questions Related to Hand Hygiene and Percentages of Students' Answers

(27.1%). In practice, approximately half of the students (47%) demonstrated good adherence to standard precautions. Examples of findings in this domain are given in Table 1.

Figure 2 presented the students' practice in implementing standard precautions. The X-axis shows the performance of students and the Y-axis denotes the percentage of students.

Overall, these students showed moderate performance, with 44.6%, 43.9%, and 47% of students achieving a score ≥80% in the knowledge, attitude, and practice sections, respectively. The median total score for students was 68 (interquartile range 62–71) out of 85, indicating good understanding and compliance with standard precautions. A comparison of Phase I and Phase II students is shown in Figure 3.


Fig. 2 Example of Questions Related to PPE and Needle Stick Injury Practices with Percentage of Students' Answers

Table 1 Practice Questions and Their Adherence by Student

Practice Questions	Adherence
I always perform hand hygiene when coming in contact with patients	78.2%
I always wear gloves when touching the patient's mucosa	86.4%
I always wear a mask when I observe any procedures that might lead to the spraying of blood, body fluids, secretions, or excretions	87.1%
Hands should be washed after coughing or sneezing	49.6%
I always wear a single-use surgical mask and discard it after each use	24%
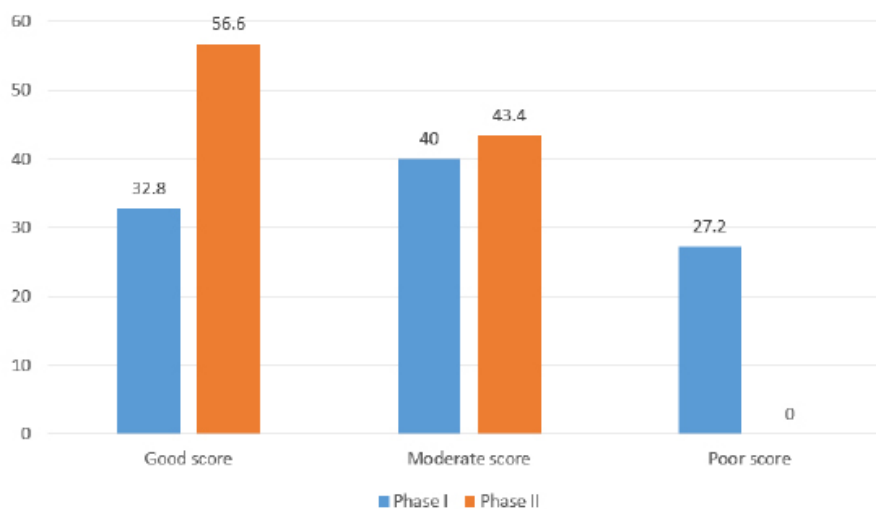
Fig. 3 Comparison of Phase I and Phase II Students

Discussion

This study was conducted among phase I and phase II medical undergraduate students of a private medical college in India. The findings of the study revealed both positive aspects and areas requiring improvement in these future healthcare providers.

In terms of knowledge, the study showed that 44.6% of the students demonstrated good knowledge of standard precautions. This indicates a moderate level of understanding in a significant proportion of the participants. The high scores in areas such as hand hygiene, personal protective equipment (PPE) use, disposal of sharps, and reporting needle stick injuries suggest that these topics are adequately covered in the curriculum or clinical training. However, areas such as the need to remove PPE before leaving the patient's environment and the practice of not recapping needles showed rooms for improvement.

In a study by Ibrahim *et al*., the knowledge of medical students regarding standard isolation precautions is also demonstrated to be very low (48.44%), which is similar to this study.[4] Saati *et al.* showed a good levels of knowledge representing 71.0% of medical undergraduates understanding on infection control measures.[5] In terms of attitude, the majority of students (85.3%) exhibited a positive attitude towards performing hand hygiene, recognizing the effectiveness of standard precautions in preventing infection spread and ensuring adequate protective barriers. This is an encouraging finding as a positive attitude is essential for the consistent implementation of infection prevention practices. However, a considerable number of students have expressed concerns about the difficulty of following standard precautions, questioning the necessity of using PPE in emergencies (15.7%) and suggesting potential psychological harm to patients due to PPE use (10.3%).

In terms of practice, the study showed that

47% of the students exhibited good adherence to standard precautions. This indicates a moderate level of compliance with infection prevention practices among the participants. Consistent hand hygiene, proper glove use, and appropriate mask usage are reported by a significant proportion of students. However, there are rooms for improvement in certain areas, such as washing hands after coughing or sneezing. Emphasizing the importance of proper hand hygiene practices in all situations, including after respiratory events, can help address this gap. In a study by Saati *et al*., 55.7% of medical undergraduates showed good practice levels of standard precautions.[5]

The present study revealed that 100% of phase II and 72.8% of phase I medical students demonstrated good to moderate knowledge of standard precautions. Phase II students demonstrated a better understanding of standard precautions compared to their phase I counterparts. This highlights the positive impact of practical hands-on training, particularly emphasized in the phase II curriculum. A multicentric study would have provided better comparisons. In addition, the self-reported design in this study may introduce bias. Thus, future research could involve direct observation to measure compliance more accurately.

In conclusion, the findings of this study suggest that the inclusion of early clinical exposure and pandemic modules in the Competency-Based Medical Education (CBME) curriculum for medical students has positively influenced students learning on standard precautions in healthcare.

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