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Original Research Article

Knowledge of Future Medical Graduates- Is it Sufficient for Infection Control?

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Abstract

Medical students are inducted into clinical practices at a very early stage of their curriculum, and become very susceptible to get infected and for accidental transfer of infections to the patients, co- workers and the environment. Their awareness regarding Infection Control Practices (ICP) has to be regularly assessed by continued teaching and training programs. The aim was to assess the awareness of undergraduate medical students about infection control practices and measures and re-emphasize the need of continued education on basic infection control practices in the existing undergraduate curriculum**.** A cross-sectional study was conducted on 131 students of second year and third year (part I) MBBS of a Tertiary care teaching Hospital and Medical College. A pretested, predesigned questionnaire was given to the participants during their regular class hours after explaining the purpose of the study. It was designed based on the study objectives, that contained questions regarding general information of biomedical waste (BMW), hand hygiene, standard precautions, infection control practices and modes of acquisition of their knowledge. Amongst 131 students, 53.5% were females and 46.5% were males. The junior batch had a poor knowledge of the BMW responsibility (65.4%), use of masks (40.7%) and protocol for spillage management (32%). The senior batch had a better knowledge on moments of hand hygiene (90%) minimal time for hand hygiene (74%). The knowledge of senior batch on preventable vaccines (68%) and risk of transmission of viruses (76%) compared to junior batch (74% & 85.1% respectively) was poor. Most students acquired knowledge through lectures, tutorials and practical (74%) and suggested it to be continuously included in their curriculum through practical and workshops (65.6%). There was lacunae in knowledge regarding waste segregation, spillage management and use of masks. Continued education is needed through various methodologies. Importance of incorporation of ICP curriculum in undergraduate education should be re-emphasized.

Keywords: Infection Control Practices, Awareness, Continued education.

INTRODUCTION

In today's world of Medical Science, Health care associated infections are undoubtedly one of the most demanding problems that we are facing. Healthcare-associated infections (HAIs) are complications of healthcare and linked with high morbidity and mortality. Healthcare associated infection, also known as "hospital acquired infection" or "nosocomial infection" are the infections occurring in patients after admission at the hospital for some other reason; aninfection that was neither present nor incubating at the time of admission and occurring more than 48 hours after admission [1]. In the Indian scenario, as most of the time it is difficult to make out whether an infection was acquired outside the hospital or inside a specific healthcare set-up this timeline has been justified bythe Hospital Infection Societyof India (HISI) [2]. HAIs leads to a substantial risk on health of patients, on health care workers (HCWs), and medical students. Medical students are inducted into clinical practices at a very early stage of their undergraduate curriculum, thus they are very much susceptible to become infected and also are responsible for accidental transfer of these infections to the patients, to their co-workers and into the environment [3-5]. Therefore, it is important for medical students to have adequate knowledge about infection prevention and control (IPC) practices and to incorporate these at a very early stage of their professional training. The undergraduate medical education is the foundation phase and thus it will be appropriate for imbibing adequate knowledge

and skills regarding ICPs into them at this stage of their medical career [6].

Most of the medical undergraduate courses lack evidence regarding devoted infection control training in the curriculum, which needs to be modified, keeping in view that the medical students are the future physicians and Health care professionals. The present study is being undertaken to evaluate the awareness and approach of undergraduate medical students towards the basic infection control practices, like standard precautions, hand hygiene, use of personal protective equipment and Biomedical waste management, and also to assess their learning approaches that helped them improve their knowledge and practices for the same.

MATERIALS AND METHODS

Study Design

A cross-sectional study was designed and conducted. Participants were 131 students from second year MBBS and third year part I MBBS (2 batches) of a tertiary care Medical college and Hospital in North India. A pretested, predesigned questionnaire was given to the participants during their regular class hours after explaining the purpose of the study. Selection of the participants was done on random basis and identities of participants was unknown. The participants who gave consent were provided with a pre-tested questionnaire. The questionnaire was designed based on the study objectives, taking help from the previous literatures and studies available on the topic. It contained questions regarding general information, handling, disposal and health hazards of biomedical waste, hand hygiene and infection control practices. Questionnaires were collected anonymously after completion from the participants. Responses to the questionnaire were graded and entered into Excel Sheet. The source and preferred mode of learning for the same was also evaluated.

Ethics and Consent

Permission was taken from the institutional ethical committee and informed consent was obtained from the students regarding the objective of the study.

Statistical Analysis

Statistical analysis was carried out using SPSS software version 17.0. Data was presented as percentages and proportions. Chi-square test was applied (wherever needed) when two or more set of variables was compared. The critical value of 'p' indicating the probability of significant difference was taken as <0.05.

RESULTS

A total of 131 students participated in the study, out of which 70(53.43%) were females and 61(46.56%) were male and the male: female ratio was 0.87:1 (Table-1).

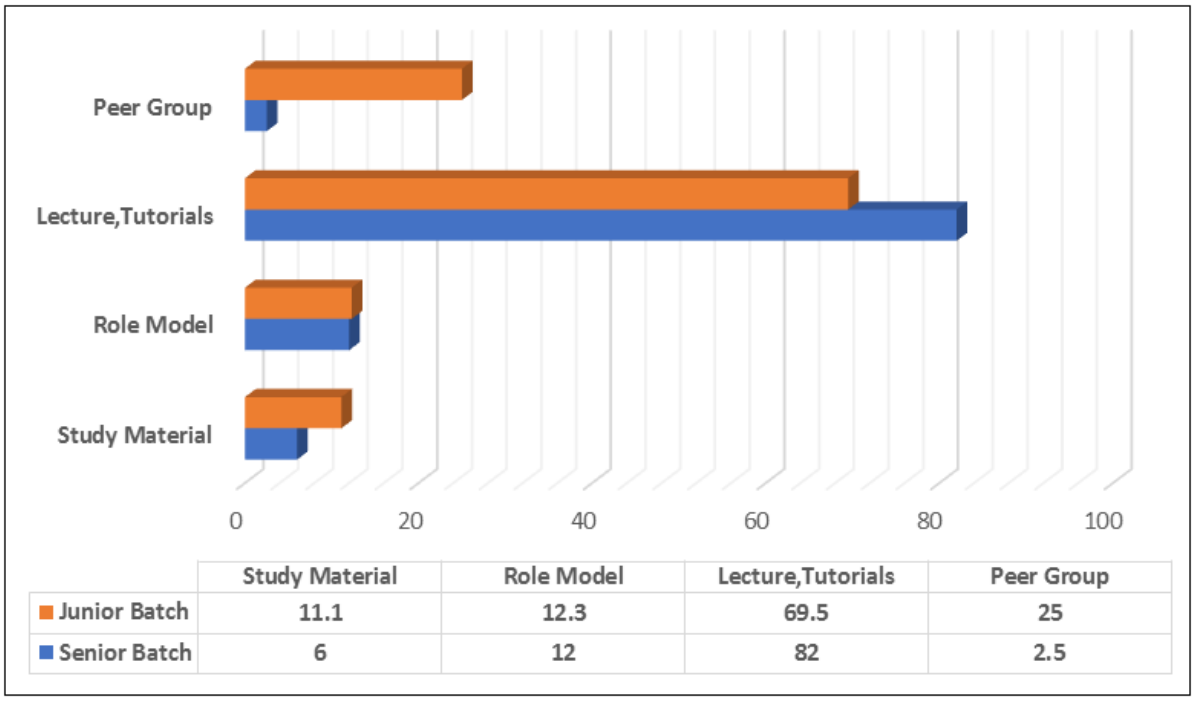
Table-1: Demographic Profile of the study Group (N=131)

Students	Male		Female		Total
	N	%	N	%	
IIndYr	40	65.57%	41	58.57%	81 (61.84%)
IIIrdYr	21	34.43%	29	41.43%	50(38.16%)
Total	61	46.56%	70	53.44%	131

Table-2 shows the comparative knowledge and attitude of the two batches of undergraduate medical students regarding various aspects of infection control practices. The senior batch had a better knowledge of the Biomedical waste management protocols excepting the risk of transmission of infection by Needle stick injury (76% compared to 85.1% of correct response by the junior batch.). Regarding the Hand Hygiene aspects, the senior batch students are more aware of the minimum time required for hand washing (74%) and the "WHO 5 Moments of hand hygiene" (95%). The senior batch had received a proper formal training (96% v/s72.8% p value 0.011) then the junior batch students. The Senior Batch students are better aware of the use of masks in various categories of patients (88% v/s 40.7% p value 0.0) and they were better trained about the spill management protocol (84% v/s 32 % p value 0.0). However, the Junior batch was better aware of the common vaccines required for post exposure prophylaxis. The average knowledge of senior batch on all the aspects of ICP was more compared to the junior batch (BMW 82.6% v/s 77.7%, HH 85.3%v/s 72.4%, SP 80% v/s 48.9%).

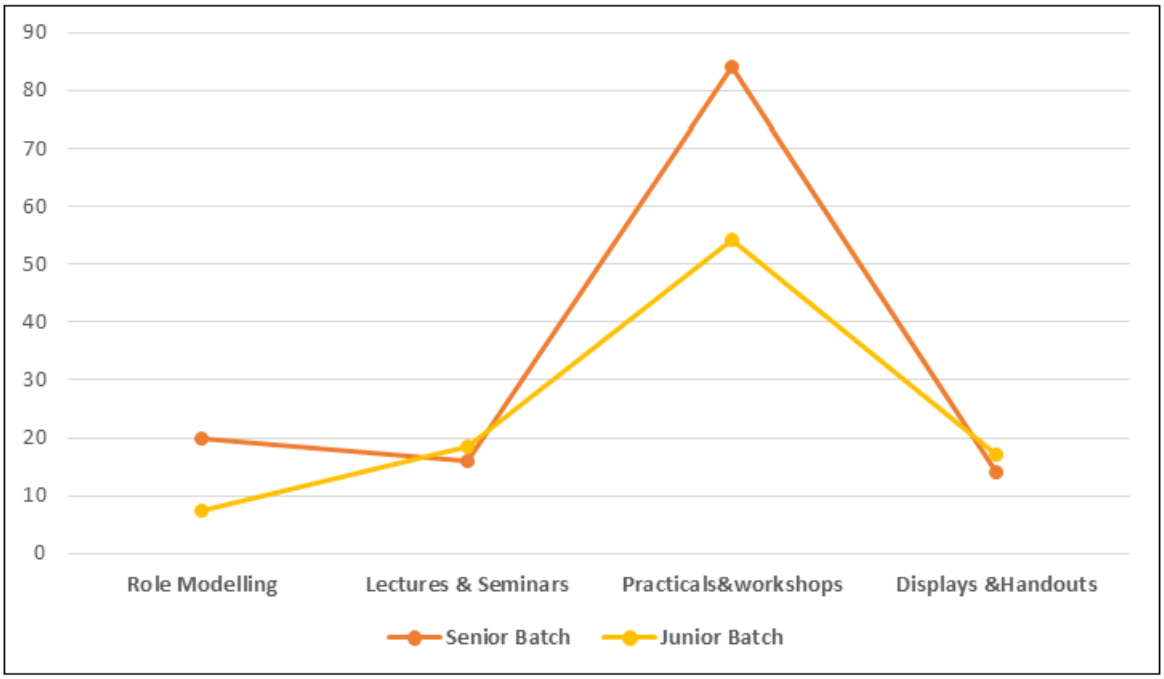
Table-2: Knowledge and Attitude of Medical students towards various aspects of Infection Control Practices (N= 131)

Questions	Positive responses of Senior Batch students	Positive responses of junior batch students	Total	P Value
Biomedical Waste (BMW)				
BMW Management is the responsibility?	44(88%)	53(65.4%)	97(74%)	0.006
Correct identification of BMW symbol	42(84%)	67(82.7%)	109(83.2%)	0.970
Needle stick injury has the highest risk of transmission of which infection	38(76%)	69(85.1%)	107(81.6%)	0.138
Average Knowledge on BMW	41.33 (82.6%)	63(77.7%)		
Hand Hygiene				
Have you received a formal training in hand hygiene?	46 (96%)	59(72.8%)	105(80.1%)	0.011
Are you aware of the '5 moments of hand washing' proposed by WHO?	45(95%)	69(85%)	114(87%)	0.528
The minimal time needed for hand washing with soap and water to kill most germs on your hands?	37(74%)	48(59.2%)	85(64.8%)	0.858
Average knowledge on Hand Hygiene	42.6((85.3%)	58.6(72.4%)		
Standard Precautions				
Are you aware of spill management protocol	42(84%)	26(32%)	68(51.9%)	0.0
Use of Mask	44(88%)	33(40.7%)	77(58.7%)	0.0
Which common vaccines can be used to prevent diseases from exposure to BMW?	34(68%)	60(74%)	94(71.7%)	0.9
Average knowledge on Standard precautions	40(80%)	39.6(48.9%)		



Graph-1: Source of Knowledge and Practices regarding Infection Control Practices (N=131)

Regarding the knowledge of students acquired on various aspects of infection control practices, both the batches have acquired the knowledge mostly through lectures and tutorials (74.04%). The acquisition of information by means of discussion amongst peer group was better in the junior batch (25%) compared to the senior batch (2.5%). A total of 12.2% of students of both the batches have gained the knowledge through direct observation (Graph-1).



Graph-2: Best means of learning as Suggested by Students (N=131)

Students of both the batches had suggested various means of learning. The students were more comfortable with practical and workshops (65.6%). There was mixed response towards Role modelling (12.21%), targeted lectures and seminars (17.5%) and pictorial display and handouts (16%) (Graph-2).

DISCUSSION

Exposure to infectious diseases is one of the most frequently identified occupational hazards facing HCW. Awareness and adequate knowledge are important requirements for all HCWs. In most teaching centers, medical students and trainees are the first level of contact with patients. They are expected to undertake activities related to patient care with the starting of their clinical years [7].

A total of 131 students participated in the study, out of which 70 (53.43%) were females and 61(46.56%) were male and the male: female ratio was 0.87:1.

Knowledge of students on BMW

The average knowledge of senior batch on all the aspects of ICP was more compared to the junior batch (BMW 82.6% v/s 77.7%, HH 85.3%v/s 72.4%, SP 80% v/s 48.9% respectively). The BMW symbol was correctly identified by Senior batch (84%) and Junior batch (82.7%) of students, while 78% of students were correct in identifying the symbol of BMW in a study in Tirupati by Kahn *et al*., [8] and 88% of Final year medical students have responded correctly in a study by Rao *et al.*, [9]. In the current study, 43 (86%) of the senior batch students have answered that BMWs to be segregated at the source, while only 43 (53%) of the junior batch have responded correctly. In a study conducted by Gogia *et al*., [10], 72.9% of the Doctors and 100% of the Nurses have correctly responded that BMW to be segregated at the source. In our study 81.6% of the students have correctly answered the risks of transmission of infection associated with mishandling BMWs, while 95% of the students have correctly responded in the study by Rao *et al*., [9]. In our study 85.1% of the junior batch students are aware of the risks of various disease transmission compared to 76% in senior batch. The junior batch since attending lectures in microbiology have a better knowledge on this, while the senior batch already passed out of microbiology couldn't answer correctly to these questions, which clearly indicates that a continuous teaching process is required at every stage of a MBBS curriculum to keep the knowledge updated.

Knowledge of Students on Hand Hygiene

The senior batch had a better knowledge on all the aspects of Hand Hygiene (HH) as compared the junior batch, like Awareness about '5 moments of HH' (95%v/s 85%) and minimal time required for hand washing with soap and water (74%v/s 59.2%). The total students who received a formal training on hand hygiene were more (96%) as compared to that of junior batch students (72.8%). The Senior batch are more exposed to and aware of clinical practice as they were attending clinical classes while the junior batch attend clinics, but are attending paraclinical theory classes, so they might have ignored the importance of HH and ICPs in clinical practice. Kamble *et al.*, [11] in 2016 in a study to analyze hand hygiene practices in MBBS students found that 38.1% students knew that the minimal time needed for alcohol-based hand rub to kill most germs on hands was 20 seconds. These results

were similar to a study by Nair *et al*., [12] (38.3%). However, our students were better aware of the minimal time of HH.

Knowledge on Standard Precautions

Overall the knowledge was 80% and 48.9% in senior batch and junior batch students respectively. The senior batch were better aware of the spill management protocol and various conditions in which use of masks is recommended (84%& 88%respectively). However, the junior batch students are better aware of the common vaccines for post exposure prophylaxis (74% v/s 68%). In a study by Kotwal *et al*., [13], the compliance of the doctors and nurses on the use of masks was 60% and 48% respectively. While, the knowledge of students regarding standard isolation precautions was very low (48.44%) in a study by Ibrahim *et al*., [14]. Our students are better aware of the respiratory etiquettes. Kotwal *et al*., [13], in their study had found that the compliance of the doctors and nurses on the spill management was 40% and 74% respectively. In the current study, senior batch students were better aware of how to manage spillage as compared to their juniors, as they were more involved in active clinical practices. The junior students had a better idea of the common vaccines that can be used to prevent disease on exposure to BMW (74%) compared to the senior batch (68%). Bharadwaj *et al*., [15] in their study found that 92.7%, 94.5% and 54.5% of the medical students were aware of the diseases due to BMW exposure.In a similar study among medical students at Vizianagaram [16], it was found that 78.87% and 58.91% of students responded for HIV and Hep-B respectively. While in another study from Tirupati 92.9% and 95.3% of students responded for HIV and Hep-B respectively as the infection transmitted by improper handling of BMW and a PEP is recommended on its exposure [8]. The junior students were better aware than the senior batch as they were undergoing theory lectures in microbiology so they were updated theoretically, while, the senior batch who were pass out, lack the theoretical aspect of infectious diseases. It clearly indicates that a continued theoretical as well as practical training is essential in the MBBS curriculum related to infection control practices.

Source of acquisition of knowledge and practices regarding infection control measures and the recommended modes of training by the students on ICPs

Students of both the batches have acquired the knowledge mostly through lectures and tutorials (74.04%). The acquisition of information by means of discussion amongst peer group was better in the junior batch (25%) compared to the senior batch (2.5%). A total of 12.2% of students of both the batches have gained the knowledge through direct observation, while, study materials were not found to be very useful by the students (Junior v/s senior, 11.1% v/s 6%). Students of both the batches had suggested various means of learning. The students were more comfortable with practical and workshops (65.6%). There was mixed response towards Role modelling (12.21%), targeted lectures and seminars (17.5%) and pictorial display and handouts (16%).

There are numerous means and sources of information, teaching and training of medical students. The evidence for the best means of teaching and learning for medical students remains conflicting. The effect of different teaching modalities in various studies as reported by students was not very clear [17]. In a study by Calabro *et al*., [18] it was found that one-time infection control educational intervention provided to the medical students was not adequate to teach themabout infection control practices and safety techniques. A study in the People's Republic of China demonstrated that a single intervention program had no effect on knowledge [19]. Increasing the emphasis on IPCs in the undergraduate curriculum by continued education and assessment, particularly in the clinical settings, and by peers, seniors and teachers acting as role models, may improve students' knowledge and attitude and may facilitate a patient safety culture amongst the medical students, thereby affecting Health care associated infections acquisition rates and thus improving patient's clinical outcome.

Limitation of the Study

The obvious limitation of our study was that it was conducted with students of two MBBS batches. A cross-sectional study including all batches would have given a better picture. The compliance with the infection control practices was measured based on their written responses. A more effective way of measuring compliance would have been to monitor them through observational studies for a better validation.

CONCLUSION

The gap between the theoretical & practical knowledge needs to be filled with continuing education by various modalities which is essential at every stage of medical education. Besides lectures and tutorials, learning by direct observation or role modelling is to be emphasized with more of practical and workshops on ICP. Scenario-based learning, assessment, both summative and formative, are all suggested examples of effective methods of teaching IPC practices. Now that the MBBS curriculum is at a threshold of paradigm change, it is the need of the hour to incorporate the important aspects of ICPs in undergraduate teaching program.

Conflict of interest

There is no conflict of interest

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