

Original Research Article

Effect of training in infection prevention and control on knowledge of healthcare professionals in a medical college, Kerala

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ABSTRACT

Background: 1 in 10 patients die from healthcare-associated infections (HAIs). Infection prevention and control (IPC) aims to prevent infections, including those from antimicrobial-resistant pathogens, to improve patient and worker safety. Though training is essential for effective IPC program according to WHO guidelines, training is often limited, especially in low-resource settings. This study aims to assess the effect of IPC training on healthcare professionals' knowledge at a medical college in Kerala.

Methods: A quasi-experimental pretest/post-test study among 339 healthcare students at Government Medical College, Thiruvananthapuram (November to December 2023), evaluated IPC training on standard precautions, sterilization, infection prevention, and needle-stick injury management. Knowledge improvement was assessed through a 25-question pre and post-test, with scores categorized as excellent (>90), good (80-90), average (70-80), and poor (<70). Change in knowledge was analysed using paired t-test.

Results: Majority participants were in poor (38.1%) and average categories (46.3%) in pretest while in post-test, majority participants were in good (34.5%) and excellent categories (40.1%) indicating an improvement in knowledge after the training. Statistically significant improvement in scores was observed in the total score of pretest and post-test as well as the individual topic wise scores.

Conclusions: The training led to significant improvements in infection prevention and control knowledge among healthcare professionals, highlighting the need for mandatory orientation and regular refresher trainings. To prepare for pandemics, prevent nosocomial infections, and combat antimicrobial resistance, hospitals should prioritize capacity building through ongoing training.

Keywords: Infection prevention and control, Training, Pretest/post-test study

INTRODUCTION

Out of every 100 patients in acute-care hospitals, seven patients in high-income countries and 15 patients in low- and middle-income countries will acquire at least one health care-associated infection (HAI) during their hospital stay. On average, 1 in every 10 affected patients will die from their HAI.¹

IPC is a clinical and public health specialty based on a practical, evidence-based approach which prevents patients, health workers, and visitors to health care facilities from being harmed by avoidable infections, including those caused by antimicrobial-resistant pathogens, acquired during the provision of health care services.¹ It occupies a unique position in the field of patient and health workers' safety and quality of care, as

it is universally relevant to every health worker and patient, at every health care interaction. Strong, effective IPC programmes have the ability to influence the quality of care, improve patient safety and protect all those providing care in the health system.²

Infection prevention and control is a cornerstone in delivering quality health care delivery, safeguarding against the spread of infectious diseases within the health care facility. For an IPC programme, WHO recommends six core components of which education and training is one.³ A comprehensive education strategy for health facilities should include IPC training and education, as well as new hire orientation and opportunities for ongoing professional development for all current employees, regardless of rank or level as per the recommendations.⁴

Inadequate IPC training and the need to focus on enhancing opportunities for education and training appears to be a recurring theme amongst the studies that have measured the levels of knowledge and preparedness regarding COVID-19 infection control among HCWs in low-resource settings.⁵ There are no published studies assessing the basic knowledge of the health professionals on basics of infection prevention and control and the change in knowledge after a training on the same. The objective of the study is to find out the effect of training in infection prevention and control on knowledge of healthcare professionals in a medical college of Kerala.

METHODS

Quasi experimental pretest/post-test study design conducted from November 2023- December 2023. Health care professional students of all the departments in Government Medical College, Thiruvananthapuram.

Sample size was calculated by the formula $n = (((\alpha + z\beta))^2 \times [SD]^2) / d^2$ where SD was taken as 10.05 according to the study done by Tchorz et.al in Bangalore (Mean score before and after study were 70.7 ± 11.2 and 87.5 ± 8.9) 6 and d as 1.6, non-response rate and drop-out rate as 5%, sample size was rounded to 325. The total no. of participants included in the study was 339 selected by convenient sampling.

Inclusion criteria

All health care professional students who were willing to give consent for the research and attend the training session.

Exclusion criteria

Health care professional students who have attended any specific training on infection prevention and control in last 1 year.

Study procedure

Training sessions included topics on standard precautions, sterilization and disinfection of instruments, prevention of hospital acquired infections and needle stick injury management. Pre-test questionnaire consisting of 25 questions on the above-mentioned topics was provided before the training and post test was conducted after the session.

Ethical approval

The research was conducted after the approval of Institutional Ethics Committee. Written informed consent was obtained from the participants. Confidentiality and anonymity of the participants were preserved.

Statistical analysis

Data was entered in MS Excel and analyzed using PASW'27. The total score was converted into 100 and scores above 90 -excellent, 80- 90- good, 70-80- average and <70- poor. Change in individual scores was analyzed and categorized. Paired t test was done to analyse the change in knowledge after training.

RESULTS

67% of the study participants were females as represented in the Figure 1. Health care professionals included interns, postgraduates, super specialty residents as well as nursing and paramedical students among which majority of the participants were post graduate students (Table 1).

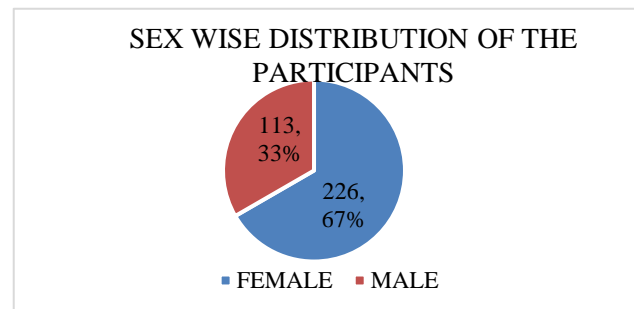


Figure 1: Distribution of the participants based on their sex (n=339).

Table 1: Distribution of participants based on their designation (n=339).

Designation	Frequency	Percentage
House surgeon	9	2.7
Nursing student	35	10.3
Paramedical student	21	6.2
Medical/surgical post graduate	240	70.8
Medical/Surgical Super speciality resident	34	10.0

The knowledge was assessed using pretest and post-test questionnaires and scores were categorized among which majority were having poor or average knowledge in pretest while good and excellent knowledge categories were majority in post-test (Table 2).

Table 2: Distribution of participants according to the categories of knowledge in pretest and post-test (n=339).

Categories	Pre-test, N (%)	Post test, N (%)
Poor	129 (38.1)	18 (5.3)
Average	157 (46.3)	68 (20.1)
Good	39 (11.5)	117 (34.5)
Excellent	14 (4.1)	136 (40.1)

Mean score of pretest and post-test as well as individual topic scores were analyzed as depicted in Table 3. The total score in pretest was 71.50±11.787 which improved in post-test to 86.80±9.219.

To assess the effect of training, change in knowledge was analyzed using paired t-test as given in Table no.4. Statistically significant improvement in scores was

observed in the total score of pretest and post-test as well as the individual topic wise scores.

Table 3: Mean scores obtained in total and the topic wise scores.

Variables	Pretest Mean ±SD	Post test Mean ±SD
Total score (0-100)*	71.50±11.787	86.80±9.219
Standard precautions (0-5)	3.67±1.004	4.39±0.793
Hand hygiene (0-4)	2.63±0.924	3.61±0.607
Biomedical waste management (0-1)	0.91±0.284	0.96±0.199
Hospital acquired infections (0-5)	3.51±1.100	4.21±0.866
Safe injection practices (0-4)	3.09±0.859	3.87±0.393
Personal protective equipment (0-4)	3.19±0.770	3.40±0.740
Sterilisation and disinfection (0-2)	0.87±0.686	1.27±0.711

*Total score is the sum of individual scores which is then converted into 100.

Table 4: Assessment of change in knowledge after the training (using paired t-test).

Pretest and post test	Mean difference	Standard deviation	P value
Total scores	-15.292	12.175	<0.001*
Standard precautions	-0.714	1.135	<0.001*
Hand hygiene	-0.976	1.006	<0.001*
Biomedical waste management	-0.047	0.294	0.003*
Hospital acquired infections	-0.696	1.196	<0.001*
Safe injection practices	-0.782	0.870	<0.001*
Personal protective equipment	-0.204	0.931	<0.001*
Sterilisation and disinfection	-0.404	0.802	<0.001*

*p value <0.05 is considered statistically significant

DISCUSSION

In our study, the baseline assessment of knowledge of health care professionals revealed that majority had only poor and average knowledge on the basics of infection prevention and control which is different than the study conducted by Shrestha et.al where they found out the overall knowledge of their participants was fair. Assefa et al in their study in Ethiopia also noted that majority of their health care providers had adequate knowledge on infection control which is different than our findings.⁷ In our study lower scores in pretest were noted in hand hygiene and sterilization and disinfection domains while notable poor knowledge was noted in waste management among the participants of Shrestha et al study.⁸ Salu S et al in their study found a similar finding to our study that most of the participants (69.2%) were not knowledgeable about the preventive measures of NCIs.⁹ Relatively high

knowledge was noted in other domains like standard precautions, personal protective measures, waste management, safe injection practices and hospital acquired infections in pretest in our study. A study on medical students of Karnataka also found that the knowledge of standard precautions was high among their participants similar to our finding.¹⁰

In this study, it was observed that with training, there is a significant improvement in knowledge of all health care professionals. While only 4% had excellent knowledge in pretest, it improved to 40.1% after the training which is similar to the study done by Ousman et.al in the context of Ebola.¹¹ A similar statistically significant increase in knowledge from the baseline value was observed after the training in the Savul et al study and also in a multi country study on infection prevention and control.^{12,13}

A significant improvement was noted in the knowledge in all the domains of infection prevention and control among all the health workers in our study which not only implies the effectiveness of training but emphasizes the need of training for all set of professionals. As per the recommendations of WHO in their publication, education and training is one of the components of infection control program.³ Different studies have recommended the need of training for all the health care workers during the context of COVID-19 similar to our finding.^{14,15} Inclusion of training program can help decrease the risk of infections amongst HCWs was mentioned in study done by Moore et al also.¹⁶ Thazha SK et al also noted that the awareness of IPC among HCPs who reported receiving information from their hospitals via trainings was better than that among HCPs who obtained their IPC information from guidelines, books, articles ($p=0.005$), and other sources ($p<0.001$).¹⁷

Strength and limitations of the study

This study assesses the basic knowledge health care professionals had and shows the effect of training in improving the same thereby improving the whole health care delivery by preventing nosocomial infections and reducing incidence of antimicrobial resistance cases. However, a follow up on the practices of infection prevention and control by the training participants needed to be done which could not be covered in this study.

CONCLUSION

There was a significant improvement in knowledge in infection prevention and control practices after the training among all the health care professionals who attended the training. This shows the need of compulsory orientation trainings and periodical refresher trainings to all the health care workers. As a part of preparedness to any pandemic emergencies, prevention of nosocomial infections as well as reduction in antimicrobial resistance, every hospital shall take the responsibility of capacity building through trainings.

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REFERENCES

1. World Health Organisation. Global report on infection prevention and control. Geneva; 2022.
2. World Health Organisation. Minimum requirements for infection prevention and control programmes; 2019:1-55.
3. Organization WH. Interim practical manual: supporting national implementation of the WHO guidelines on core components of infection prevention and control programmes [Internet]. World Health Organization; 2017. Available at: <https://apps.who.int/iris/bitstream/handle/10665/330073/WHO-HIS-SDS-2017.8-eng.pdf>. Accessed on 23 November 2023.
4. World Health Organisation. Improving infection prevention and control at the health facility: Interim practical manual supporting implementation of the WHO Guidelines on Core Components of Infection Prevention and Control Programmes. Geneva; 2018.
5. Qureshi M, Chughtai A, Seale H. Supporting the Delivery of Infection Prevention and Control Training to Healthcare Workers: Insights from the Sector. *Healthcare*. 2022;10(5):936.
6. Tchorz KM, Thomas N, Jesudassan S, Kumar R, Chinnadurai R, Thomas A, et al. Teaching trauma care in India: an educational pilot study from Bangalore. *J Surg Res*. 2007;142(2):373–7.
7. Assefa J, Alen GD, Adane S. Infection prevention knowledge, practice, and its associated factors among healthcare providers in primary healthcare unit of Wogdie District, Northeast Ethiopia, 2019: a cross-sectional study. *Antimicrob Resist Infect Control*. 2020;9(1):136.
8. Shrestha S, Cho Y, Bhujju C, Cha K, Chung M, Pun KD. Knowledge, Perception and Confidence in Performance on Infection Prevention and Control Measures among the Nursing Students. *Kathmandu Univ Med J KUMJ*. 2023;21(84):383–8.
9. Salu S, Okyere J, Charles-Unadike VO, Ananga MK. Nurses' knowledge on nosocomial infections preventive measures and its associated factors in Ghana: a cross-sectional study. *BMC Health Serv Res*. 2023;23(1):941.
10. Kulkarni V, Papanna MK, Mohanty U, Ranjan R, Neelima V, Kumar N, et al. Awareness of medical students in a medical college in Mangalore, Karnataka, India concerning infection prevention practices. *J Infect Public Health*. 2013;6(4):261–8.
11. Ousman K, Kabego L, Talisuna A, Diaz J, Mbuyi J, Houndjo B, et al. The impact of Infection Prevention and control (IPC) bundle implementation on IPC compliance during the Ebola virus outbreak in Mbandaka/Democratic Republic of the Congo: a before and after design. *BMJ Open*. 2019;9(9):e029717.
12. Savul S, Ikram A, Khan MA, Khan MA. Evaluation of Infection Prevention and Control training workshops using Kirkpatrick's model. *Int J Infect Dis*. 2021;112:76–80.

13. E T, C F, S MR, H MV, I FM, MI RN, et al. Train-the-Trainers in hand hygiene: a standardized approach to guide education in infection prevention and control. *Antimicrob Resist Infect Control* [Internet]. 2019;8(1). Available at: <https://pubmed.ncbi.nlm.nih.gov/32005230/>. Accessed on 23 November 2023.
14. Saqlain M, Munir MM, Rehman SU, Gulzar A, Naz S, Ahmed Z, et al. Knowledge, attitude, practice and perceived barriers among healthcare workers regarding COVID-19: a cross-sectional survey from Pakistan. *J Hosp Infect*. 2020;105(3):419–23.
15. Elhadi M, Msherghi A, Alkeelani M, Zorgani A, Zaid A, Alsuyihili A, et al. Assessment of Healthcare Workers' Levels of Preparedness and Awareness Regarding COVID-19 Infection in Low-Resource Settings. *Am J Trop Med Hyg*. 2020;103(2):828.
16. Moore D, Gamage B, Bryce E, Copes R, Yassi A, other members of The BC Interdisciplinary Respiratory Protection Study Group. Protecting health care workers from SARS and other respiratory pathogens: Organizational and individual factors that affect adherence to infection control guidelines. *Am J Infect Control*. 2005;33(2):88–96.
17. Thazha SK, Cruz JP, Alquwez N, Scaria B, Rengan SS, Almazan JU. Infection prevention and control awareness, attitudes, and practices among healthcare professionals in South India. *J Infect Dev Ctries*. 2022;16(4):659–67.

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