

## ASSESSMENT OF KNOWLEDGE, ATTITUDES, AND PRACTICES IN INFECTION PREVENTION AND CONTROL AMONG HEALTH-CARE WORKERS AT THE GOVERNMENT TEACHING HOSPITAL, VISAKHAPATNAM

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### ABSTRACT

**Objectives:** The purpose of this questionnaire-based study is to assess frontline healthcare professionals' knowledge and awareness of infection prevention and control policies and procedures.

**Methods:** This is a cross-sectional study in which the knowledge and practices of the study group (Doctors, Nurses, and Laboratory Technicians) were assessed using an electronic Google form questionnaire. Data were collected and statistically analyzed.

**Results:** There were 67 doctors, 18 laboratory technicians, and 35 nurses among the 120 responses analyzed. The majority of respondents (67%) were females and majority (50%) were between the ages of 21 and 30 years, with a mean age of 28. Among the respondents, 67% participated in training programs and 28% completed a certified course in infection prevention control. The majority (95%) were aware of all the standard precautions. Knowledge levels on hand washing, respiratory hygiene, and biomedical waste management were 85%, 77%, and 62% respectively. In comparison to knowledge, their attitudes toward infection control were lower (81%). In this study, only 70% of participants followed WHO guidelines for hand washing. More than 74% are familiar with the single-handed scoop technique for recapping needles. Only 50% know correct sequence of donning and doffing of PPE.

**Conclusion:** The study participants have gaps in their knowledge and application of infection control. It would be beneficial for all HCW to receive formal and refresher training periodically.

**Keywords:** Healthcare workers, Infection control, Knowledge, attitude, practice, Hand hygiene, Biomedical waste management.

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### INTRODUCTION

Healthcare-associated infections (HAIs) were defined as those that develop during hospitalization but are neither present nor incubating upon the patient's admission to the hospital; generally for those infections that occur more than 48–72 h after admission. Healthcare-associated infections commonly called as nosocomial infection is a major public health concern and leads to the prolonged hospital stay, long-term disability, and even deaths [1,2]. Hospital-acquired infection preventions are a method of creating a barrier between the susceptible host and the microorganism and are an important part of providing safe and high-quality care at the facility level. Infection prevention strategies such as establishing a representative infection control committee, excellent practice and safe procedures in proper waste disposal, adequate sanitation, safety radiation, and occupational protection can help to avoid HAI-related morbidity and mortality [3]. Hospital-acquired infection preventions are a guideline containing a multitude of protocols such as adherence to standard precautions, which are needed to be implemented by HCWs, thus greatly reducing the magnitude of HAIs. Several factors such as poor awareness among HCWs and compliance associated with personal, logistical, and organizational barriers exert their own effect on the proper application of these protocols. Knowledge and adherence to infection control guidelines are critical for reducing their risk of HAIs [1,4]. Adherence to these guidelines can be influenced by a variety of factors, including educational level, laboratory safety training, and years of experience. Effective infection prevention and control in healthcare institutions are dependent on the awareness and compliance of health-care workers (HCWs) at all levels of the

organization. There is a scarcity of research on health-care workers knowledge and practices. As a result, more research into the impact of health-care workers knowledge and practices on infection control is needed. The goal of this questionnaire-based study is to assess the need for strategic implementation of infection control practices by evaluating awareness of infection prevention and control policies and procedures among frontline healthcare professionals. The aim of this study is to assess infection control knowledge and practices among HCWs at a Tertiary care institution to improve on what is currently available.

### METHODS

#### Study design

This is an institution-based cross-sectional research conducted to assess the knowledge, attitudes, and practice of healthcare workers towards infection prevention and control at King George Hospital, a renowned Government teaching hospital in Visakhapatnam from January 2022 to April 2022.

#### Sample size and study population

The study comprised a total of 100 healthcare personnel who completed the survey questionnaire. The study population was selected by a simple random sampling technique.

#### Inclusion criteria

The categories of health-care workers included in the present study were doctors, nurses, and laboratory technicians working at King George Hospital.

### Exclusion criteria

The health-care workers unable to fill the Google form were excluded from the study.

### Data collection procedure and validity

A Google form with a self-administered and self-validated questionnaire was prepared to collect data from research participants. The questionnaire had all the study goals and was prepared in English. The survey content involved several necessary elements, including the CDC and WHO guidelines, on infection prevention and control. The questionnaire was divided into the following sections – Informed consent, socio-demographic factors including age, gender, category of healthcare worker, place of working, Infection control training, knowledge component, attitude component, and practice component [2].

### Operational definitions

- Knowledge refers to healthcare professionals' clear awareness and understanding of infection prevention activities when caring for patients [1].
- Attitude refers to a health-care worker's personal perspective on infection prevention measures when caring for patients [1].
- Practice refers to a health-care worker's ability to do infection prevention measures while caring for patients [1].

The scoring system for knowledge, attitudes, and practices regarding infection control measures was according to the scales [2]:

- Good knowledge and practice: earning a score of 75% and above
- Moderate knowledge and practice: earning a score of 50–75%
- Poor knowledge and practice: earning a score below 50%
- Positive attitude: study participants who responded 50% and above
- Negative attitude: study participants who responded below 50%

### Scoring definitions

- Respondents were classified as knowledgeable (if the respondent scored greater than or equal to the mean score of the correctly answered questions for the whole respondents) or not knowledgeable (if a respondent scored less than the mean score of the correctly answered questions for the whole respondents).
- Attitude levels were classified as a good attitude (if participants scored greater than or equal to the mean score of the correctly answered questions for the whole participants) or poor attitude (if a participant scored less than the mean score of the correctly answered questions for the whole participants).
- A good practice was defined as a score greater than or equal to the mean of the correctly answered questions for the entire group. A bad practice (if a participant's score was lower than the mean score of correctly answered questions for all participants).

### Statistical analysis

One-point was given to a correct answer while 0 was given to an incorrect answer. The responses were recorded in Microsoft Excel software and scores were analyzed according to the scoring system.

### Ethical considerations

The study protocol was approved by the Institutional Ethics Review Committee. An official letter of approval was taken from the Ethics Committee and attached to the study. Data were collected after taking consent from the study participants, electronically through Google Forms and they were informed about the objectives of the study, procedures, and benefits of the study.

## RESULTS

### Sociodemographic parameters and infection control training

A Google form questionnaire was sent to 155 participants, and 120 of them responded, yielding a response rate of 77.4%. Out of 120 responses, 18 were laboratory technicians, 35 were nurses, and 67 were doctors. The majority of responders (50%) were in the 21–30 age range; with a mean age of 28. The majority of responders were females (67%). Among the study participants, 51 were from Medical departments (AMCU, CTICU, Paediatrics ward, GM ward, Casualty, and CSR Block), 32 from surgical departments (OT, OBG ward, Ortho ward, Surgical ward), and 37 from laboratories (Virology laboratory, central laboratory). Among the 120 respondents, 80 (67%) attended infection control training programs and 34 (28%) completed certification courses. Among the respondents, 84 (70%) members participated in continuous education programs such as workshops and conferences (Table 1).

### Assessment of knowledge on infection prevention and control

All the questions were positively worded with a "True" response representing the correct answer and a "False" response representing the incorrect answer. Respondents were classified as knowledgeable when they score greater than or equal to the mean of the correctly answered questions for the entire group and non-knowledgeable if a participant's score was lower than the mean score of correctly answered questions for all participants. Of all respondents, 102 (85%) reported as knowledgeable, while 18 (15%) reported as non-knowledgeable with regard to infection prevention and control. The majority (>95%) were aware of the risk of nosocomial infections and standard precautions. Knowledge levels on hand washing, respiratory hygiene, and biomedical waste management were 85%, 77%, and 62%, respectively (Table 2).

### Assessment of attitudes on infection prevention and control

The attitude section of the questionnaire was designed to provide a score of 1 and 0 for the correct and incorrect responses, respectively. A good attitude was defined as a score greater than or equal to the mean of the correctly answered questions for the entire group. A bad attitude (if a participant's score was lower than the mean score of correctly answered questions for all participants). Of all respondents, 88 (73%) reported a positive attitude, while 32 (27%) reported a negative attitude. Almost 75% of the participants agreed that hand hygiene in between the patient care is necessary to prevent HAIs and 62% have the habit of cleaning and disinfection of equipment and surfaces after use. More than 87% have the habit of changing new pair of gloves for each new patient visiting the hospital. All 100% agreed that eating and drinking should be allowed in non-patient care areas only (Table 3).

**Table 1: Demographic and infection control training details of the respondents**

Variables	Doctors	Nurses	Laboratory technicians	Total (n=120), n (%)
Total number of participants	67	35	18	120 (100)
Gender (females)	45	23	12	80 (67)
Gender (male)	22	12	6	40 (33)
Maximum participants average age (21–30 years)	34	18	8	60 (50)
Medical departments	31	20	0	51 (42)
Surgical departments	17	15	0	32 (27)
Laboratories	19	0	18	37 (31)
Completion of infection control training	50	20	10	80 (67)
Completion of infection control certification course	23	11	0	34 (28)
Participation in continuous education programmes like workshops and conferences	58	20	7	85 (71)

**Table 2: Respondent's knowledge with regard to infection control measures (only correct responses are shown in the table)**

Variables	Correct response (n=120), n (%)	Incorrect response (n=120), n (%)
1. Advanced age and very young age increases the risk of nosocomial infections (true)	114 (95)	6 (5)
2. Standard precautions includes the recommendations to protect all the patients and the healthcare workers (true)	118 (98)	2 (2)
3. Infection control standard precautions must be applied to all patients at all times regardless of diagnosis (true)	112 (93)	8 (7)
4. Hand washing with soap and water should be done when your hands are visibly soiled (true)	102 (85)	18 (15)
5. Correct practice of respiratory hygiene is to wipe your hands to your coat after your cough/sneeze (false)	92 (77)	28 (23)
6. Used PPE are discarded in general waste bins (false)	74 (62)	46 (28)

**Table 3: Respondent's attitudes toward infection control measures (only correct responses are shown in the table)**

Variables	Correct response (n=120), n (%)	Incorrect response (n=120), n (%)
1. Habit of hand hygiene in between the patient care is necessary for infection control (agree)	90 (75)	30 (25)
2. Cleaning and disinfection of equipment and surfaces shall be performed after every patient use (agree)	74 (62)	46 (38)
3. Eating and drinking allowed in nonpatient care areas only (agree)	120 (100)	Nil
4. If there is no sign on a patient's door or chart indicating the patient is on additional precautions, and then PPE is never required when providing care (disagree)	90 (75)	30 (25)
5. New pair of gloves should be used for each new patient visiting the hospital (agree)	104 (87)	16 (13)
6. You can handle body fluids with bare hands if gloves are not available (disagree)	102 (85)	18 (15)

**Assessment of practices on infection prevention and control**

The practices section of the questionnaire was designed to provide a score of 1 and 0 for the correct and incorrect responses, respectively. A good practice was defined as a score greater than or equal to the mean of the correctly answered questions for the entire group. A bad practice (if a participant's score was lower than the mean score of correctly answered questions for all participants). Of all respondents, 84 (70%) followed the correct practice of IPC, while 36 (30%) were unaware of the correct practice of IPC. Among the study participants, almost 76% of them followed WHO guidelines for hand washing and almost 74% are familiar with the single-handed scoop technique for recapping needles. Only 50% know correct sequence of donning and doffing of PPE and 88% know the practice of sharp waste disposal (Table 4).

**Table 4: Respondent's practices with regard to infection control measures (only correct responses are shown in the table)**

Variables	Correct response (n=120), n (%)	Incorrect response (n=120), n (%)
1. Duration of hand washing is (correct practice-40-60 s)	82 (68)	38 (28)
2. Correct order of hand hygiene practice (correct practice: Wet-soap-rub-wash-dry)	102 (85)	18 (15)
3. In situation where recapping is necessary, the correct method to be followed is (correct practice: Single handed scoop method)	89 (74)	31 (26)
4. Correct sequence of donning practice of PPE is (correct practice: Hand hygiene-gown-mask-eye wear-gloves)	62 (52)	58 (48)
5. Correct sequence of doffing practice of PPE is (correct practice: Gloves-gown-eye wear-Mask-hand hygiene)	58 (48)	62 (52)
6. Sharp materials are discarded in (correct practice: White bin containing 1% hypochlorite)	106 (88)	14 (12)

**DISCUSSION**

A Google form questionnaire was sent to 155 participants, and 120 of them responded, yielding a response rate of 77.4%. All the study participants were divided into three groups. Specifically, doctors, nurses, and laboratory technicians. Among the 120 responses analyzed were 67 doctors, 18 laboratory technicians, and 35 nurses. Interns were the most numerous participants among the doctors (33 [49%]). The majority of respondents (67%) were females and this was consistent with the findings of Najod (69.8%) [2], Fashafsheh *et al.* (56.1%) [4], Almohammed *et al.* (53.7%) [3]. Among the study participants, majority (50%) were between the ages of 21 and 30, with a mean age of 28 and this was consistent with the findings of Abdul Rauf Alhassan *et al.* [5] (Mean age-32 years). Among the respondents, 67% participated in training programs and 28% of them completed a certified course in infection prevention control, whereas in the study of Najod *et al.*, 81% completed the training in IPC. Among the respondents, 84 (70%) members participated in continuous education programs such as workshops and conferences. Among the study participants, 51 (42%) were from medical departments, 32 (27%) were from surgical departments and 37 (31%) were from laboratories.

**Assessment of knowledge of the health-care workers in infection prevention and control**

In this study, more than 85% of the participants were found to be knowledgeable about infection prevention and control measures. This was in correlation with Nag *et al.* (87.4%) [6] showed >90% knowledge score. The majority, >95%, is more knowledgeable about standard precautions and the need to put them into practice to lower hospital-acquired infections. The majority, >85%, is more knowledgeable about recommended hand hygiene practices when to use hand rub, and when to wash hands, and the 15% who are less knowledgeable may be newly hired healthcare employees who need orientation training. 77% of participants disagreed with the practice of wiping hands to coats after coughing or sneezing and had better knowledge of respiratory hygiene recommendations. Other 23% may be unaware of respiratory etiquette guidelines and need refresher training. Only 62% of those surveyed correctly identified that used PPE should not be disposed of in general waste bins, demonstrating the necessity of conducting regular training programs on the management of biomedical waste.

**Assessment of attitudes of the healthcare workers in infection prevention and control**

Of all respondents, 88 (73%) reported a positive attitude, while 32 (27%) reported a negative attitude. This was in consistent with

Almohammed *et al.* (72.2%) [3]. Nearly 75% of the participants regularly wash their hands between patient care activities, and they agree totally that this practice will help to prevent HAIs. Nearly 62% of people have the practice of disinfecting and cleaning surfaces and equipment after use. 100% agreed that eating and drinking should only be permitted in areas other than those used for patient care. More than 87% have the practice of switching to a new pair of gloves for each new patient visiting the hospital. More than 85% of respondents disagreed with the idea of handling bodily fluids without gloves. More the 85% disagreed that to handle body fluids with bare hands when gloves are not available. According to the current study, there is a need to change people's attitudes toward cleaning surfaces and equipment, which is the key to reducing hospital-acquired infections. This can be accomplished by putting strict policies and standard operating procedures in place for cleaning and disinfecting surfaces and equipment following each patient use [7-9].

#### Assessment of practices of the healthcare workers in infection prevention and control

Of all respondents, 84 (70%) followed the correct practice of IPC, while 36 (30%) were unaware of the correct practice of IPC. This was in correlation with Nag *et al.* (61%) [6]. Only 68% of study participants washed their hands for the recommended amount of time in accordance with WHO recommendations and 85% of them used the proper hand washing technique in order (Wet – Pour Hand wash – Rub – Wash – Dry). All health-care workers must be continuously monitored by conducting hand hygiene audits on a regular basis and must receive ongoing training by participating in hand hygiene workshops, as hand washing is the key step in reducing hospital-acquired infections. Hand hygiene posters should be placed near all hand-washing areas in accordance with WHO guidelines. In this study, nearly 74% of respondents agree that they should avoid recapping needles and are familiar with the single-handed scoop technique when it is unavoidable. Capping needles is not recommended because needle stick injuries are a major concern among health-care workers. In emergency situations where needle recapping is required, all health-care workers should be well-trained in the single-handed scoop technique. More than 88% of people are aware that sharp waste should be disposed of in white, puncture-proof containers containing 1% hypochlorite, and that waste should be disposed of once three-quarters of the container is full. Only 50% of people are aware of the proper PPE donning and doffing procedure. Near the changing rooms, posters with the sequence of donning and doffing should be displayed. Hands-on workshops should be held on a regular basis to train healthcare workers in the proper donning and doffing of PPE. To improve the knowledge, attitudes, and practices of health-care workers in infection prevention and control, infection control training will be included as part of the intern orientation program to increase interns' infection control knowledge and practices [10,11]. Continuous on-the-job and off-the-job infection prevention and control training programs should be conducted for all healthcare personnel. Updated Standard Operating Procedure and Infection control manual should be made available in every patient care location. A well-organized institutional infection control program should be in place to reinforce and integrate standard precautions with routine services through protocols, rules, and regulations. In continuing education programs, emphasizing the significance of adhering to the most up-to-date evidence-based infection control practices. To determine the level of practice, a replication of this study utilizing an observation checklist should be conducted [12-14]. In addition, hospitals should provide infection prevention facilities and supplies, such as continuous water supply, hand washing sinks with elbow taps, sufficient PPEs to improve health-care personnel' infection prevention practices.

#### CONCLUSION

Although the health-care personnel in this study had enough knowledge of infection prevention and control, their attitudes and implementation of safe procedures were not sufficient, favorable, and safe enough to the expected standard. Health-care workers' practical awareness of

basic elements such as duration of hand washing, donning and doffing of PPE, and disposal of biomedical waste into color-coded bins was unsatisfactory, which might increase the risk of HAIs to healthcare workers, patients, visitors, and the community. It is possible that the low percentage of practical component in this study is due to the fact that the majority of the participants were interns with less participation in infection control training programs. It is recommended to strengthen and integrate universal precaution with routine services by providing training, protocol, rules, and regulations.

#### ETHICAL APPROVAL

The study was approved by the Institutional Ethics Committee of Andhra Medical College, Visakhapatnam, Andhra Pradesh, India.

#### AUTHORS' CONTRIBUTION

First author of the study Swapna Sasapu contributed conceptual design, literature search, collected the data, analyzed the data, and wrote the first draft of the manuscript. The second author Kamala P guided the work and corrected the manuscript. The third author Sateesh Kumar helped in the statistical analysis and literature survey.

#### CONFLICTS OF INTEREST

The study declared "no conflicts of interest".

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