

## Assessment of Knowledge, Attitude, and Practices on Hospital Acquired Infections, Prevention and Control Measures among a Group of Healthcare Workers – A Cross-Sectional Study

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### ABSTRACT

**Background:** Of every 100 hospitalized patients at any given time, 7 in developed and 10 in developing countries will acquire at least one Hospital Acquired Infection.

The risk is substantial not only for patients, but also for Health Care Workers (HCWs), including Doctors, medical students, nurses, and working staff.

Healthcare workers acquire these infections during specimen collection, processing and discarding, handling medical equipment, needle prick injuries and by direct interactive sessions with the patients without taking any precautions and by poor awareness about HAI's.

**Objective:** To assess the Knowledge, and attitude of Health care workers towards Hospital Acquired Infections. To assess their practices regarding universal standard precautions, hand hygiene, respiratory hygiene, cough etiquette, and use of personal protective equipment.

**Methods:** The is a cross sectional study done on 161 Health care workers which includes medical students, interns, and postgraduates of the Sri Siddhartha Medical College and hospital, Tumkur, Karnataka, India, done in the span of 3 months (January to March 2022). Pretested semi structured questionnaires were given to the participants and were selected using convenient sampling techniques. The data was analysed using SPSS version 21 software.

**Results:** Only, more than one fourth (46, 28.5%) of the participants are having >50% knowledge on HAIs. Almost three-fourth (120, 74.5%) of the participants are having a positive attitude towards HAIs, (44, 27.3%) of the participants are trying to reduce the risk of these infections with their good practices.

**Conclusion:** Postgraduates are having more knowledge and following less practices about HAIs. Medical students have less knowledge, more positive attitude about HAIs. Interns are having a positive attitude with good practices towards HAIs. We recommend Health Care Workers to follow Strict aseptic precautions, limiting

use of external devices, removal of catheters as soon as no longer indicated, public health surveillance, Antibiotic stewardship and follow patient safety.

**Keywords:** Hospital Acquired Infections (HAIs), Health Care Workers (HCWs), universal precautions, respiratory hygiene & cough etiquette, patient safety guidelines.

## INTRODUCTION

Hospital-acquired infections, also known as Healthcare-Associated Infections (HAIs), are nosocomial acquired infections that are typically not present or might be incubating at the time of admission. These infections are usually acquired after hospitalization and manifest 48 hours after admission to the hospital. The infections are monitored closely by agencies such as the National Healthcare Safety Network (NHSN) of the Centre for Disease Control And Prevention (CDC).<sup>[1]</sup> Knowledge, Attitude And Practices (KAP) study with predefined and standardized questionnaires will reveal misconceptions or misunderstandings that may be an obstacle to the activities that we would like to implement. It can also identify potential barriers to behaviour change. Several hospitals have established infection tracking and surveillance systems in place, along with robust prevention strategies to reduce the rate of Hospital-Acquired Infections.<sup>[2]</sup> Of every 100 hospitalized patients at any given time, 7 in developed and 10 in developing countries will acquire at least one Hospital Acquired Infection.<sup>[3]</sup> Urinary tract infection is the most frequent health care-associated infection in high-income countries. Surgical site infection is the leading infection in settings with limited resources, affecting up to one-third of operated patients; this is up to nine times higher than in developed countries. Even Hospital and Ventilator associated pneumonia (HAP & VAP) tend to rise nowadays in developing countries. The most common pathogens for HAP and VAP are staph aureus and pseudomonas aeruginosa, while E Coli and Klebsiella pneumonia can be seen in higher proportions among paediatric populations.<sup>[4]</sup> The overall rate of ventilator-associated pneumonia was also higher (16.8 vs 1.1 per 1,000 ventilator days), as was the rate of catheter-associated urinary tract infection (5.5 vs 1.3 per 1,000 catheter days). The risk is substantial not only for patients, but also for Health Care Workers (HCWs), including medical students.<sup>[5]</sup> The common factors associated with hospital acquired infection are long hospital stays, use of indwelling catheters, failure of the health care workers to wash their hands properly and overuse of antibiotics. Even those at greater risk are the elderly, young children and immunocompromised states of a person. One of the major reasons for these high-rate Healthcare Associated Infections is the lack of infection control programs, which have been neglected due to limited resources, competing priorities, and other barriers.<sup>[6]</sup> Factors such as poor awareness among HCWs and compliance associated with personal, logistical and organizational barriers exert their own effect on proper application of these protocols.<sup>[7]</sup> HAI creates additional suffering and high cost for patients, their families and to the health system prolonged hospital stays, creating long-term disability and deaths, increasing resistance to antimicrobials.<sup>[8]</sup> Central Line Associated Bloodstream Infections (CLABSIs) are deadly nosocomial infections with the death incidence rate of 12%–25%.<sup>[9]</sup> According to acute care hospital statistics in 2011, UTIs account for more than 12% of reported infections.<sup>[10]</sup> Nosocomial infection affects huge number of patients globally, elevating mortality rate and financial losses significantly. These infections are responsible for 4%–56% of all deaths causing in especially neonates, with incidence rate of 75% in South-East Asia and Sub-Saharan Africa.<sup>[11]</sup> The incidence is high enough in high income countries i.e.,

between 3.5% and 12% whereas it varies between 5.7% and 19.1% in middle- and low-income countries. The frequency of overall infections in low-income countries is three times higher than in high income countries whereas this incidence is 3–20 times higher in neonates.<sup>[12]</sup> Healthcare staff and cleaners should be informed about hazards of the waste and its proper management. Use of masks, gloves, head covers, or a proper uniform is essential for healthcare delivery.<sup>[13]</sup> In 2014, the CDC published a multistate point prevalence survey of healthcare-associated infections involving 11,282 patients from 183 US hospitals. According to this report, about 4% of hospitalized patients suffered from at least one of the HAI. In absolute numbers, in 2011, an estimated 648,000 hospitalized patients suffered from 721,800 infections. The dominant infections (in descending order) include Pneumonia (21.8%), surgical site infections (21.8%), gastrointestinal infections (17.1%), urinary tract infections or UTIs (12.9%), and primary bloodstream infection (9.9%, and include Catheter-associated bloodstream infections). Among the pathogens causing HAI, *C. Difficile* (12.1%) is the leading pathogen and is closely followed by *Staphylococcus aureus* (10.7%), *Klebsiella* (9.9%), and *Escherichia coli* (9.3%).<sup>[14]</sup> Based on extensive studies in USA and Europe shows that Health care associated infections incidence density ranged from 13.0 to 20.3 episodes per thousand patient-days. For instance, while getting care for other diseases many patients probably get respiratory infections and it becomes troublesome to spot the prevalence of any nosocomial infection in continuation of a primary care facility.<sup>[15]</sup>

## METHODOLOGY

**1. Study Design:** This was a cross-sectional study conducted among health care professionals using convenient sampling techniques in a tertiary care center in Sri Siddhartha medical college, Tumkur, Karnataka, India, done in the span of 3 months (January to March 2022). Pretested semi structured questionnaires were given to the participants and were selected using convenient sampling techniques.

**2. Sample size:** The study is done on 161 Health care workers which includes medical students, interns, and postgraduates of the Sri Siddhartha Medical College and hospital, Tumkur

**3. Statistical Analysis:** The data was analysed using SPSS version 21 software. Statistical analysis was done using descriptive statistics like proportion and Inferential statistics like Chi-square test. P-value less than 0.05 was taken as statistically significant.

**4. Inclusion Criteria:** All health care workers who were willing to participate were considered as inclusion criteria.

**5. Exclusion Criteria :** Subjects who were not willing to participate were taken as exclusion criteria and were not considered in the study.

### **6. Steps to be followed to conduct this study:**

1. Subjects from medical college will be approached.
2. The study subjects will be included in the study after obtaining written consent.
3. The data will be collected using a pre-tested semi structured questionnaire.
4. Confidentiality of the study subject is ensured.
5. The study does not require any investigation or interventions to be conducted on patients.

## ETHICAL CLEARANCE

This study has got ethical clearance which was obtained from our Institution.

## LIMITATIONS OF THE STUDY

1. KAP survey essentially records an “opinion” and is based on the “declarative” i.e., statements which reveals what was said, but there may be considerable gaps between what is said and what is done
2. Individuals express their perception and feelings and recollection of knowledge at that point of survey and are affected by various factors from time to time.
3. The represent sample may not reflect total college students

## FUTURE SCOPE OF STUDY

These types of studies must be done repeatedly at regular intervals with large sized sample for better understanding

## RESULT

**Table 1:** Distribution of Study participants based on Gender (n=161).

Gender	Frequency	Percent (%)
Male	86	53.4
Female	75	46.6
Total	161	100

The table shows more than half (53.4%) of participants were females and less than half (46.6%) of participants were males.

**Table 2:** Distribution of Study participants based on occupation (n=161)

Occupation	Frequency	Percent (%)
Medical student	52	32.3
Intern	86	53.4
Pg	23	14.3
Total	161	100

The table shows more than half (53.4%) of participants were interns, almost one-third (32.3%) were medical students, and less than one-fifth (14.3%) were postgraduates.

**Table 3:** Distribution of Study participants based on Knowledge Questions (n=161)

Questions	Options	Frequency	Percent (%)
1. Universal precautions means	A. Avoid all contact with people who might be infected.	6	3.7
	B. Treating all blood and other body fluids as if they are infectious.	8	5
	C. Washing hands carefully with soap and water.	6	3.7
	D. Gloves are worn whenever you anticipate contact with blood and/or body fluids.	7	4

	E. All	134	83.2
	Total	161	100
2. The most appropriate way to reduce the spread of infection is?	A. Through frequent and proper hand washing	92	57.1
	B. By making the patient perform their own self-care	24	14.9
	C. By wearing PPE	31	19.3
	D. By not touching a patient unless medically indicated	14	8.7
	Total	161	100
3. which of the following is the most common hospital-acquired infection (HAI)?	A. Urinary Tract Infections	52	32.3
	B. Surgical Site Infections	22	13.7
	C. Bloodstream Infections	18	11.2
	D. Resp tract infections	69	42.9
	Total	161	100
4. The minimum time needed for hand Washing?	A. 5 seconds	1	0.6
	B. 10 seconds	16	9.9
	C. 20 seconds	69	42.9
	D. 1 minute	64	39.8
	E. more than 1 minute	11	6.8
	Total	161	100
5. which of the following is associated with a higher risk of spread of infections?	A. Wearing jewelry	19	11.8
	B. Wearing a white coat outside the hospital	116	72
	C. Wearing necktie	6	3.7
	D. Wristwatch	20	12.4
	Total	161	100
6. If my hands are not visibly dirty, there is no need to wash my hands prior to patient contact.	A. True	10	6.2
	B. False	151	93.8
	Total	161	100
7. The following needs to be done after a needle stick injury EXCEPT	A. Squeeze out as much blood as possible from the site	105	65.2
	B. Report the Needle Stick Injury	12	7.5
	C. Take post-exposure prophylaxis	28	17.4
	D. Wash the area with soap and water	16	9.9
	Total	161	100
8. Sterilization by autoclaving is used to decontaminate all EXCEPT	A. Cultures	12	7.5
	B. Glass ware	16	9.9
	C. Pipettes	7	4.3
	D. Corrosive chemicals	126	78.3
	Total	161	100
9. How many moments of hand hygiene	A. 2	7	4.3

are there as per WHO?			
	B. 3	11	6.8
	C. 4	31	19.3
	D. 5	112	69.6
	Total	161	100
10. Nosocomial infections includes the following EXCEPT?	A. Ventilatory associated pneumonia.	9	5.6
	B. Bacteremia	13	8.1
	C. Central line infection	16	9.9
	D. Malaria	123	76.4
	Total	161	100
11. How do you dispose of needle, cap and syringe after injections?	A. Dispose all in white PPC container	19	11.8
	B. Dispose needle in PPC container	14	8.7
	C. Dispose of cap and syringe in red colored waste bin.	6	3.7
	D. Both B and C	122	75.8
	Total	161	100
12. The most common agents to cause nosocomial infections include?	A. Staphylococcus aureus	102	63.4
	B. Streptococcus	20	12.4
	C. Pseudomonas	18	11.2
	D. E. coli	21	13
	Total	161	100
13. Factors influencing the Nosocomial infection are	A. Patient susceptibility	6	3.7
	B. Microbial agent	6	3.7
	C. Environment factors	7	4.3
	D. All the above	142	88.2
	Total	161	100
14. Standard precautions must be:	A. Applicable if the patient has a blood borne infections	13	8.1
	B. Applicable if the patient has a viral infection	12	7.5
	C. always Applied to all the patients	111	68.9
	D. Applicable when dealing with spillages of blood or bodily fluids	25	15.5
	Total	161	100
15. What order should PPE be put on?	A. Mask, gown, gloves, eyewear	22	13.7
	B. Gown, mask, eyewear, gloves	94	58.4
	C. Gloves, eyewear, mask, gown	22	13.7
	D. Eyewear, mask, gown, gloves	23	14.3
	Total	161	100

The table represents the greatest number of responses by the participants towards knowledge questions regarding HAIs. The questions regarding Universal precautions means was answered as 'all' by more than four-fifth (134, 83.2%), the most appropriate way to reduce the spread of infection is by frequent and proper hand washing by

more than half (92, 57.1%), respiratory tract infections is the most common hospital HAI followed by urinary tract infection by less than half (69, 42.9%) & more than half (52, 32.3%) respectively, 20 seconds as the minimum time needed for hand washing by less than half (69, 42.9%), wearing a white coat outside hospital is associated with a higher risk of spread of infections by almost three-fourth (116, 72%), If my hands are not visibly dirty, there is no need to wash my hands prior to patient contact as false statement by almost everyone (151, 93.8%), The following needs to be done after a needle stick injury EXCEPT to Squeeze out as much blood as possible from the site by almost two-thirds (105, 65.2%), Sterilization by autoclaving is used to decontaminate all EXCEPT which was corrosive chemicals by more than three-fourth (126, 78.3%), there are 5 moments of hand hygiene are there as per WHO by more than two-third (112, 69.6%), Nosocomial infections includes the following EXCEPT which is malaria by almost three-fourth (126, 76.4%), option d which is both a and b to dispose of needle, cap and syringe after injections by exactly three-fourth (122, 75.8%), Staphylococcus Aureus as The most common agents to cause nosocomial infections by almost two third (102, 63.4%), option d which is all of the above for Factors influencing the Nosocomial infection by more than four-fifth (142, 88.2%), Standard precautions must be always Applied to all the patients by more than two-third (111, 68.9%), and finally the order to put PPE is Gown, mask, eyewear, gloves which is answered by more than half (94, 58.4%) of the participants.

**Table 4:** Distribution of study participants based on Attitude Questions (n=161)

Questions	Options	Frequency	Percent
1. Needle-stick injury at workplace should be immediately reported to the concerned authority	A. Strongly agree	115	71.4
	B. Somewhat agree	31	19.3
	C. No opinion	10	6.2
	D. Somewhat disagree	3	1.9
	E. Strongly disagree	2	1.2
	Total	161	100
2. It is necessary to categorize hospital waste before disposal.	A. Strongly agree	143	88.8
	B. Somewhat agree	9	5.6
	C. No opinion	6	3.7
	D. Somewhat disagree	2	1.2
	E. Strongly disagree	1	0.6
	Total	161	100
3. I am aware that patients expect me to wash my hands before touching them.	A. Strongly agree	107	66.5
	B. Somewhat agree	39	24.2
	C. No opinion	10	6.2
	D. Somewhat disagree	4	2.5
	E. Strongly disagree	1	0.6

	Total	161	100
4. Do you think that duration of hand washing affects the outcome of prevention of spread of infection?	A. Strongly agree	96	59.6
	B. Somewhat agree	55	34.2
	C. No opinion	5	3.1
	D. Somewhat disagree	3	1.9
	E. Strongly disagree	2	1.2
	Total	161	100
5. Do you think pre and post exposure prophylaxis decreases HAI	A. Strongly agree	104	64.6
	B. Somewhat agree	38	23.6
	C. No opinion	12	7.5
	D. Somewhat disagree	4	2.5
	E. Strongly disagree	3	1.9
	Total	161	100
6. Do you believe that universal precautions reduce the risk of contamination?	A. Strongly agree	134	83.2
	B. Somewhat agree	18	11.2
	C. No opinion	5	3.1
	D. Somewhat disagree	2	1.2
	E. Strongly disagree	2	1.2
	Total	161	100
7. Do you believe that wearing PPE during sample collection of COVID-19 prevents transmission of infection?	A. Strongly agree	120	74.5
	B. Somewhat agree	32	19.9
	C. No opinion	5	3.1
	D. Somewhat disagree	3	1.9
	E. Strongly disagree	1	0.6
	Total	161	100
8. Do you think N95 masks must be thrown after each use?	A. Strongly agree	53	32.9
	B. Somewhat agree	55	34.2
	C. No opinion	22	13.7
	D. Somewhat disagree	22	13.7
	E. Strongly disagree	9	5.6
	Total	161	100
9. Do you believe that N95 mask can be reused if stored in a plastic bag?	A. Strongly agree	17	10.6
	B. Somewhat agree	31	19.3
	C. No opinion	37	23



	D. Somewhat disagree	41	25.5
	E. Strongly disagree	35	21.7
	Total	161	100
10. I need to wear eye gear all the time during conducting procedures that generate splashes/aerosols	A. Strongly agree	124	77
	B. Somewhat agree	24	14.9
	C. No opinion	9	5.6
	D. Somewhat disagree	4	2.5
	E. Strongly disagree	0	0
	Total	161	100

The table represents the greatest number of responses by the participants towards positive attitude questions regarding HAIs. questions regarding Needle-stick injury at workplace should be immediately reported to the concerned authority as strongly agree by almost three-fourth (115, 71.4%), somewhat agree by less than one-fourth (31, 19.3%), It is necessary to categorize hospital waste before disposal as strongly agree by more than four-fifth (143, 88.8%), HCWs are aware that patients expect me to wash their hands before touching them as strongly agree by two-third (107, 66.5%), Do you think that duration of hand washing affects the outcome of prevention of spread of infection as Strongly agree by more than half (96, 59.5%), Do you think pre and post exposure prophylaxis decreases HAI as Strongly agree by almost two -third (104, 64.6%), Do you believe that universal precautions reduce the risk of contamination as strongly agree by more than fourth-fifth (134, 83.2%), Do you believe that wearing PPE during sample collection of COVID-19 prevents from transmission of infection as Strongly agree by almost three-fourth (120, 74.5%), Do you think N95 mask must be thrown after each use as somewhat agree by more than one-third (55, 34.2%), Do you believe that N95 mask can be reused if stored in a plastic bag as somewhat disagree by one-fourth (41, 25.5%), and finally, I need to wear eye gear all the time during conducting procedures that generate splashes/aerosols by strongly agree by more than three- fourth ( 124, 77%) of the participants.

**Table 5:** Distribution of study participants based on practice questions (n=161)

Questions	Options	Frequency	Percent
1. Do you practice hand washing before and after touching the patient?	A. Always	112	69.6
	B. Sometimes	46	28.6
	C. Never	3	1.9
	Total	161	100
2. Do you segregate infectious waste from general waste before disposal as BMW guidelines?	A. Always	122	75.8
	B. Sometimes	37	23
	C. Never	2	1.2
	Total	161	100

3. Do you always discard needles in the safety box?	A. Always	132	82
	B. Sometimes	26	16.1
	C. Never	3	1.9
	Total	161	100
4. Do you recap needles before disposal?	A. Always	130	80.7
	B. Sometimes	16	9.9
	C. Never	15	9.3
	Total	161	100
5. Do you drink or eat at work?	A. Always	14	8.7
	B. Sometimes	85	52.8
	C. Never	62	38.5
	Total	161	100
6. Do you wear an N95 mask after proper disinfection?	A. Always	98	60.9
	B. Sometimes	55	34.2
	C. Never	8	5
	Total	161	100
7. Do you wear PPE while sample collection for COVID-19?	A. Always	115	71.4
	B. Sometimes	36	22.4
	C. Never	10	6.2
	Total	161	100
8. Do you cough/ sneeze on a disposable napkin and wash your hands	A. Always	97	60.2
	B. Sometimes	57	35.4
	C. Never	7	4.3
	Total	161	100
9. Do you cough/ sneeze over your shoulder if a napkin is not available?	A. Always	74	46
	B. Sometimes	66	41
	C. Never	21	13
	Total	161	100
10. Do you keep 3 ft distance from others when coughing?	A. Always	81	50.3
	B. Sometimes	75	46.6
	C. Never	5	3.1
	Total	161	100

The table represents the greatest number of responses by the participants towards practice questions regarding HAIs. Questions regarding - Do you practice hand washing before and after touching the patient as always by more than two-third (112, 69.6%), Do you segregate infectious waste from general waste before disposal as BMW guidelines as always by three-fourth (122, 75.8%), Do you discard needles in the safety box always as always by more than four-fifth (132, 82%), Do you recap needles before disposal as always by more than four- fifth (130, 80.7%), Do you drink or eat at work area as never by almost more than one-third (62, 38.5%), Do you wear an N95 mask after proper disinfection as always by almost two-third (98, 60.9%), Do you wear PPE while sample collection for COVID-19 as always by almost three-fourth (115, 71.4%), Do you cough/ sneeze on a disposable napkin and wash your hands as always by more than half (97, 60.2%), Do you cough/ sneeze over

your shoulder if napkin is not available as always by almost half (74, 46%), and finally, Do you keep 3 ft distance from others when coughing as always by half (81, 50.3%) of the participants.

**Table 6:** Distribution of study participants based on their overall knowledge of more than 50 percent on HAIs (n=161).

Group	Total Frequency	Participants having >50% knowledge	Percent according to a specific group	Overall percent
Medical students	52	14	26.9	8.69
Interns	86	24	27.9	14.99
Postgraduates	23	8	34.7	4.9
Total	161	46		28.57%

The table shows More than one-fourth (14, 26.9%), (24, 27.9%), and (8, 34.7%) of the participants having more than 50 percent knowledge based on their specific group of occupation. The table also shows Less than one-tenth (14, 8.69%), more than one-tenth (24, 14.99%), less than one-tenth (8, 4.9%) of the participants having more than 50 percent knowledge according to the overall percent of participants. To summarise, more than one fourth (46, 28.57%) of participants are having more than 50 percent knowledge regarding HAIs.

**Table 7:** Distribution of study participants based on positive Attitude towards HAI (n=161).

Group	Total Study Participants	Frequency according to specific group	Percent (%) according to a specific group	Overall percent (%)
Medical students	52	37	71.1	22.9
Interns	86	65	75.5	40.3
Postgraduates	23	18	78.2	11.3
Total	161	120		74.50%

The table shows almost three-fourth (37, 71.1%), exactly three-fourth (65, 75.5%), and more than three-fourth (18, 78.2%) of the participants having a positive attitude towards HAIs according to their specific group of occupation. The table also shows, less than one-fourth (37, 22.9%), less than half (65, 40.3%), and more than one-tenth (18, 11.3%) of the participants are having a positive attitude towards HAIs according to the overall percent of participants. To summarise, almost three-fourth (120, 74.5%) of participants are having a positive attitude towards HAIs.

**Table 8:** Distribution of study participants based on good Practices towards HAI (n=161).

Group	Total Study Participants	Frequency according to specific group	Percent according to a specific group	Overall percent
Medical students	52	19	36.5	11.7
Interns	86	22	25.5	13.8
Postgraduates	23	3	13	1.8
Total	161	44		27.3

The table shows more than one-third (19, 36.5%), exactly one-fourth (22, 25.5%), and more than one-tenth (3, 13%) of the participants are following good practices towards HAIs according to their specific group of occupation. The table also shows, more than one-tenth (19, 11.7%), more than one-tenth (22, 13.8%), and less than one-tenth (3, 1.8%) of the participants are following good practices towards HAIs according to the overall percent of participants. To summarise, more than one-fourth (44, 27.3%) of participants are following good practices and trying to reduce HAIs.

## DISCUSSION

These results are much better than the findings at the University Of Port Harcourt Teaching Hospital, Nigeria (UPTH) in which more than half of the HCWs (55.4%) lack good knowledge of hand washing.<sup>[16]</sup> A clustered randomised controlled trial study was designed for preventing bloodborne infections in People's Republic of China on medical students. The intervention group underwent an educational intervention programme consisting of a series of lectures and videos following a baseline survey. The control group completed the same intervention programme after the study was completed. The results clearly demonstrated that a one-time intervention program had no effect on knowledge.<sup>[17]</sup> In a similar cross-sectional descriptive and observational study conducted for six months in 2006 at Ains shans hospital, Cairo, Knowledge & attitude of HCWs towards hand hygiene was done. Out of 2189 participants, the mean knowledge score was higher in nurses compared to doctors (42.6 +/- 1.7 and 39.1 +/- 10.5). Doctors showed significantly higher compliance (37.5%) than other groups. The most common type of Hand Washing (HW) practiced was the routine HW (64.2%) and the least was the antiseptic HW (3.9%). Having a short contact time and improper drying (23.2%) were the most common errors that lead to inappropriate HW.<sup>[18]</sup> A cross-sectional study was conducted in 2006 & 2007, at eight randomly selected non-academic acute public hospitals in Caserta and Naples (Italy) on 307 participants. (87.9%) were aware that HCWs can acquire HCV and HIV from a patient, but less than one-third knew that a HCW can transmit these infections to a patient. (86.3%) were aware of both preventive measures and this knowledge was significantly higher in nurses. HCWs had an extremely positive attitude, (94.5%) and (89.2%) agreed that guidelines for preventing HAIs should strictly be followed and hand hygiene measures should be taken to reduce the risk after treating patients, respectively. A total of (80.8%) of respondents often or always used gloves and performed hand hygiene measures after removing gloves.<sup>[19]</sup> A cross-sectional study conducted in Panimalar Medical College Hospital & Research Institute, Chennai, Tamil Nadu, India, 262 participants were included in the study. (93%) had sufficient knowledge of HAI's, (91%) agreed that healthcare workers are the main source of HAIs. (95%) of them had a high level of perception and (5%) of them had a moderate level of perception. The mean level of knowledge and perception score on HAI was (19.58 ± 2.70) and (51.97 ± 5.62).<sup>[20]</sup> A study at a tertiary care center in Switzerland from 2019 to 2020, shoe soles of HCWs were cultured for *C. Difficile* twice per shift while taking care of a patient infected with toxigenic *C. Difficile*. A total of 103 HCWs exposed to 42 hospitalized patients participated in the study, providing 206 samples. Contamination of shoe soles with *C. Difficile* was detected in 37 samples (17.8%) of HCWs taking care of patients infected with *C. Difficile*.<sup>[21]</sup> A descriptive cross-sectional study was done in a health facility in Akure, Nigeria, involving 137 randomly selected HCWs (19 doctors, 66 nurses and 52 health assistants). Majority (84.7%) were trained on hand hygiene and was knowledgeable about HAIs (86.9%), modes of transmission (57.7%) and effectiveness of

hand hygiene (94.9%). However, about half (48.9%) of the HCWs reported did not adhere to hand hygiene.<sup>[22]</sup> A similar study was conducted on 150 hospital employees about HAIs, prevention, and recommendations with reference to tertiary care hospital, Tamil Nadu. (92%) of the respondents are aware on all types of Hospital Acquired Infections and prevention recommendations. (36%) of the respondents answered strongly agree for usage of Personal Protective Equipment as an effective barrier for infection control. 36% of the respondents answered Excellent, 42% of the respondents are answered good for Quality of sanitation services provided in hospital.<sup>[23]</sup> This study purported to investigate their prevalence and risk factors of infectious diseases among healthcare workers from Limpopo province of South Africa. The total number of cases of infectious diseases reported during the study period was 56; of these, 83.9% (47) of cases were for tuberculosis, 10.7% (6) for cholera, and 5.4% (3) for chickenpox. The majority of those infected were female (67.9%), aged over 40 years (57.1%), and who had worked for over 10 years (59.2%).<sup>[24]</sup> A similar study was conducted to assess health care workers knowledge, attitude and practice towards hospital acquired infection prevention at Dessie referral hospital. 191 study subjects were participated in the study which gives a response rate of 90.5% from 211 total sample sizes. The result indicated that 86.4%, 76.4% and 77% of respondents had good knowledge and favourable attitude and poor practice towards hospital acquired infection prevention respectively.<sup>[25]</sup> A cross- sectional online survey among HCWs was conducted in a University Hospital in Qassim, Saudi Arabia. A total of 213 HCWs participated in the survey. The prevalence of good ( $\geq 80\%$  correct response) knowledge, attitude, and practice were 67.6%, 61.5%, and 73.2%, respectively.<sup>[26]</sup> A retrospective study included 355 patients hospitalized over a 2-year period. HAIs were diagnosed in 32.7% of patients. Resistance rates were ( $>50\%$ ) observed in all antimicrobials except for tigecycline (14%), colistin (9%), and linezolid (0%). Predictors of HAI acquisition were underlying viral CNS infections and invasive devices—urinary and central venous catheters, and nasogastric tubes. Diabetes mellitus and intubation were identified as predictors for increased mortality in patients who had a HAI.<sup>[27]</sup> In a cross-sectional study conducted among healthcare workers at Dessie referral hospital 191 study subjects participated in the study, indicates that 86.4%, 76.4% and 77% of respondents had good knowledge and favorable attitude and poor practice toward hospital-acquired infection prevention respectively.<sup>[28]</sup> In a Cross-sectional study to assess knowledge, attitude, and practice towards infection control measures among Mizan-Aman general hospital, in Southwest Ethiopia, 135 HCWs were included in the study, of which, (42.2%) think that they apply standard precaution always, (76.3%) think that they were at risk of acquiring HIV in their workplace, (43.7%) of them disposed of sharp materials in open pails, (67.4%) in a sharp and liquid proof container without removing the syringe. (76.5%) of HCWs wore gloves last time while they took a blood sample, (68.7%) wash their hands before examining the patients, and (62.5%) recap needles immediately after using them.<sup>[29]</sup> A Hospital-based cross-sectional study was conducted in Debre Markos referral hospital, Northwest Ethiopia among 150 participants, more than two thirds (84.7%) of healthcare workers were found to be knowledgeable but only 86 (57.3%) of respondents demonstrated a good practice on infection prevention. Older age, lengthy work experience and higher educational status were significantly associated with both knowledge and practice of infection prevention.<sup>[30]</sup> A Cross-sectional study was conducted at Wolaitta Sodo teaching and referral hospital, Southeast Ethiopia on 271 Health Care Workers. Among the respondents, (93.4%) have a good attitude, and (6.6%) of the respondents have a negative attitude towards

infection Prevention. (99.3%) of HCWs have good knowledge, (0.7%) have poor knowledge, (60.5%) of HCWs have a good practice and the remaining (39.5%) of HCWs had poor practice towards infection prevention.<sup>[31]</sup>

## CONCLUSION

Out of the three categories, postgraduates are having more knowledge about HAIs, medical students are having less knowledge about HAIs, positive attitude towards HAIs is more in interns and postgraduates, and finally, postgraduates are not trying to reduce HAIs by their practices, unlike interns, who are trying to reduce HAIs more by their practices.

## RECOMMENDATION

We recommend Health Care Workers to follow Strict aseptic precautions, limiting use of external devices, removal of catheters as soon as no longer indicated, public health surveillance, Antibiotic stewardship and follow patient safety guidelines all the time.

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## DECLARATION OF INTERESTS

We are declaring that there is no conflict of interest between all the authors in the study.

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