

ORIGINAL RESEARCH

Awareness of practices of hand hygiene for infection prevention

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ABSTRACT

Objective: Infection poses a significant challenge within the global landscape of healthcare delivery services. It significantly contributes to morbidity and death linked to clinical, diagnostic, and therapeutic interventions. The objective of this study was to evaluate the level of knowledge, awareness, and adherence to infection control protocols among healthcare personnel working in the Intensive Care Unit (ICU) of our hospital.

Methodology: The present study employed a cross-sectional descriptive methodology to evaluate the knowledge and hand hygiene behaviors of doctors and nurses, while also identifying factors that influence and either encourage or hinder these practices at Sri Krishna Medical College and Hospital, Muzaffarpur, Bihar. The Knowledge questionnaire consisted of a total of 22 questions, each requiring a true or false response. The knowledge was assessed using a percentage-based grading system. Participants with higher scores demonstrate a greater level of knowledge on hand hygiene.

Results: The respondents to the knowledge exam were predominantly male healthcare professionals (HCPs), with 16 (64%) being nurses and midwives. The average age of the participants was 31.4 years, with a standard deviation of 5.8 years. The age range was from 25 to 48 years. Following the completion of bivariate analysis, it was determined that there was no statistically significant correlation between knowledge and several factors including occupation ($p = 0.9$), gender ($p = 0.7$), work experience ($p = 0.9$), age ($p = 0.8$), and training ($p = 0.9$). In summary, none of the variables examined exhibited a statistically significant association with the observed disparities in knowledge scores. A total of 44 spot checks were carried out. The availability of water was recorded at 29%, while soap availability was found to be 45%.

Conclusion: Healthcare professionals (HCPs) demonstrated a commendable level of understanding on the practice of hand hygiene. The frequency of hand washing increased following exposure to bodily fluids.

Keywords – Awareness and Practice, Hand Hygiene, Infection, Prevention

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INTRODUCTION

Infection poses a significant challenge within the global landscape of healthcare delivery services. It significantly contributes to morbidity and death linked to clinical, diagnostic, and therapeutic interventions. The user has provided a numerical sequence [1,2]. Hospital-acquired infections pose significant challenges in patient care due to the escalation of healthcare expenses and strain on existing healthcare resources. Nosocomial or hospital-acquired infection (HAI) is a significant concern within the realm of public health, with around 1.4 million individuals worldwide being affected by such infections at any given moment. According to estimates, around 10% of hospital patients are susceptible to developing various infections throughout their hospitalisation [4,5]. The prevalence rate of the condition is a significant

concern in developing countries, with a range of 30-50% [6,7]. Hospital-acquired infections (HAIs) result in significant morbidity and are estimated to be responsible for around 80,000 fatalities annually in the United States [8]. Based on the research conducted by Koch *et al.*, it was shown that patients who had healthcare-associated infections (HAIs) had a higher likelihood of mortality during a 30-day period in comparison to individuals who did not have HAIs [9]. Furthermore, patients with healthcare-associated infections (HAIs) experienced a continued risk of mortality for a duration of one year.

The primary transmission mode for these illnesses is via the contaminated hands of healthcare providers, including doctors, nurses, and other staff members [7]. Most nosocomial infections are attributed to the spread of pathogens between patients, primarily due

to inadequate hand cleanliness practices among healthcare staff during patient evaluations or failure to adhere to basic hospital hygiene protocols [10]. Hospital-acquired infections (HAIs) exhibit variation based on the clinical department, with the intensive care units, newborn units, and burns units typically demonstrating the greatest infection rates [9].

Consequently, critically sick patients who are hospitalised in the intensive care unit (ICU) exhibit a greater inclination towards the development of healthcare-associated infections (HAIs). The susceptibility of patients with several invasive devices to nosocomial infections, such as urinary tract infection (UTI) and respiratory tract infection (RTI), is a significant concern. In a study conducted by Fadeyiet *al.* [11] it was shown that 17% of patients receiving critical care had MRSA bacteraemia. Additionally, the study revealed an MRSA carrier prevalence rate of 52.5% among healthcare personnel in the critical care unit, with doctors and nurses comprising 22.7% and 16.7% of carriers, respectively [12]. Promoting adherence to infection control protocols among healthcare providers in the intensive care unit (ICU) is advocated to reduce the occurrence of cross-infection between patients, particularly when dealing with highly infectious organisms, during the provision of care.

According to a survey, there is a prevalent lack of adherence to hand hygiene practices among healthcare professionals. Moreover, a number of studies have been conducted to evaluate the knowledge, attitudes, and adherence to hand hygiene guidelines among healthcare workers. These studies have consistently found that compliance with hygiene protocols is suboptimal [13-15]. This lack of compliance can be attributed to various factors, such as the heavy workload, the large number of clinical procedures performed, and the presence of skin conditions among healthcare workers [16,17]. The discovery that adherence to general aseptic protocols was comparatively poorer before the execution of high-risk procedures is a cause for concern. Therefore, the necessity of this study arises from the documented instances of healthcare professionals displaying a low or complete lack of adherence to worldwide best practices in preventing the transmission of hospital-acquired infections, which subsequently leads to increased morbidity and mortality rates. The user has provided a numerical range, specifically [14,18]. Hence, the objective of this study was to evaluate the level of knowledge, awareness, and adherence to infection control protocols among healthcare personnel working in the Intensive Care Unit (ICU) of our hospital.

METHODOLOGY

The present study employed a cross-sectional descriptive methodology to evaluate the knowledge and hand hygiene behaviors of doctors and nurses,

while also identifying factors that influence and either encourage or hinder these practices at Sri Krishna Medical College and Hospital, Muzaffarpur, Bihar.

The participants of this study consisted of Health Care Providers (HCPs) employed at Kirehe District Hospital. The inclusion criteria for this study consisted of doctors and nurses who were employed full-time in postpartum wards at the hospital during the specified time period, and who were 18 years of age or older. The exclusion criteria encompassed individuals who were under the age of 18 and those who were not employed inside the department. Furthermore, those without medical training were also omitted from the study.

A study was conducted to observe the hand hygiene routines of 29 healthcare professionals (HCPs). A cohort comprising 26 healthcare professionals (16 nurses and 10 doctors) was enlisted to participate in the knowledge questionnaire.

The data collection period spanned from May 15th to June 20th, 2019, encompassing both the post-caesarean and general postpartum wards.

The assessment of water availability in hand washing facilities, as well as the presence of soap, alcohol-based hand rub, and hand towels, was conducted between the hours of 7am and 12noon. The supply observation checklist was integrated into the KoboCollector program subsequent to receiving training on its utilization. Subsequently, the collected data was sent to the server on a daily basis. The package had the necessary components that were essential for the team to protect the integrity of the data. The data was extracted using Microsoft Excel and underwent weekly verification.

The researchers conducted daily observations of opportunities and practices related to hand hygiene among healthcare professionals (HCPs) for a period of one month. These observations were carried out in accordance with the five hand hygiene moments specified by the World Health Organization (WHO) in 2009. The researchers utilized a standardized hand hygiene observation tool for this purpose. The form documented the quantity of occasions in which health workers had the opportunity to engage in hand hygiene, as well as the quantity of instances in which they actually performed hand hygiene. The questionnaire included in the study conducted by the World Health Organization (WHO) consisted of a total of 22 true and false questions that were designed to assess participants' knowledge of hand hygiene (World Health Organization). Compliance was determined by dividing the number of observed practices by the total number of opportunities seen. The health worker's adherence to hand hygiene protocols was assessed by the researchers through the utilization of a hand hygiene observation form specifically developed within the KoboCollect program. The data collection period spanned seven consecutive working days for a duration of four

weeks, with observations done from 7 a.m. to 12 noon each day. The research team selected this particular time frame due to its designation as the period of highest activity.

Following a period of four weeks of observation, the knowledge questionnaires were administered to the respondents during the shift report time in the ward and promptly collected once the healthcare professionals had finished filling them out. The shift report time refers to the designated hour during which nurses and doctors exchange information regarding their respective patients prior to the ward round. Historically, it was more convenient to have a staff of 6-10 individuals available for this purpose. The researchers utilized the Hand Hygiene questionnaire as a tool to evaluate individuals' understanding and implementation of hand hygiene principles. A score of 1 point was awarded for each correct answer, while a score of 0 was given for each incorrect response. In order to gather data on gender, age, discipline, and experience, a demographic component was incorporated into the questionnaire. The cumulative knowledge score was determined by dividing the number of correct responses by the total number of questions and expressing the result as a percentage. The participants were allocated a time frame of 20 minutes to fully respond to the questionnaire. A total of 26 questionnaires were disseminated, and 25 of them were subsequently returned, resulting in a response rate of 95%.

The demographic data, hand hygiene compliance rate, knowledge score, and supply availability were summarized using descriptive statistics such as frequency and percentage of frequency, mean, and standard deviation. The chi-square test was employed to examine the relationship between demographic variables and knowledge scores. The Chi-square test was employed for doing bivariate analysis. The statistical studies were performed using the R software, with a significance level (P-value) of 0.05. The Knowledge questionnaire consisted of a total of 22 questions, each requiring a true or false response. The knowledge was assessed using a percentage-based grading system. Participants with higher scores demonstrate a greater level of knowledge on hand hygiene. According to Ekwere and Okafor,[19] a score ranging from 0 to 33% was classified as poor, while a score greater than 33.3% but less than or equal to 66.6% was considered fair. Scores equal to or beyond 66.6% were categorized as good.

RESULTS

The respondents to the knowledge exam were predominantly male healthcare professionals (HCPs), with 16 (64%) being nurses and midwives. The average age of the participants was 31.4 years, with a standard deviation of 5.8 years. The age range was from 25 to 48 years. The largest proportion of participants (16, 64%) were within the age category of 20-30 years. In the survey, it was found that 17 out

of the respondents, accounting for 68% of the total, indicated that they had undergone at least one training session related to household hygiene in the past. Additionally, 8 respondents, representing 32% of the total, reported having less than one year of work experience in a healthcare institution. Furthermore, 4 respondents (16%) stated having between 1 and 3 years of experience, while the majority of respondents, 13 individuals (52%), claimed having more than 3 years of experience. These findings are summarized in Table 1. The entire sample (100%) of participants demonstrated awareness regarding the efficacy of hand hygiene practices prior to patient contact in mitigating the transfer of pathogens from healthcare providers to patients. The individuals also possess knowledge regarding the importance of practicing hand cleanliness following patient contact in order to mitigate the transmission of pathogens from patients to healthcare providers, with a success rate of 100%. It is important to acknowledge that the use of artificial fingernails is associated with an increased likelihood of harboring pathogenic bacteria on the hands. Consequently, it is highly recommended to abstain from their usage with a high level of certainty. The use of hand hygiene protocols after coming into touch with the immediate surroundings of a patient has demonstrated a significant reduction in the transmission of infections from healthcare workers to patients, as evidenced by a 100% success rate (Table 2). The aggregate outcome of the HH knowledge test was 77.5%. Question 10, which addresses the hospital's air as the principal origin of germs associated with healthcare-related infections, obtained the lowest score of 40%. The score for Question 19, which pertains to the transmission of potentially hazardous pathogens in hospital settings through the sharing of stethoscopes or pressure cuffs among patients, was found to be 16%. Finally, question 20, which proposes that the frequent application of hand cream or lotion raises the probability of detrimental germ colonization on hands and should be abstained from, likewise obtained a score of 40% (Table 2).

Following the completion of bivariate analysis, it was determined that there was no statistically significant correlation between knowledge and several factors including occupation ($p = 0.9$), gender ($p = 0.7$), work experience ($p = 0.9$), age ($p = 0.8$), and training ($p = 0.9$) (as shown in Table 3). In summary, none of the variables examined exhibited a statistically significant association with the observed disparities in knowledge scores. A total of 44 spot checks were carried out. The availability of water was recorded at 29%, while soap availability was found to be 45%. Additionally, glove availability was reported to be 98%, and alcohol hand rub availability was observed to be 52%. The availability of alcohol hand rub was categorized into two distinct groups: availability

throughout the entire ward (11.4%) and personal possession by doctors (40.6%).

During the duration of the study, a cohort of 29 staff members working in the postpartum and post-cesarean sections were observed, resulting in a total of 2149 instances of hand hygiene chances. Out of the total 2149 possibilities that were observed, a total of 488 procedures were executed, resulting in an overall hand hygiene compliance rate of 23%. The study findings revealed a significant difference in hand hygiene compliance rates between doctors (30.2%) and nurses (11.9%), with a p-value less than 0.001. Among the five moments examined, the moment immediately following exposure to human fluids demonstrated a notably high score of 48.6%. The pre-contact moments, accounting for 24.7% of the total score, exhibited higher scores compared to the post-contact times involving the patient's surroundings, which accounted for 14.2% of the total score. Following exposure to body fluids, there was a notable difference in compliance rates between

doctors (69.6%) and nurses (32.2%), with doctors demonstrating much higher compliance. This difference was statistically significant, as indicated by a p-value of 0.0003. Following the act of physically contacting a patient, it was observed that doctors exhibited a substantially higher level of compliance (29.2%) compared to nurses (16.9%), with a p-value of 0.001. Prior to making physical contact with a patient, it was observed that doctors (32.2%) exhibited a substantially higher level of compliance compared to nurses (11.5%), with a statistically significant difference ($P < 0.001$). Prior to implementing clean aseptic procedures, the rate of compliance among doctors was much higher (35.4%) compared to nurses (8.5%), with a statistically significant difference ($P < 0.001$). After coming into contact with the immediate environment of patients, it was seen that doctors exhibited a substantially higher level of compliance (21.5%) compared to nurses (5.7%), with a statistically significant difference ($P < 0.001$).

Table 1: Demographic characteristics of patients

Variables	
Age	
Less than 30	16 (64%)
31 to 40	7 (28%)
More than 40	2 (8%)
Gender	
Male	16 (64%)
Female	9 (36%)
Work experience	
More than three year	13 (52%)
1 to 3 years	4 (16%)
Less than 1 year	8 (32%)
Profession	
Nurse/Midwives	16 (64%)
Doctors	9 (36%)
Hand hygiene training	
Not received	8 (32%)
Received	17 (68%)

Table 2: Knowledge about hand hygiene practices

	Correctly responded
Germes are propagated via airborne droplets.	24 (96%)
The implementation of hand hygiene practices before to making contact with a patient has the potential to effectively mitigate the transfer of pathogens from healthcare providers to patients.	25 (100%)
Practicing hand hygiene measures subsequent to patient contact can effectively mitigate the spread of pathogens from patients to healthcare professionals.	25 (100%)
The act of rubbing one's hands with alcohol is a more expeditious method for cleansing the hands compared to traditional hand washing.	16 (64%)
The minimum duration required for alcohol-based hand rub to effectively eliminate a majority of germs on one's hands is 30 seconds.	19 (76%)
The act of adorning oneself with jewelry, such as watches and rings, has been found to be correlated with a heightened probability of hand colonization by pathogenic microorganisms, therefore suggesting the prudence of refraining from such practices.	24 (96%)

The duration of handwashing is inconsequential as long as soap is utilized.	19 (76%)
Practicing hand cleanliness promptly following exposure to bodily fluids can effectively mitigate the transfer of pathogens from healthcare providers to patients.	20 (80%)
The hands of health-care professionals serve as the primary pathway for the cross-transmission of potentially hazardous pathogens among patients within a health-care setting.	23 (92%)
The air within healthcare facilities is commonly identified as the primary reservoir for pathogenic microorganisms that are responsible for healthcare-associated illnesses.	10 (40%)
The utilization of alcohol-based hand sanitizers is associated with a higher incidence of skin dryness compared to traditional hand washing.	18 (72%)
The presence of damaged skin is correlated with a heightened probability of hand colonization by pathogenic microorganisms, thereby necessitating the avoidance of such skin conditions.	20 (80%)
The efficacy of hand cleansing is enhanced with the use of higher water temperatures during handwashing.	19 (76%)
The primary origin of pathogens causing healthcare-associated illnesses is typically the preexisting microbial flora found on or within the patient.	15 (60%)
The primary mode of cross-transmission of potentially pathogenic microorganisms among patients in a healthcare setting is through their contact with colonized surfaces, such as beds, chairs, tables, and floors.	24 (96%)
Practicing hand hygiene measures subsequent to contact with the immediate vicinity of a patient might effectively mitigate the spread of pathogens from healthcare providers to patients.	25 (100%)
The efficacy of hand rubbing in reducing germs surpasses that of hand washing.	20 (80%)
Practicing hand hygiene immediately prior to a clean or aseptic procedure has the potential to effectively mitigate the spread of pathogens from patients to healthcare providers.	20 (80%)
The most prevalent mode of cross-transmission of potentially pathogenic microorganisms between patients within a healthcare facility is the practice of utilizing shared stethoscopes or pressure cuffs.	4 (16%)
Frequent use of hand cream or lotion has been found to be correlated with an elevated probability of hand colonization by pathogenic microorganisms, so it is advisable to refrain from its regular usage.	10 (40%)
The utilization of antibacterial soap reduces the frequency of handwashing required.	21 (84%)
The utilization of artificial fingernails has been found to be correlated with a heightened probability of hand colonization by pathogenic microorganisms, hence it is advisable to refrain from their use.	25 (100%)

Table 3: Logistic Analysis of Knowledge score

Variables	Low Knowledge score (<75%)	High Knowledge score (≥ 75%)	p-value
Age			0.8
Less than 30	8 (53%)	7 (47%)	
31 to 40	2 (25%)	6 (75%)	
More than 40	1 (50%)	1 (50%)	
Gender			0.7
Male	8 (50%)	8 (50%)	
Female	3 (33%)	6 (67%)	
Work experience			0.9
Less than one year	4 (50%)	4 (50%)	
1 to 3 years	2 (50%)	2 (50%)	
More than 3 years	5 (38%)	8 (62%)	
Profession			0.9
Nurse/Midwives	7 (44%)	9 (56%)	
Doctors	4 (45%)	5 (55%)	

Hand hygiene training			0.9
Not received	5 (63%)	3 (37%)	
Received	6 (35%)	11 (65%)	

DISCUSSION

The objective of this study was to evaluate the level of hand hygiene compliance and awareness among healthcare professionals, specifically nurses/midwives and doctors, who are employed in the postpartum and post-cesarean departments of the hospital. The findings indicated that the average knowledge score was 77.5%, but the level of compliance, as determined through observation, was 23%. The average degree of household hygiene awareness in our survey exceeded 75%. It is noteworthy that all participants possessed knowledge regarding the importance of hand hygiene (HH) both before to and following contact with patients, as a means to avoid the transmission of pathogens from patients to healthcare providers and vice versa. However, they exhibited a lack of implementation in this regard.

The data revealed that 56% of the medical professionals, including doctors and nurses, achieved scores beyond 75%, while the remaining 44% obtained scores below this threshold. The findings at the Raichur Tertiary Health Care Center in India indicate that there were notable differences in the results compared to previous studies. Specifically, it was observed that a significant majority of the participants, accounting for 74% (107 out of 144), did not possess appropriate knowledge regarding hand hygiene. Conversely, only a small proportion, specifically 9%, demonstrated appropriate knowledge in this regard [20]. The observed disparity may arise from the fact that a majority of healthcare professionals Sri Krishna Medical College and Hospital, Muzaffarpur, Bihar had undergone various hand hygiene (HH) training programs, resulting in a higher retention of hand hygiene knowledge among them. The study conducted by Zakeriet *al* [21] in a teaching hospital situated in Mishhad yielded comparable findings. Outcomes of this study can be regarded as favorable discoveries, with the findings on HH knowledge surpassing those on hand hygiene practices. This implies that possessing information about hand hygiene does not necessarily lead to its effective implementation. This phenomenon may be attributed to a dearth of reinforcement and incentive. This finding suggests that in order to enhance household practices within the target group of this study, it is necessary to consider a comprehensive approach that includes the provision of resources, as well as knowledge training.

The findings of this study indicate that there is no statistically significant disparity between the amount of knowledge and household training ($P = 0.9$). The study conducted by Holmen *et al* [22] yielded comparable findings, indicating that the provision of training did not have a significant impact on the

participants' level of knowledge. This observation suggests that certain individuals may perceive HH training as ineffective due to their proficiency in conventional training methods that prioritize knowledge acquisition while neglecting the development of skills and attitudes. Consequently, this approach may lead to limited transformative outcomes in training.

The study noted the presence of water and soap within the hospital premises, although it was discovered that the provision of water supply to individual rooms was constrained. Among the three wards, there were two sinks, but only one of them was operational, equipped with flowing water and a liquid soap dispenser. The results of this study exhibit a resemblance to the findings of a systematic review conducted in Rwanda, whereby it was discovered that over 30% of healthcare professionals refrain from practicing hand hygiene due to the scarcity of resources and supplies in Rwandan healthcare facilities [23].

The present study conducted at Sri Krishna Medical College and Hospital, Muzaffarpur, Bihar examined hand hygiene compliance rates among postpartum and post-cesarean section patients. The findings revealed an overall compliance rate of 23%, which falls below the median compliance rate of 30% – 40% reported in a comprehensive review of hand hygiene studies conducted globally [24]. The results of this study exhibit resemblance to a prior investigation carried out at Gitwe Hospital in Rwanda in 2016, when the prevalence of the condition was reported to be 34.1% [22].

Present study assessed the rates of compliance with hand hygiene in relation to the five designated opportunities for hand hygiene as outlined by the World Health Organization (WHO). The results of this study indicate percentages of 24.7%, 20%, 48.6%, 25.2%, and 14.2% in the respective order. In a study conducted in a recognized tertiary hospital in a rural area of India, Chavaliet *al* [25] discovered compliance rates for the 5 moments of hand hygiene to be as follows: 63%, 39%, 93%, 91%, and 50% respectively.

Furthermore, it was observed that the wards were overcrowded with a high patient load, which adversely affected the ability to adhere to appropriate hand hygiene practices. The study documented the practice of a single physician conducting rounds in a department comprising of around 50-60 patients who had undergone both normal deliveries and cesarean sections. This finding is reminiscent of a study conducted by the All India Institute of Medical Sciences (AIIMS) in New Delhi, India. The study discovered that the burden experienced by healthcare professionals in the pediatric intensive care unit had a

negative impact on their adherence to hand hygiene protocols [26]. The results of our study indicate a pressing requirement to address the constraints of water, sanitation, and hygiene (WASH) infrastructure within the ward. Additionally, it is crucial to enhance access to hand hygiene for healthcare professionals (HCPs) and guardians.

In addition, our observations revealed that even healthcare personnel who engaged in hand hygiene did not adhere to the recommended hand washing technique as outlined by the World Health Organization (WHO). Additionally, the research team noted a dearth of exhibited materials pertaining to handwashing within the hospital wards. The maternity wards at Sri Krishna Medical College and Hospital, Muzaffarpur, Bihar were found to lack one of the five key elements of hand hygiene (HH) as recommended by the World Health Organization (WHO), specifically reminders/posters in the workplace.

CONCLUSION

Healthcare professionals (HCPs) demonstrated a commendable level of understanding on the practice of hand hygiene. The frequency of hand washing increased following exposure to bodily fluids. The healthcare facility experienced an excessive patient load, resulting in a suboptimal environment for adhering to proper hand hygiene practices. Additionally, the hand hygiene infrastructures within the facility were inadequately positioned and maintained. The potential impact of consistent glove usage on hand hygiene adherence necessitates further investigation in order to ascertain the underlying reasons for non-compliance with handwashing protocols. The enhancement of hand hygiene compliance necessitates the implementation of the World Health Organization (WHO) and Hospital Improvement Guidelines, as well as the involvement of the Hospital Quality Improvement Team. Additionally, it is crucial to provide consistent performance feedback to the department.

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