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Precaution Practice to Safety Preventive Measure Control among Health-care Providers in Critical Care Units of Al-Anbar Governorate: A Hospital-based Study

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Abstract

AIM: Health-care-associated infections (HAI) are a serious patient safety problem. There are effective preventive practices, but little information on adherence in AL-Anbar hospitals. This study aims to identify the practice association of health-care providers (HCPs) in infection prevention with some sociodemographic characteristics.

METHODS: A cross-sectional observational study was conducted at different three critical areas (critical (or coronary) care unit, respiratory care unit, and intensive care unit) of the three largest hospitals of Fallujah Teaching Hospital, Ramadi Gynecology-Pediatric Hospital, and Ramadi Teaching Hospital in Al-Anbar, Iraq. A prepared questionnaire by the researcher for the study was conducted and involved 9 questions about sociodemographic characteristics and 17 questions about practice characteristics. Chi-square and frequency distribution were used to identify the significance of the variables' association at the $p = 0.05$.

RESULTS: Among 67 health-care providers (HCPs) of the present study, the highest proportion involved were at age 25–29 years with 30 (44.8%) with mean ± SD (28.35 ± 6.2), 71.6% of them were male gender, 32 (47%) of them had a diploma degree in education, and their occupation was rotator nurse 28 (41.8%). Nearly half of 31 (46.3%) of HCPs used all available aseptic techniques. Statistically, a significant association was reported between the practice level and aseptic technique using ($p = 0.032$), respiratory hygiene ($p = 0.01$), and sharp safety engineering and work practice controls ($p < 0.001$).

CONCLUSIONS: Despite the availability of good procedures for HCPs, preferable to make efforts to decrease the minority absence of practice due to little education by continuing training and measurable control on HCPs for better performance in critical areas particularly.

Introduction

A major cause of nosocomial transmission is poor compliance with personal protective behaviors among health-care staff [1], and health-care-associated infections (HAI) are common in hospitalized patients, impacting 7–10% of patients globally. In lower- and middle-income countries, the risk is 15%, with surgical site infection being the most common; in higher-income countries, HAIs affect up to 30% of intensive care unit (ICU) patients who are vulnerable because of underlying comorbidities and immunosuppression, and the presence of invasive catheters and devices [2]. Hospital-acquired infections are the main problems associated with health-care services, and at present, more than 1.4 million people are suffering from hospital-acquired infections worldwide and the risk is 2–20 times higher among developing countries [3]. Infection prevention plays a key role in preventing and reducing the rate of HAIs. HAIs, the most frequent adverse event in health-care worldwide can occur as a part of an endemic or epidemic situation and affect the quality of care of hundreds of millions of patients every year in both developed and developing countries [4]. HAIs can hurt a person's quality of life, possibly shorten their life span, and ultimately cost them a lot of money. According to the World Health Organization, there has been an overall increase in the incidences of HAIs around the world in both developed and developing countries, with an annual average prevalence of about 5–10% of patients. There are now approximately 1.4 million people worldwide suffering from HAIs annually [5], which is considered a health hazard that may be in the form of materials and substances, activities, processes, and conditions present in the work environment that tends to increase the risk of injury or ill health. In other words, it is a potential risk to an individual's health arising from an unhealthy work environment in which one works [6]. Globally, problems emanating from occupational exposures have gained tremendous attention among health-care staff and especially among, especially among nurses, who are often the first-line health-care providers. These problems are often underreported and under-researched in Nigeria probably due to poor motivation and poor demand for research findings

by policymakers. Health providers and other support staff in health-care institutions are subjected to a variety of occupational health hazards [7]. Studies in the field describe this subject, for example, Ilo *et al.*, in Nigeria, Abalkhail and Alsalmah, Geberemariyam *et al.*, Alemayehu *et al.*, in Ethiopia [8], Wahed *et al.*, in Egypt [9], and Haguminshuti *et al.*, in Rwanda in a different way focused generally on this subject [10].

Despite the availability of infection prevention guidelines to protect HCWs, they are not immune to the disease, therefore, this study aimed to assess the practice of health-care providers in critical areas of the Al-Anbar government and identify some associations between the sociodemographic characteristics and the practice level.

Specific objectives

- To determine the practice level of infection prevention among health-care providers.
- To identify the practice association of health-care providers in infection prevention with some sociodemographic characteristics.

Methods and Materials

Study design, period, and setting

This is a hospital-based study, and a cross-sectional descriptive study was conducted among health-care providers at Ramadi Teaching Hospital, Fallujah Hospital, and Ramadi Gynecology-Pediatric from January 2023 to April 2023. All health-care providers working in critical care units who afford care and have direct involvement in patient care were eligible to be included in the study. These providers were rotated doctors and nurses, nurses, and anesthetists' technicians. Individuals who were on annual and maternity leave during data collection time and those who could not respond to the questions due to illness were excluded from the study. A pre-tested structured self-administered questionnaire was used to collect data. The data collection tool was developed by reviewing relevant literature and adapting related studies' content. Data collection was conducted by the researcher's self-administrated questionnaire formed by health-care providers working in the three general hospitals in the Al-Anbar governorates.

Variables and measurements

The dependent variables studied were the practices of health-care providers toward infection prevention, whereas the independent variables include age, gender, occupation, role, educational level, and health-care providers' practice regarding infection prevention was measured by ten "yes or no" questions.

A scoring system was used in which the respondent's correct and incorrect answers provided for the questions were allocated "1" or "0" points, respectively. The health-care providers' infection prevention practice was measured by ten items in which responses were answered on a three-point Likert scale (always or yes, sometimes, and never) options. To analyze the practice, similar procedures have followed; a score of 1 was assigned for each acceptable or correct practice and 0 for unacceptable; hence, the total score of infection prevention practice ranged from 0 to 10. Accordingly, health-care providers' infection prevention practice was classified into two types: Safe (if above the mean) and unsafe (equal to or below the mean).

Designing the questionnaire after presented to a group of experts in the field and changes are done accordingly to attain data on variables comprised related to the research such as sociodemographic profile (age, sex, marital status, education, and occupation), practice-related hygiene of self and pieces of equipment, a pilot study was done, and the final draft of the questionnaire was prepared. The income had been selected accordingly by the European Asylum Support Office [11].

Data analysis

For data entry and analysis, SPSS version 24 was used. Cross-tabulations, frequency distributions, and Chi-square (χ^2) analysis were performed; statistically, the association was significant at $p \leq 0.05$.

Results

This study showed that 67 health-care providers had the highest proportion involved at age 25–29 years with 30 (44.8%) with mean ± SD (28.35 ± 6.2), and the lowest proportion was among 35 years old and over 10 (14.9%). Males (71.6%) represented the highest proportion, 32 (47%) of them had a diploma degree in education, rotator nurse 28 (41.8%) represented the highest involved individuals and the lowest of them represented others 8 (11.9%), their jobs were nurse 36 (53.7%) as highest rate and lowest were doctor 14 (20.9%), the highest rate of the health-care providers was lived with their families by 44 (65.7%) and only 2 (3%) of them lived in a rented house. The highest proportion of them did not have a private car presented at 46 (68.7%). Single health-care providers represented 35 (52.2%) and married were 32 (47.8%), nonsmokers represent the highest proportion of the participants 39 (58.2%), and the lowest proportion reported among ex-smokers 7 (10.4%), and the details are shown in Table 1.

Table 1: Sociodemographic characteristics of the study sample

Variables	Characteristics	n (%)
Age (years)	Mean ± SD	28.35 ± 6.2
	Under 25	18 (26.9)
	25–29	30 (44.8)
	30–34	9 (13.4)
	35 and over	10 (14.9)
Gender	Male	48 (71.6)
	Female	19 (28.4)
Educational level	≥ high school	6 (9.0)
	Diploma	32 (47.8)
	College	29 (43.3)
Occupation	Rotator nurse	28 (41.8)
	Anesthetic	17 (25.4)
	Rotator doctor	9 (13.4)
	Pharmacist	5 (7.5)
	Others	8 (11.9)
Role in hospital	Nurse	36 (53.7)
	Anesthetic	17 (25.4)
	Doctor	14 (20.9)
Homeownership	With family	44 (65.7)
	Owned	21 (31.3)
	Rented	2 (3.0)
Car ownership	Yes	21 (31.3)
	No	46 (68.7)
Marital status	Married	32 (47.8)
	Single	35 (52.2)
Smoking habit	Smoker	21 (31.3)
	Nonsmoker	39 (58.2)
	Ex-smoker	7 (10.4)
Total		67 (100)

SD: Standard deviation

Table 2 shows that both procedures reported the highest proportion of hand hygiene by 62 (92.5%) and only 1 (1.5%) person responded to make it before any procedures. All aseptic techniques against infection were used by the health-care providers with the most rate of recording 31 (46.3%) and 1 (1.5%) did not do anything, respiratory hygiene conducted by 41 (61.2%), and 11 (16.4%) of them did not do this procedure yet. Sharp tools, engineering machines, and work practice control 52 (77.6%) safely by health-care providers, and sometimes, this is performed by only 1 (1.5%) person. 61 (90%) of them made safety and aseptic injection technique procedures and 1 (1.5%) do that sometimes, washing the equipment after-before any procedure was reported among 60 (89.6%), while 7 (10.4%) of them do not do that properly. 27 (40.3%) of the health-care providers have taken vaccines for infectious diseases and 17 (25.4%) of them did not have so, the highest rate of the health-care providers responded by making communication certainly with patients and their relatives and inspecting and monitoring everything after each shift changing by 65 (98.5%) and 1 (1.5%) of them responded by sometimes or did not. 49 (73.1%) of them responded that they monitor patients' wounds and sometimes rate was 6 (9%), the highest proportion of the health-care providers reported checking foley-catheter 54 (80.6%) and others reported sometimes by 5 (7.5%), 45 (67.2%) inspect the endotracheal tube certainly and only 6 (9%) do so sometimes. Monitoring the patient central venous catheterization performances was 56 (83.6%) and sometimes was 3 (4.5%), the highest proportion of the health-care providers responded checking drugs administrated to the patients by 60 (89.6%) and only 2 (3%) do that sometimes.

Table 2: Practice characteristics of the study sample

Variables	Characteristics	n (%)
Hand hygiene practice	After every procedure	4 (6.0)
	Before every procedure	1 (1.5)
	Both procedure	62 (92.5)
Kind of aseptic technique against infection using	Gloves	3 (4.5)
	Mask	3 (4.5)
	Nothing above	1 (1.5)
	Gloves, gown, mask	29 (43.3)
	All the available tools	31 (46.3)
Make respiratory hygiene for the patient	Yes	41 (61.2)
	No	11 (16.4)
	Sometimes	15 (22.4)
Sharp tools, engineering machines, and work practice controls safely	Yes	52 (77.6)
	No	1 (1.5)
	Sometimes	14 (20.9)
Making safety and aseptic injection technique procedures	Yes	61 (91)
	No	5 (7.5)
	Sometimes	1 (1.5)
Wash equipment after-before the procedure	Yes	60 (89.6)
	No	2 (3.0)
	Sometimes	5 (7.5)
Vaccinating against infectious disease	Yes	27 (40.3)
	No	17 (25.4)
	Sometimes	23 (34.3)
Making communication with patients/ relatives	Yes	65 (98.5)
	No	1 (1.5)
	Sometimes	1 (1.5)
Inspecting and monitoring everything after each shift changing	Yes	65 (97)
	No	1 (1.5)
	Sometimes	1 (1.5)
Monitoring the patient's wounds	Yes	49 (73.1)
	No	12 (17.9)
	Sometimes	6 (9.0)
Monitoring the patient's foley-catheter	Yes	54 (80.6)
	No	8 (11.9)
	Sometimes	5 (7.5)
Monitoring patient endotracheal tube	Yes	45 (67.2)
	No	16 (23.9)
	Sometimes	6 (9.0)
Monitoring the patient central venous catheterization	Yes	56 (83.6)
	No	8 (11.9)
	Sometimes	3 (4.5)
Monitoring the patient drug administration equipment	Yes	60 (89.6)
	No	5 (7.5)
	Sometimes	2 (3.0)
Total		67 (100)

The present study showed that the highest rate of health-care providers' involvement was those working at morning shift 30 (44.8%) and the lowest rate was among those working at night 4 (6%) time, the majority proportion of health-care providers involved was in Fallujah Teaching Hospital by 24 (35.8%) and lowest proportion was in Ramadi Teaching Hospital by 21 (31.3%); finally, when the perception taken from health-care providers about their satisfaction with the current job the majority responded positively by 50 (74.6%) and only 3 (4.5%) denied this perception, the details illustrated in Table 3.

Table 3: Some variables related to the study sample characteristics

Variables	Characteristics	*n* (%)
Shift period	Morning	30 (44.8)
	Afternoon	9 (13.4)
	Night	4 (6.0)
	24 h	24 (35.8)
Hospital working place	Fallujah teaching	24 (35.8)
	Ramadi gynecology-pediatric	22 (32.8)
	Ramadi teaching	21 (31.3)
Satisfaction with current job type	Yes	50 (74.6)
	No	14 (20.9)
	Sometimes	3 (4.5)
Total		67 (100)

According to Table 4, among 62 health-care providers, the highest proportion involved in hand hygiene was those who graduated with a diploma degree and statistically, there was a non-significant association between the education level and the practice of health-care providers (p = 0.87). Statistically, using an aseptic technique to protect against infection was significantly (p = 0.32) associated

Table 4: Practice association characteristics and the educational level of the study sample

Variables related to the practice	Educational level				p
	≤ high school, n (%)	Diploma, n (%)	College, n (%)	Total, n (%)	
Making hand hygiene					
After every procedure	0	2 (50)	2 (50)	4 (100)	0.875
Before every procedure	0	0	1 (100)	1 (100)	
Both procedure	6 (9.7)	30 (48.4)	26 (41.9)	62 (100)	
Use an aseptic technique to protect against infection					
Gloves	0	1 (33.3)	2 (66.7)	3 (100)	0.032
Mask	0	0	3 (100)	3 (100)	
Nothing above	0	0	1 (100)	1 (100)	
Gloves, gown, mask	4 (13.8)	16 (55.2)	9 (31)	29 (100)	
All the available tools	2 (6.5)	15 (48.4)	14 (45.2)	31 (100)	
Making respiratory hygiene for the patient					
Yes	5 (12.2)	25 (61)	11 (26.8)	41 (100)	<0.001
No	1 (9.1)	4 (36.4)	6 (54.5)	11 (100)	
Sometimes	0	3 (20)	12 (80)	15 (100)	
Sharp safety engineering and work practice controls					
Yes	3 (5.8)	24 (48)	25 (48.2)	50 (100)	0.01
No	0	3 (100)	0	3 (100)	
Sometimes	3 (21.4)	7 (50)	4 (28.6)	14 (100)	
Making a safety injection technique in procedures					
Yes	4 (9.8)	31 (50.8)	24 (39.3)	59 (100)	0.183
No	0	0	5 (100)	5 (100)	
Sometimes	2 (0.0)	1 (100)	0	3 (100)	
Washing equipment after – before the procedure hygienically					
Yes	5 (10)	32 (53.3)	21 (36.7)	58 (100)	0.037
No	0	0	3 (100)	3 (100)	
Sometimes	1 (0.0)	0	5 (100)	6 (100)	
Vaccinated against infectious diseases					
Yes	2 (11.1)	9 (33.3)	15 (55.6)	26 (100)	0.034
No	2 (11.8)	9 (52.9)	6 (35.3)	17 (100)	
Sometimes	2 (4.3)	14 (60.9)	8 (34.8)	24 (100)	
Making communication and response to patients?					
Yes	6 (9.1)	32 (48.5)	28 (42.4)	66 (100)	0.43
Sometimes	0	0	1 (100)	1 (100)	
Inspect and monitor everything after each shift change					
Yes	6 (9.4)	32 (50)	26 (40.6)	64 (100)	0.076
No	0	0	1 (100)	1 (100)	
Sometimes	0	0	2 (100)	2 (100)	
Monitoring patient's wounds					
Yes	6 (12.5)	24 (50)	18 (37.5)	48 (100)	0.053
No	0	5 (41.7)	7 (58.3)	12 (100)	
Sometimes	0	3 (42.9)	4 (57.1)	7 (100)	
Monitoring the patient's foley-catheter					
Yes	6 (11.3)	24 (50.9)	19 (37.7)	53 (100)	0.038
No	0	3 (37.5)	5 (62.5)	8 (100)	
Sometimes	0	2 (33.3)	4 (66.7)	6 (100)	
Monitoring the patient's endotracheal tube					
Yes	2 (4.5)	23 (52.3)	19 (43.2)	44 (100)	0.443
No	4 (18.8)	6 (37.5)	7 (43.8)	17 (100)	
Sometimes	0	3 (50)	3 (50)	6 (100)	
Monitoring the patient's central venous catheterization					
Yes	5 (8.9)	31 (55.4)	20 (35.7)	56 (100)	0.032
No	1 (12.5)	0	7 (87.5)	8 (100)	
Sometimes	0	1 (33.3)	2 (66.7)	3 (100)	
Monitoring the patient drug administration equipment					
Yes	5 (8.5)	32 (54.2)	22 (37.3)	59 (100)	0.029
No	1 (16.7)	0	5 (83.3)	6 (100)	
Sometimes	0	0	2 (100)	2 (100)	
Total				67 (100)	

with the educational level of the respondents, among 31 health-care providers with diplomas (48.4%) and followed by university (45.2%) graduated persons more involved in this job than others. Among 41 health-care providers making respiratory hygiene for the patient about 60% of them done by whom have diploma degrees and statistically, a significant association was reported between them ($p < 0.001$), among 50 health-care providers who conduct sharp safety engineering and work practice controls the highest proportion was equally among those graduating from the university by 96.2% and statistically, a significant association report between the education level and practice ($p = 0.01$). Finally, 59 respondents were positive about monitoring the patient drug administration equipment 54.2% of diploma graduates reported they do; statistically, a significant association was revealed between them ($p = 0.029$).

Discussion

The present study was conducted in the Al-Anber governorates in three critical areas (critical (or coronary) care unit [CCU], respiratory care unit [RCU], ICU) of the three largest hospitals of Fallujah Teaching Hospital, Ramadi Gynecology-Pediatric Hospital, and Ramadi Teaching Hospital. The present study showed that the highest proportion of health-care providers was between the ages of 25–29 years old, this study agreed with a study in Northwest Ethiopia [12] that showed the same result between the age of 26–30 years old among 236 health-care providers, this study revealed that nearly half of the health-care providers were graduated from medical institutes which represented a high proportion as representative of the samples. Our results reported that the highest proportion of the

type using aseptic techniques against infectious control were gloves, face masks and gowns and this result was in agreement with another study among 215 HCWs in Karongi-Rwanda with knowledge, attitude and practices (KAP) study by Haguminshuti *et al*., [13].

This study showed that many health-care providers had good practices with hand hygiene before and after any procedure. This study agreed with another study in Kenya among 168 respondents, including laboratory technologists, clinical officers, nurses, and cleaners [14]. Another study reported that more than two-thirds (68.7%) of HCWs wash their hand earlier assessing patients [15] in Ethiopia, this difference is because they have different lifestyles with different health systems, besides the department occupation type, the rules, and the decision-making impact on this subject.

Another study in Nigeria of Enugu assessed the knowledge and practices of HCWs [7] and showed the response always and often of this subject by an equal proportion. In disagreement with our finding a study in three Brazilian hospitals showed a low assessment of hand hygiene practice [16] because the contradiction is due to the method of collecting data which was an observational study as compared to our findings.

This study showed that there was a significant association between the educational level of the health-care providers and some practices, for instance, using aseptic techniques ($p = 0.032$), respiratory hygiene ($p < 0.001$), sharp safety engineering-work practice ($p = 0.01$), washing equipment during the procedure ($p = 0.037$), vaccination against infectious diseases ($p = 0.034$), monitoring the patient's foley-catheter ($p = 0.038$), monitoring the patient's central venous catheterization ($p = 0.032$), and monitoring the patient drug administration ($p = 0.029$).

These results were somehow in agreement with a study conducted to identify and compare the effects of two education programs for infection control of 62 undergraduate third-stage nurse students which revealed that education had a strong impact on health-care providers to increase the ability of infection control ($p < 0.001$), the etiquette of respiratory ($p < 0.001$), and providers safety ($p < 0.001$) [17].

Another study [18] disagreed with our finding and stated that statistically, there was not any significant association between the effect of educational programs on the practices of health-care providers immediately and after a month ($p = 0.284$) and even receiving training about infection Taghrir *et al*. [19] found no significant association between protective behaviors and having received an education; Nour *et al.* [20] reported a non-significant increase in protective practices in control ($p = 0.190$) at the Hemodialysis Unit, Alexandria Fever Hospital for post-training; and Shigayeva *et al.* [21] found that an infection control training was a significant predictor of compliance with recommended behaviors. Qualitative evidence suggested that staff felt that their prior training and education were not useful in dealing with the rapidly changing nature of emerging infectious disease outbreaks. Participants themselves believed that inadequate training was a barrier to compliance and that infection control training with annual refresher courses would benefit them [1].

This study in general showed good practice yet, in our opinion, all of these variables should be perfectly responded to by HCPs as a result of the work location obligation necessity to do so.

The present study agreed with another study [22] in Minia/Egypt pre/post-quasi-experimental design in pediatric hemodialysis units at Minia University and Minia General Hospitals and showed another point which pointed out that education and educational programs will affect wearing gloves, administration of injectable drugs, and total nurses' practices against infectious control ($p = 0.001$). Finally, a study in the Karongi district in Rwanda showed a significant association between the education level (high school = 0.061 and university = 0.035) and the practices of HCPs [13]. Finally, to our knowledge, the most applicable decision-making that works perfectly to decrease any conflict in the critical area is the implementation of clinical practice guidelines in public health and artificial intelligence.

Due to the time, access, facilities, hospital routine, attendance, and instructions, all health-care providers were not included in the study, for that reason, the study relied on a sampling of the population for the study. With a known population of 78, a sample size of 67 was used for this study.

Conclusions

This study showed that statistically, a significant association was reported between the practices of HCPs and using aseptic technique against infectious diseases, respiratory hygiene, keeping sharp equipment safe and sterilized, and vaccinating against diseases. Despite the availability of good procedures for HCPs, preferable to make efforts to decrease the minority absence of practice due to little education by continuing training and measurable control on HCPs for better performance in critical areas particularly.

Recommendations

A new strategy, continuing efforts, and scheduled training to increase knowledge and attitudes that affect the practices besides more particular studies about this subject are recommended.

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Ethics Approval

The approval from the ethical committee of the Al-Qalam University College was completed, besides the oral approval from each health-care provider was taken as informed consent.

Authorship Contributions

All the process of the present study was completed by the researcher.

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