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# Assessment of Nurses' Knowledge and Attitude Regarding Infection Control Measures in Critical Care Units

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**Abstract:** Infection control measures are crucial in critical care units to prevent healthcare-associated infections and ensure patient safety. Nurses play a vital role in implementing these measures, making their knowledge and attitudes towards infection control essential for effective practice. Study aims to assess nurses' knowledge regarding basic life support /cardiopulmonary resuscitation among nursing professionals and to design a proposed training program for nurses working in Al-Najaf Teaching Hospital in their training needs. A descriptive cross-sectional study design was conducted at Al-Najaf city in the southern region of Iraq in Al-Sadder Medical City and AL-Hakeem Teaching Hospital from January 28th, 2024, to April 28th, 2024, in order to assess the nurses' knowledge and attitudes regarding infection control methods in critical care units. The methodological strategies for data collection used a needs assessment questionnaire survey methodology. In the present study, an assessment of nurses' knowledge concerning infection control measures revealed a moderate level of understanding. Furthermore, an evaluation of their attitudes towards infection control measures demonstrated a positive outlook among the nursing staff within the Critical Care Units (CCUs). Most nurses were aged 26-30, had College of Nursing education, and urban residence. With  $\leq 5$  years of CCU experience, they showed moderate knowledge influenced by workload. Positive attitudes towards infection control were observed.

**Keywords:** Infection Control; Attitudes; Critical Care Units

## 1. Introduction

Today, the growing increase in health care-associated infections (HAIs) is considered one of the most important challenges facing health care systems worldwide (Hesaraki et al., 2021). Nosocomial infections, also known as healthcare associated infections or hospital acquired infections, are infections that a patient acquires either during hospitalization or soon after discharge from the hospital (Neelam et al., 2023), that first appear 48 h or more after hospital admission or within 30 days after discharge following in patient care (Revelas, 2012). Healthcare-associated infection (HCAIs) are problematic for both patients and health-care professionals as they result in prolonged hospital stays, increased resistance of micro-organisms to antimicrobial agents and additional financial burden for the health system and patients (Thandar et al., 2021). The risk of acquiring Healthcare-associated infections (HAIAs) can reach the healthcare worker as they deal directly with patients during their daily clinical duties. For instance, during their daily routine they can get blood borne pathogens such as hepatitis B, hepatitis C and HIV from needle stick injuries or the direct exposure to human secretions and blood (Sadoh et al., 2006). Infection prevention and control (IPC) is a practical, evidence-based approach preventing patients and health workers from being harmed by avoidable infections (Baral, 2022). Infection control standard precautions include certain measures such as hand hygiene, sharps

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safety, staff health, use of personal protective equipment (PPE), equipment safety, single use policy, waste Introduction Chapter one management and environmental cleaning. Many infection control measures, such as appropriate hand hygiene and the correct application of basic precautions during invasive procedures are simple and of low-cost, but require staff accountability and behavioral change, in addition to improving staff education, reporting and surveillance systems (Bouallègue et al, 2013). These measures can significantly reduce the incidence of healthcare-associated infections (HAIs) such as central line-associated bloodstream infections (CLABSIs), ventilation-associated pneumonia (VAP), and catheter-associated urinary tract infections (CA-UTIs) (Tuma et al., 2023). Adherence to infection prevention and control measures is crucial in preventing these infections, and nurses play a key role in implementing these measures (Bangani, 2023; Sodhi et al., 2023). Nurses are exposed to hospital infections to varying extents, and these infections can be dangerous. Factors such as nurse understaffing, limited work experience, and biological risks contribute to the development of hospital infections (Koskinen and Virtanen, 2023). Infection control (IC)/prevention is the responsibility of critical care nurses, and represents an integral element of patients' safety programmes (Royal College of Nursing RCN, 2012). Therefore, adequate nursing staff is necessary because a higher patient-to nurse ratio increases the risk of nosocomial infection (Hugonnet, Chevrolet, & Pittet, 2007). The nurses should have professional and ethical responsibilities to make sure that their knowledge and skills regarding infection control are up-to-date and they practice safely and competently at all times (Royal College of Nursing, 2012). Therefore, critical care nurses should have sound knowledge and strict adherence to infection control standard precautions (Eskander et al., 2013). Studies indicate that inadequate workers' knowledge and environment related problems, including the lack of protective materials other equipment and utilities required to ensure safety of HCWs is a crucial issue that need urgent attention (A Moran and Onwube, 2013). Although the Intensive Care Units (ICUs) account for fewer than 10% of total beds in most hospitals, more than 20% of all nosocomial infections are acquired in ICUs and carry substantial morbidity, mortality, and expense (UluKilic et al ., 2013). The most common clinically significant infections observed in the ICU are intravascular catheter-related bloodstream infection (CR-BSI), ventilator associated pneumonia (VAP), and catheter associated urinary tract infection (CA-UTI) (Burillo and Burillo, 2014). Patients in ICUs are particularly susceptible to healthcare-associated infections (HAIs) due to factors like invasive procedures, immunosuppression, and underlying conditions (Blot et al., 2022). Nurses can play a role in transmission of HAIs, with studies suggesting a link between inadequate adherence to standard precautions and increased infection rates (Donati et al ., 2019). due to knowledge and attitude of the critical care nurses significantly affects their practices for infection control, it becomes imperative for the hospitals to ensure that the nurses have a good level of knowledge and positive attitude for infection control (Kaushal et al ., 2015).

### **Study Significance**

Hospital-acquired infections (HAI) or healthcare-associated infections (HCAI) represent prevalent complications of hospital stays and pose a substantial global challenge, posing a serious risk to patients' well-being and survival. The ongoing efforts to combat these infections are crucial given their significant economic impact and the elevated rates of morbidity and mortality associated with them (Kenetra, 2013). The management of infection control and prevention plays a crucial role in safeguarding the well-being of both nurses and patients across healthcare facilities. Nosocomial infections pose a significant challenge to healthcare systems and patients, as reported by the World Health Organization (WHO) in 2011. WHO indicated that the prevalence of patients experiencing at least one infection is approximately (7%) in developed countries and (15%) in low and middle-income countries, with an associated mortality rate of around (10%) (StorT et al., 2017). The nursing team plays a crucial role in executing infection control and prevention strategies. Therefore, educating nurses, healthcare professionals, and patients

on infection control measures is fundamental in preventing or decreasing healthcare-associated infections (HCAs). Employing proper infection control practices like hand hygiene, personal protective equipment (PPE), and employing aseptic techniques (disinfection and sterilization) for ventilator tubing circuits, intravenous (IV) catheters, and urinary catheters, and surgical instruments assist in lowering and preventing of HCAs (Smeltzer et al., 2010) Assessing nurses' knowledge and attitudes towards infection control in CCUs can identify training needs and support ongoing professional development to ensure adherence to best practices {singh2023assessing This will reduce mortality and morbidity, thereby saving more lives for the patients in need of Critical health care.(Malombe, 2015).

## 2. Materials and Methods

### Study Design:

A descriptive cross-sectional study design was conducted at Al-Najaf city in the southern region of Iraq in Al-Sadder Medical City and AL-Hakeem Teaching Hospital from January 28th, 2024, to April 28th, 2024, in order to assess the nurses' knowledge and attitudes regarding infection control methods in critical care units. The methodological strategies for data collection used a needs assessment questionnaire survey methodology.

### Population and Study Sample:

A Non-probability (convenience) sample of (100) nurses who work who work in critical care units at Al-Sadder Medical City and Al-Hakeem Teaching Hospital were included in the study.

### Data collection tool

A questionnaire was constructed by the researcher to measure the variables of interest. The final study instrument consisting of three parts : the first part is the demographic data, the second part is the instrumental Assessment of Nurses' Knowledge toward Infection Control Measures Scale, and the third part is the instrumental Nurses' Attitude toward Infection control Scale.

Further, internal consistency was analyzed by calculation of Cronbach's alpha. Data was collected over a period of 20 days to allow participants the opportunity to respond at their convenience. The researcher used a survey created using Survey google form. Only subjects who consented to participate in the survey were given access to the survey in Google form.

### Statistical methods

The data analysis process entailed using Statistical Package for Social Sciences computer software to categorize information in graphs and charts that SPSS created. Statistical analysis was performed using Statistical Package for Social Sciences version 20 for Windows (SPSS Inc., Chicago, IL, USA). Descriptive statistics were used to present the demographic data and patterns of answers to the different questionnaire items; categorical variables were presented as frequency and percentage, whereas numerical ones were presented as mean  $\pm$  standard deviation (S.D). Chi-Square test ( $X^2$ ) to test independency distribution of observed frequencies, and for measuring the association between the studies variables according to its type, and P-value  $\leq 0.05$  was considered statistically significant.

### 3. Results

**Table (1).** The Demographic characteristic of the study sample for Assessment of Nurses' Knowledge and Attitude Regarding Infection Control Measures in Critical Care Units

Demographic Data	Freq.	%	
Age Groups (Years)	<= 25	36	36
	26 – 30	47	47
	31 – 35	7	7
	36 and More	10	10
Gender	Males	51	51
	Females	49	49
Level of Education	Nursing preparatory school	10	10
	Nursing Institute	29	29
	College of Nursing	54	54
	Postgraduate	7	7
Place of Residence	Urban	90	90
	Rural	10	10
Experience (work) in CCUs (Years)	<= 5	74	74
	6 – 10	22	22
	11 and More	4	4
Exposure to infection while working	Yes	42	42
	No	58	58
Do you have training courses on preventing the spread of infection	Yes	70	70
	No	30	30
Number of training sessions	<= 2	48	68
	3 – 5	19	27
	6 and More	3	4
<b>Total</b>	<b>100</b>	<b>100%</b>	

Table (1) shows that most Nurses (47%) were in the age group (26-30) years. In addition, most Nurses (51%) were males, Furthermore, most nurses had level of education of College of Nursing (54%) and residence in urban area (90%). Regarding Experience (work) in CCUs, it was clear that the majority (74%) of study sample were <= 5 years. For Exposure to infection while working, it was clear that (42%) of the sample exposed to infection. Finally, the present study revealed that the majority of nurses (70%) had training course for about <=2 (68%).

**Table (3-2).** The Mean scores of each items for Assessment of Nurses' Knowledge Regarding Infection Control Measures in CCU (n=100):

Assessment of Nurses' Knowledge	Freq.	%	MS	SD	Assess.	
<b>Question 1</b> Which item would the nurse remove first when removing personal protective equipment? A) Mask. <b>B) Gloves.</b> C) Face shield. D) Gown.	<b>Incorrect</b>	58	58	.42	.50	<b>Moderate</b>
	<b>Correct</b>	42	42			
<b>Question 2</b>	<b>Incorrect</b>	67	67	.33	.47	<b>Poor</b>

Most health care-associated infections are transmitted to patients: <b>A) from the hands of health care workers.</b> B) from dirty washrooms. C) from hospital food. D) By touching surfaces like doorknobs and bedrails.	<b>Correct</b>	33	33			
<b>Question 3</b> when should you dispose of a plastic disposable apron? A) At the end of each shift. B) Every hour. <b>C) Between caring for each patient.</b> D) After it's been washed once.	<b>Incorrect</b>	43	43	.57	.50	<b>Moderate</b>
	<b>Correct</b>	57	57			
<b>Question 4</b> What is the recommended duration for effective hand washing? A) 5 seconds. B) 2-3 minutes. <b>C) 15-20 seconds.</b> D) for As long as you feel it is appropriate.	<b>Incorrect</b>	77	77	.23	.42	<b>Poor</b>
	<b>Correct</b>	23	23			
<b>Question 5</b> Anatomical/Pathological waste shall be kept in: <b>A) Red bags.</b> B) Yellow bags. C) Black bags. D) Blue bags.	<b>Incorrect</b>	64	64	.36	.48	<b>Moderate</b>
	<b>Correct</b>	36	36			
<b>Question 6</b> Which is acceptable if recapping a needle is necessary? A) Two-handed recapping technique. <b>B) One-handed "scoop" technique.</b> C) Relying on double gloves. D) Never recap a needle.	<b>Incorrect</b>	51	51	.49	.50	<b>Moderate</b>
	<b>Correct</b>	49	49			
<b>Question 7</b> The first step after a needlestick or sharps injury is to A) inject antiseptics or disinfectants into the wound. B) Apply ice directly to the wound.	<b>Incorrect</b>	63	63	.37	.49	<b>Moderate</b>
	<b>Correct</b>	37	37			

C) gently wash the exposed area with soap and water without scrubbing. <b>D) Squeeze the wound to encourage bleeding.</b>						
<b>Question 8</b> The single most important way to control the spread of infection is by: A) Disinfecting equipment and surfaces. B) Covering the mouth and nose when sneezing and coughing. <b>C) hand washing.</b> D) Wearing glove.	<b>Incorrect</b>	82	82	.18	.39	<b>Poor</b>
	<b>Correct</b>	18	18			
<b>Question 9</b> All hazardous medical waste - except anatomical/pathological waste - shall be disposed of in: A) Red bags. <b>B) Yellow bags.</b> C) Black bags. D) sharp container.	<b>Incorrect</b>	62	62	.38	.49	<b>Moderate</b>
	<b>Correct</b>	38	38			
<b>Question 10</b> When using personal protective equipment (PPE), a healthcare provider should perform hand hygiene? A) Before donning PPE . B) After PPE removal . <b>C) Both a and b .</b> D) None of the above because gloves are a substitute for performing hand hygiene.	<b>Incorrect</b>	35	35	.65	.48	<b>Moderate</b>
	<b>Correct</b>	65	65			
<b>Question 11</b> What are the benefits of performing alcohol-based hand rub when hands are not visibly soiled? A) Takes less time . B) Less drying to hands . <b>C) More effective than soap and water when hands are not visibly soiled .</b> D) Removes all bacteria and viruses.	<b>Incorrect</b>	66	66	.34	.48	<b>Moderate</b>
	<b>Correct</b>	34	34			
<b>Question 12</b>	<b>Incorrect</b>	73	73	.27	.45	<b>Poor</b>

Which of the following is NOT part of standard infection control precaution practice? <b>A) placing a patient in an isolation room .</b> B) washing hands with soap and water C) disposing of sharps in a sharps container D) managing a blood or body fluid spillage.	<b>Correct</b>	<b>27</b>	<b>27</b>			
<b>Question 13</b> The most common means of spreading infection are: A) Soiled instruments . B) Infected patients . <b>C) Human hands .</b> D) Domestic animals.	<b>Incorrect</b>	<b>78</b>	<b>78</b>	<b>.22</b>	<b>.42</b>	<b>Poor</b>
	<b>Correct</b>	<b>22</b>	<b>22</b>			
<b>Question 14</b> What is the minimum % alcohol that Alcohol-based hand rub (like Purell) should contain ? A) 30%. B) 75%. <b>C) 60%.</b> D) 100%.	<b>Incorrect</b>	<b>75</b>	<b>75</b>	<b>.25</b>	<b>.44</b>	<b>Poor</b>
	<b>Correct</b>	<b>25</b>	<b>25</b>			

MS: mean of scores ( $\leq .33$ ) as (Poor); mean of scores (.34 - .67) as (Moderate); and ( $\geq .68$ ) as (Good); SD: Standard deviation.

Table (2) shows the assessment (mean of scores) of each items of Nurses' Knowledge Regarding Infection Control Measures in Critical Care Units; it reveals that the assessment of all items were (Moderate). This assessment is based on the statistical scoring system that indicates the total mean of scores ( $\leq .33$ ) as (Poor); mean of scores (.34 - .67) as (Moderate); and ( $\geq .68$ ) as (Good).

**Table (3).** The Mean scores of overall items for Assessment of Nurses' Knowledge Regarding Infection Control Measures in Critical Care Units (n=100):

Assessment of Nurses' Knowledge		Freq.	%	MS	SD	Assess.
Knowledge	Poor	41	41	.36	.13	Moderate
	Moderate	59	59			
	Good	0	0			

MS: mean of scores ( $\leq .33$ ) as (Poor); mean of scores (.34 - .67) as (Moderate); and ( $\geq .68$ ) as (Good); SD: Standard deviation.

Table (.3) shows the assessment (mean of scores) of overall items of Nurses' Knowledge Regarding Infection Control Measures in Critical Care Units; it reveals that the assessment of overall items were (Moderate). This assessment is based on the statistical scoring system that indicates the total mean of scores ( $\leq .33$ ) as (Poor); mean of scores (.34 - .67) as (Moderate); and ( $\geq .68$ ) as (Good).

**Table (4).** The Mean scores of each items for Assessment of Nurses' attitude Regarding Infection Control Measures in CCU (n=100):

Assessment of Nurses' attitude		Freq	%	MS	SD	Assess
1-I think it must put used needles on the bed, beside the patient before disposing it into sharp-bins.	I agree	24	24	1.76	.43	Positive
	Disagree	76	76			
2-I think that sharps containers should not be placed in clinical waste bags.	I agree	24	24	1.76	.43	Positive
	Disagree	76	76			
3-I think it should to Report any needle sticks or sharps injuries immediately.	I agree	79	79	1.79	.41	Positive
	Disagree	21	21			
4-I think it should Do not recap needles.	I agree	24	24	1.24	.43	Negative
	Disagree	76	76			
5-I feel confident in ability to identify and segregate different types of waste correctly.	I agree	77	77	1.77	.42	Positive
	Disagree	23	23			
6-I think alcohol-based hand rub (ABHR) is effective against all types of germs, including bacteria, viruses, and fungi.	I agree	60	60	1.40	.49	Negative
	Disagree	40	40			
7-I think I should hand wash/use hand-sanitizer before wearing gloves.	I agree	82	82	1.82	.39	Positive
	Disagree	18	18			
8-I think gloves should be changed between contacts of different patients.	I agree	88	88	1.88	.33	Positive
	Disagree	12	12			
9-I think should wear masks when conducting procedures that are likely to generate splashes of blood, body fluids, secretions or excretions.	I agree	82	82	1.82	.39	Positive
	Disagree	18	18			
	I agree	32	32	1.68	.47	Positive

10-It is difficult to work wearing Personal protective equipment.	<b>Disagree</b>	<b>68</b>	<b>68</b>			
11-Infection control measures is not easy to follow.	<b>I agree</b>	<b>34</b>	<b>34</b>	<b>1.66</b>	<b>.48</b>	<b>Positive</b>
	<b>Disagree</b>	<b>66</b>	<b>66</b>			
12-I tend to compromise on standard donning and doffing practice when my colleagues/other healthcare workers do not follow the proper way of donning and doffing of Personal protective equipment.	<b>I agree</b>	<b>24</b>	<b>24</b>	<b>1.76</b>	<b>.43</b>	<b>Positive</b>
	<b>Disagree</b>	<b>76</b>	<b>76</b>			
13-I think that Standard method of donning and doffing of Personal protective equipment can be modified based on convenience.	<b>I agree</b>	<b>44</b>	<b>44</b>	<b>1.56</b>	<b>.50</b>	<b>Positive</b>
	<b>Disagree</b>	<b>56</b>	<b>56</b>			
14-I am willing to take extra time to ensure that I am following infection control protocols correctly.	<b>I agree</b>	<b>73</b>	<b>73</b>	<b>1.73</b>	<b>.45</b>	<b>Positive</b>
	<b>Disagree</b>	<b>27</b>	<b>27</b>			

MS: mean of scores ( $\leq 1.5$ ) as (Negative); and ( $> 1.5$ ) as (Positive); SD: Standard deviation

Table (4) shows the assessment (mean of scores) of each items of Nurses' attitude regarding Infection Control Measures in Critical Care Units; it reveals that the assessment of Most items were (Negative). This assessment is based on the statistical scoring system that indicates the total mean of scores ( $\leq 1.5$ ) as (Negative); and ( $> 1.5$ ) as (Positive).

**Table (5).** The Mean scores of overall items for Assessment of Nurses' attitude Regarding Infection Control Measures in Critical Care Units (n=100):

<b>Assessment of Nurses' attitude</b>		<b>Freq</b>	<b>%</b>	<b>MS</b>	<b>SD</b>	<b>Assess.</b>
Attitude	Positive	83	83	1.68	.11	Positive
	Negative	17	17			

Table (5) shows the assessment (mean of scores) of overall items of Nurses' attitude regarding Infection Control Measures in Critical Care Units; it reveals that the assessment of overall items were (Positive). This assessment is based on the statistical scoring system that indicates the total mean of scores ( $\leq 1.5$ ) as (Negative); and ( $> 1.5$ ) as (Positive).

**Table (6).** Relationship between Assessment of Nurses' Knowledge Regarding Infection Control Measures in Critical Care Units and their demographic Data using Chi-square statistical test:

Demographic Data		Knowledge						Chi-square (df)	P-value (Sig.)
		Poor		Moderate		Good			
		Freq.	%	Freq.	%	Freq.	%		
Age Groups (Years)	<= 25	18	43.90	18	30.51	0	0	5.703 (3)	.127 NS
	26 - 30	16	39.02	31	52.54	0	0		
	31 - 35	1	2.44	6	10.17	0	0		
	36 and More	6	14.63	4	6.78	0	0		
Gender	Males	23	56.10	28	47.46	0	0	.723 (1)	.395 NS
	Females	18	43.90	31	52.54	0	0		
Level of Education	Nursing preparatory school	5	12.20	5	8.47	0	0	2.577 (3)	.462 NS
	Nursing Institute	13	31.71	16	27.12	0	0		
	College of Nursing	22	53.66	32	54.24	0	0		
	Postgraduate	1	2.44	6	10.17	0	0		
Place of Residence	Urban	37	90.24	53	89.83	0	0	.005 (1)	.946 NS
	Rural	4	9.76	6	10.17	0	0		
Experience (work) in CCUs (Years)	<= 5	31	75.61	43	72.88	0	0	.448 (2)	.799 NS
	6 - 10	9	21.95	13	22.03	0	0		
	11 and More	1	2.44	3	5.08	0	0		
Exposure to infection while working	Yes	15	36.59	27	45.76	0	0	.836 (1)	.360 NS
	No	26	63.41	32	54.24	0	0		
Do you have training courses on preventing the spread of infection	Yes	29	70.73	41	69.49	0	0	0.018 (1)	.894 NS
	No	12	29.27	18	30.51	0	0		
Number of training sessions	<= 2	34	82.93	44	74.58	0	0	.986 (2)	.611 NS
	3 - 5	6	14.63	13	22.03	0	0		
	6 and More	1	2.44	2	3.39	0	0		

Abbreviations: df= degree of freedom; NS=non-significant.

Table (6) shows that there is non-significant relationship between Assessment of Nurses' Knowledge Regarding Infection Control Measures in Critical Care Units and their demographic Data; All p-values were more than 0.05.

**Table (3-7).** Relationship between Assessment of Nurses' Attitude Regarding Infection Control Measures in Critical Care Units and their demographic Data using Chi-square statistical test:

Demographic Data		Attitude				Chi-square (df)	P-value (Sig.)
		Negative		Positive			
		Freq.	%	Freq.	%		
Age Groups (Years)	<= 25	31	37.35	5	29.41	.501 (3)	.919 NS
	26 - 30	38	45.78	9	52.94		
	31 - 35	6	7.23	1	5.88		
	36 and More	8	9.64	2	11.76		
Gender	Males	45	54.22	6	35.29	2.022 (1)	.155 NS
	Females	38	45.78	11	64.71		
Level of Education	Nursing preparatory school	9	10.84	1	5.88	2.338 (3)	.505 NS
	Nursing Institute	26	31.33	3	17.65		
	College of Nursing	42	50.60	12	70.59		
	Postgraduate	6	7.23	1	5.88		
Place of Residence	Urban	74	89.16	16	94.12	.386 (1)	.534 NS
	Rural	9	10.84	1	5.88		
Experience (work) in CCUs (Years)	<= 5	62	74.70	12	70.59	.235 (2)	.889 NS
	6 - 10	18	21.69	4	23.53		
	11 and More	3	3.61	1	5.88		
Exposure to infection while working	Yes	37	44.58	5	29.41	1.332 (1)	.248 NS
	No	46	55.42	12	70.59		
Do you have training courses on preventing the spread of infection	Yes	57	68.67	13	76.47	.408 (1)	.523 NS
	No	26	31.33	4	23.53		
Number of training sessions	<= 2	64	77.11	14	82.35	.684 (2)	.710 NS
	3 - 5	16	19.28	3	17.65		
	6 and More	3	3.61	0	.00		

Abbreviations: df= degree of freedom; NS=non-significant.

Table (3-7) shows that there is non-significant relationship between Assessment of Nurses' Attitude Regarding Infection Control Measures in Critical Care Units and their demographic Data; All p-values were more than 0.05.

#### 4. Discussion

##### Part-I: Discussion of the Demographic Characteristics:

The results of the current study indicate that slightly over two-fifths of the sample were aged between (26-30) years old, Over half of the sample was comprised of participants from those who had obtained a bachelor's degree in nursing, similar to this study is a study done in Palestinian the results demonstrate that nearly two thirds of the

studied sample aged between 20 to 30 years old, More than half of the sample had bachelor's degree in nursing (Ayed, A. 2015).

The current study demonstrates a near-even gender distribution among nurses, with 51% male and 49% female participants. This balanced representation enables a comprehensive exploration of how gender might impact attitudes and behaviors concerning infection control measures in Critical Care Units (CCUs). Another study conducted by (Radzak et al., 2021) reported that more than half of the respondents were female, comprising 62.2% of the participant population. A research conducted by (Omer & Saleh, 2023) revealed that males accounted for more than half of the sample population the majority of nurses (90%) resided in urban areas, while 10% resided in rural areas. This distribution of nurses' residence aligns with previous research findings that have also shown a higher concentration of healthcare professionals, including nurses, in urban settings due to better access to healthcare facilities, professional opportunities, and infrastructure

Moreover, three-quarters of the nurses had work experience of five years or less, while a smaller proportion had experience ranging from six to ten years, and only a small fraction had more than eleven years of experience in CCUs. A similar study by (Kaushal et al., 2015) found that a significant portion of nurses in their sample also had relatively limited work experience in critical care settings, with the majority having less than five years of experience. This trend of nurses having varying levels of experience in CCUs is consistent with findings from previous research in the field.

It was observed that approximately two-fifths of the sample of nurses were exposed to infection while working in Critical Care Units (CCUs), while the remaining three-fifths reported no exposure to infection. This finding highlights the occupational risks that nurses face in critical care units, emphasizing the importance of robust infection control measures to protect healthcare workers.

It was noted that approximately three-quarters of the sample of nurses had undergone training courses on preventing the spread of infection while working in

Critical Care Units (CCUs). This indicates a positive aspect where the majority of nurses have undergone specific training in infection control practices. A study by (Ahmed & Okab, 2022) reported a similar trend, with substantial proportion of critical care nurses receiving training on infection prevention strategies. The emphasis on training courses aligns with the importance of continuous education and skill development in maintaining high standards of infection control in healthcare settings. These results disagreed with the findings of a study by (Uchenna et al., 2015) that revealed that most participants (65.5%) did not receive training courses in infection control.

## **Part-II: Discussion of the Nurses' Knowledge:**

The research findings regarding the assessment of nurses' knowledge on infection control measures in Critical Care Units (CCUs) revealed a moderate level of understanding among the participants. This study utilized a statistical scoring system where mean scores falling between .34 and .67 were categorized as "Moderate." The results indicated that the nurses demonstrated a moderate level of knowledge in various aspects related to infection control in CCUs, this results may be due to most of the study sample are newly appointed and not have enough experience about this topic and nurses in CCUs often have heavy workloads, which may limit their time for continuous education and training on infection control.

The current results supported by the study (Miah et al., 2023) showed moderate knowledge regarding infection control measures based on the assessment of various items related to infection control measures. On the other hand, in a study

conducted by (Omer & Saleh, 2023), the results of this study disagreed with the current study, which showed that most nurses had good knowledg. Another study by

(Kartufan et al., 2022) The result of this study indicated that knowledge and awareness of HCAs among ICUs nurses were not at a desired level.

### **Part-III: Discussion of the Nurses' Attitude:**

The assessment of overall items of nurses' attitudes regarding infection control measures in CCUs was positive preventing the positive assessment of overall items of nurses' attitudes towards infection control measures in Critical Care Units (CCUs) was evidenced by a total mean of scores ( $> 1.5$ ). This positive outlook may be attributed to the recognition of the importance of infection control in preventing healthcare-associated infections, enhancing patient safety, and promoting a culture of safety within healthcare facilities.

Consistent with the current study, previous research by (Kaushal et al., 2015) demonstrated a positive attitude towards infection control measures, with 89% of participants exhibiting a good attitude. Similarly, a study conducted by (Naderi et al., 2017) at a tertiary university hospital also indicated a favorable attitude among healthcare professionals towards infection control practices. These findings align with the positive assessment of nurses' attitudes towards infection control measures in Critical Care Units (CCUs) observed in the current study, highlighting a common trend of favorable attitudes towards infection prevention and control within healthcare settings.

In contrast, findings from a study by (Bangani et al., 2023) revealed that nurses' attitudes towards infection control measures in Intensive Care Units (ICUs) were generally negative. This attributed to factors such as limited training opportunities, time constraints, and shortages of personal protective equipment (PPE). These challenges influenced nurses' practices despite having moderate levels of knowledge in infection control. The study highlights the impact of external factors on nurses' attitudes and practices related to infection control measures in healthcare settings.

### **Part-IV: Relationships between Nurses' Knowledge; Attitudes and the Sociodemographic data:**

The study results reveal that statistically no relationships were found between nurses' knowledge; attitudes regarding infection control and their socio-demographic variables. That agreement with studies conducted in Federal Republic of Nigeria (Ogoina et al., 2015), also the eastern province of the KSA (Elsherbeny et al., 2018).

## **5. Conclusion**

The study found that most nurses in the sample were in the age group of (26-30) years. A significant proportion of nurses had a level of education from the College of Nursing and resided in urban areas. In addition, the majority of nurses had work experience of  $\leq 5$  years in CCUs, and a considerable percentage had been exposed to infections while working. Furthermore, a high percentage of nurses had undergone training courses on infection control measures, with most having  $\leq 2$  training sessions.

The research findings revealed a moderate level of knowledge among the participants, as indicated by mean scores falling within the "Moderate" category. This suggests that nurses demonstrated a reasonable understanding of various aspects related to infection control in CCUs.

Additionally the moderate level of knowledge observed in the study may be attributed to factors such as the relatively limited experience of the sample population and the heavy workloads often faced by nurses in CCUs, which may limit their time for continuous education and training on infection control. Finally, the positive attitudes observed among participants underscore the importance of prioritizing infection control practices in healthcare facilities.

## **Recommendations**

Participation in education programs can enhance nurses' understanding of infection control measures in Critical Care Units (CCUs) and serve as a source of motivation for knowledge development and to enhance nurses' positive attitudes towards infection control measures.

Besides, nurses in Critical Care Units (CCUs) should seize the opportunity for ongoing education and training, to maintain their knowledge and skills.

Furthermore, the need for adequate allocation of resources to support nurses in maintaining a safe environment. Addressing shortages of personal protective equipment (PPE) and essential infection control tools is critical and providing regular updates on best practices and guidelines to help improve nurses' competency in implementing effective infection control protocols.

Creating a standardized tool for regular assessment of nurses' knowledge and skills in Critical Care Units (CCUs) can enhance monitoring and evaluation processes.

And assigning and disseminating a handbook containing infection control strategies to all nurses in Critical Care Units (CCUs) can facilitate knowledge sharing and implementation of best practices.

## **Study Limitations**

The chosen participants may not have been an adequate sample size to be generalized to the larger population. Further studies should be pursued with a larger population sampling and possibly more detailed questions to assess nurses' knowledge and attitudes regarding infection control measures in critical care units. Further research should be conducted to obtain a broader spectrum of the nursing population to determine if these problems were unique to the hospital or if they were generalized problems across the nursing spectrum. Future studies may need to be conducted through hospitals and clinic centres and possibly through surveys in these areas.

## **Ethical considerations**

The researcher obtained an approval from the Faculty of Nursing / University of Kufa to conduct the study, also another permission is obtained from Al-Najaf Al-Ashraf Health Directorate/ Al-Sadder Medical City and Al-Hakeem Teaching Hospital , in order to interviewing each subject. And finally, subjects' agreement also obtained from the nurses themselves after the researcher explained the purpose of the study to them; sought informed consent; and offered a respect to participants confidentiality as well as making the participation voluntary, to answer the questionnaire items

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## **Conflicts of interest**

The author declares no conflict of interest to declare for publication

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