Nurses' Knowledge, Attitudes, Practice, And Decision-Making Skills Related to Sepsis Management, in Saudi Arabia

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Abstract

Background: Sepsis remains a major global health issue with high mortality rates and significant healthcare burdens. Nurses play a vital role in early detection and management, yet gaps in knowledge, attitudes, and practices (KAP) persist, affecting adherence to evidence-based guidelines. This study assesses critical care nurses' KAP and decision-making skills in sepsis management. Aim: to assess critical care nurses' knowledge, attitudes, and decision-making skills regarding sepsis management. Methods: A cross-sectional survey was conducted among 100 critical care nurses in Jeddah, Saudi Arabia, using a self-administered questionnaire. Knowledge was evaluated through multiple-choice questions, while attitudes and practices were assessed via a Likert scale. Statistical analyses examined correlations between KAP variables. Results: knowledge was significantly higher among male nurses ($p < 0.001$), non-Saudis ($p = 0.002$), and those with a bachelor's degree ($p = 0.009$). In contrast, attitudes were significantly associated with the nurses' position in the hospital ($p = 0.031$), where charge nurses had the highest scores. Additionally, practice scores were significantly higher among non-Saudi nurses ($p = 0.003$). Conclusion: Despite high adherence to guidelines, knowledge and attitudinal gaps remain. Most of the participants level of knowledge between weak and average regarding sepsis management. In the same line participants' attitude towards management of sepsis ranged between weak and average. Recommendations: Educational interventions, including simulation-based training and interdisciplinary workshops, are essential to enhance competency. Future research should evaluate long-term educational impacts on clinical decision-making.

Keywords: Nurses' knowledge, attitudes, practice, decision-making, sepsis management, critical care, clinical decision-making.

Sepsis is a pressing global health concern, contributing to high morbidity and mortality rates worldwide. As highlighted by Rababa et al. (2022), sepsis remains a major cause of death, requiring urgent medical intervention and adherence to evidence-based guidelines. Critical care units face considerable challenges due to the extensive consumption of healthcare resources required for sepsis management. In their study, Chua et al. (2023) emphasized the financial

burden associated with sepsis treatment, noting that hospital expenses for sepsis patients in the United States alone exceed $24 billion annually.

Sepsis is often triggered by viral, bacterial, or fungal infections, with renal conditions being among the most common underlying causes. According to Goulart et al. (2019), early identification of infection sources and appropriate antimicrobial therapy are crucial in preventing sepsis-related complications. It involves a complex interplay of inflammatory responses that compromise tissue integrity and lead to hemodynamic disturbances, ultimately resulting in inadequate tissue perfusion for vital organs. Nucera et al. (2018) also highlighted the systemic inflammatory response syndrome (SIRS) as a key factor contributing to organ dysfunction in septic patients.

The consequences of sepsis extend beyond physiological impairments to include psychological and economic burdens. Organ dysfunctions such as acute renal failure, acute respiratory distress syndrome, and cardiac dysrhythmias, including atrial fibrillation, are frequently observed. Hamad et al. (2024) emphasized that organ dysfunction in sepsis significantly increases patient mortality, reinforcing the need for early intervention. Additionally, sepsis is associated with psychological sequelae like anxiety, depression, and post-traumatic stress disorder. As noted by Edwards and Jones (2021), the psychological impact of sepsis extends to both patients and their families, necessitating comprehensive support systems.

The complexity of sepsis necessitates the implementation of structured nursing interventions, such as sepsis care bundles, which encompass essential resuscitation measures. These include intravenous fluid administration, oxygen therapy, antibiotic treatment, low-dose steroid therapy, insulin administration, blood glucose monitoring, blood culture collection, lactate measurement, and vasopressor support. As highlighted by Bleakley and Cole (2020),and Yo Lin (2021) they adherence to sepsis care bundles significantly reduces mortality rates and improves patient outcomes.

Intensive care unit (ICU) nurses play a pivotal role in the early detection and management of sepsis, ensuring prompt implementation of sepsis protocols and facilitating early resuscitation efforts. Harley et al. (2019) underscored the importance of nurses' role in sepsis recognition, stating that timely screening and intervention directly impact survival rates. The establishment of nurse-led sepsis response teams has demonstrated efficacy in reducing mortality rates, minimizing ICU stay durations, and lowering readmission rates. Michiel Schinkel et al (2022) further emphasized that well-trained nurses contribute to better adherence to sepsis protocols, ultimately improving patient prognosis.

Managing sepsis is inherently challenging and demands early identification, appropriate infection control measures, and timely interventions to address hemodynamic instability and organ dysfunction. In their study, Kabil et al. (2021) discussed the challenges faced by emergency nurses in implementing sepsis protocols, particularly in resource-limited settings. Given its severity, sepsis and septic shock are considered critical nursing emergencies requiring immediate resuscitation and intervention. According to Masood et al. (2023), timely implementation of evidence-based sepsis interventions leads to a significant reduction in ICU admissions and mortality rates.

Recognizing the profound impact of sepsis underscores the necessity for heightened awareness among healthcare professionals to facilitate early detection and timely management. Intensive care nurses, given their frontline role, must be adept at conducting initial assessments, identifying potential sepsis cases, and executing prompt interventions to mitigate clinical deterioration. Nakiganda et al. (2022) highlighted that targeted education programs for ICU nurses can enhance their ability to identify and manage sepsis effectively. Chua et al. (2023) further emphasized that nurses must undergo

targeted training to enhance their competency in sepsis identification and intervention.

The 2018 Surviving Sepsis Campaign (SSC) guidelines advocate for the completion of sepsis care bundles within one hour of diagnosis, a recommendation aimed at improving patient outcomes by expediting treatment. Umemura et al. (2022) found that adherence to the Hour-1 Bundle significantly reduced in-hospital mortality among sepsis patients in Japan. The concept of care bundles is rooted in the integration of multiple evidence-based interventions, which, when implemented collectively, yield superior clinical outcomes compared to isolated therapeutic measures. As noted by Harley et al. (2021), integrating structured sepsis care pathways within hospital protocols leads to more consistent and effective sepsis management.

Sepsis patients typically present with symptoms such as altered mental status, systolic blood pressure below 100 mmHg, respiratory rates exceeding 22 breaths per minute, cold and pale extremities, and abnormal body temperature fluctuations accompanied by chills and palpitations. According to Storozuk et al. (2019), recognizing these early warning signs is essential for initiating timely treatment and preventing deterioration. In cases of septic shock, patients require vasopressor support to maintain systolic blood pressure above 65 mmHg and exhibit elevated lactate levels. Valičević et al. (2021) reported that nurses who received specialized sepsis training were more adept at identifying critical signs and responding effectively.

Given the critical nature of sepsis, ICU nurses must possess sound clinical decision-making skills. The effectiveness of their decision-making directly influences patient outcomes. Ismail et al. (2021) found that nurses with higher levels of sepsis-related knowledge demonstrated better decision-making capabilities, leading to improved patient care. Research has identified multiple factors affecting nurses' clinical decisions, including prior experience, institutional protocols, work environment, and nurse-to-patient ratios. Yousefi et al. (2012) also found that structured training programs significantly enhance nurses' ability to make accurate clinical decisions regarding sepsis management.

Decision-making among nurses generally follows two approaches: analytical and intuitive. Analytical decision-making involves a structured, step-by-step approach based on logical reasoning. Conversely, intuitive decision-making relies on experience and pattern recognition but may lead to inconsistencies or errors if not supplemented by evidence-based guidelines. Carmean et al. (2015) suggested that a combination of analytical and experience-based decision-making enhances nurses' ability to manage sepsis effectively. Rababa et al. (2022) asserted that while intuition alone cannot guarantee sound decision-making, integrating accumulated knowledge with evidence-based practices can significantly enhance nursing competency in sepsis management.

Several studies have underscored the necessity of enhancing sepsis care through structured and frequent educational initiatives. Proposed educational methods include in-service lectures, seminars, e-learning platforms, case discussions, clinical mentorship by physicians, and simulation-based training. Wei et al. (2022) highlighted that nurses who participated in continuous education programs exhibited greater confidence and proficiency in managing sepsis. Additionally, many healthcare institutions have advocated for the establishment of hospital-wide sepsis workflows and protocols, incorporating sepsis management algorithms, screening tools, and escalation strategies to guide nurses in optimal patient care. Bleakley and Cole (2020) emphasized that standardized protocols ensure consistency in sepsis care across different hospital units.

Furthermore, the concept of "nursing independence" in sepsis management has been highlighted, emphasizing the importance of empowering ward nurses to initiate early sepsis interventions within their scope of practice. The

role of dedicated sepsis resource nurses has been proposed to enhance awareness and effectiveness in sepsis detection and management. Öztürk Birge et al. (2022) highlighted that sepsis resource nurses improve early detection rates and promote adherence to treatment protocols. Chua et al. (2023) also emphasized the importance of interdisciplinary collaboration, urging physicians to actively consider nurses' assessments and concerns regarding patient conditions. The aim of this was to study to assess critical care nurses' knowledge, attitudes, and decision-making skills regarding sepsis management.

Methods

The research used a quantitative cross-sectional descriptive design to assess critical care nurses' knowledge, attitudes, and decision-making skills regarding sepsis management. The study was conducted in the critical care units of government hospitals in Jeddah, KSA. The target population comprised all critical care nurses working in these settings. A convenient sample of 120 nurses from critical care areas was selected for participation in the study. The inclusion criteria encompassed both Saudi and non-Saudi nurses of any gender who were willing to participate in the study.

A self-administered electronic questionnaire served as the primary data collection tool. It was structured into two main sections. The first section gathered sociodemographic characteristics, including gender, age, marital status, qualifications, job role, years of experience, and prior training related to sepsis management. The second section assessed participants' knowledge, attitudes, practices, and decision-making skills concerning sepsis management. The knowledge component consisted of three key questions, with responses scored as follows: a correct answer received 2 points, an incorrect answer received 0 points, and responses indicating uncertainty were assigned 1 point. Additionally, 18 multiple-choice questions were included, with correct responses receiving 1 point and incorrect responses receiving 0 points, leading to a total possible score of 18.

The scoring system classified knowledge levels as follows: a good level (≥70%), an average level (60-69%), and a poor level (<60%). To evaluate performance, attitudes, and decision-making, 12 questions were included based on a Likert scale. Attitudes were measured using a five-point Likert scale, with response options ranging from "Strongly Disagree" to "Strongly Agree." The practice assessment used responses such as "Always," "Sometimes," "Occasionally," "Rarely," and "Never." Decision-making was evaluated through a single question that determined whether the respondent exhibited an analytical or intuitive orientation in their decision-making approach.

Ethical considerations were carefully addressed throughout the study. Institutional Review Board (IRB) approval was obtained to ensure adherence to ethical research standards. Participants provided informed consent after receiving comprehensive information regarding the study's purpose, procedures, and benefits. The voluntary nature of participation was emphasized, and individuals were assured of their right to withdraw at any time without affecting their professional standing or patient care responsibilities. Confidentiality, anonymity, and participant safety were upheld throughout the research process. The validity of the research instrument was assessed using the Content Validity Index (CVI), evaluated by four experts in the field of critical care nursing. Necessary modifications were implemented based on expert recommendations to ensure the tool's accuracy and relevance. Reliability testing was conducted using Cronbach's alpha to measure the internal consistency of the instrument. The reliability assessment determined the degree to which items measuring the same construct produced consistent results. The statistical reliability coefficient was calculated to ensure the robustness of the measurement tool.

Results

The study included a total of 100 nurses, with the majority being female (94.0%), while only 6.0% were male. The largest proportion of participants (53.0%) were between 26-35 years old, followed by those aged 36-45 years (42.0%), while only 4.0% were under 25 years, and a single participant (1.0%) was 56 years or older. Regarding nationality, 70.0% of the participants were Saudi, whereas 30.0% were non-Saudi. In terms of marital status, 54.0% were married, and 46.0% were single (Table 1).

Concerning educational qualifications, the majority (73.0%) held a bachelor's degree, while 17.0% had a master's degree, and 10.0% possessed a diploma. The distribution of work experience indicated that 36.0% of the participants had 11-15 years of experience, while 20.0% had more than 16 years. Additionally, 20.0% had 6-10 years of experience, 19.0% had 1-5 years, and only 5.0% had less than one year of experience. The majority of participants (74.0%) worked as registered nurses (RN), while 13.0% were charge nurses and another 13.0% held head nurse positions. Notably, 61.0% of participants reported receiving training on sepsis, whereas 39.0% had not attended such training (Table 1).

Table 1: Sociodemographic Characteristics of the Participants

Characteristic	Category	Frequency (%)
Age - years	<25	4 (4.0)
	26-35	53 (53.0)
	36-45	42 (42.0)
	56≤	1 (1.0)
Gender	Female	94 (94.0)
	Male	6 (6.0)
Nationality	Saudi	70 (70.0)
	Non-Saudi	30 (30.0)
Marital Status	Single	46 (46.0)
	Married	54 (54.0)
Qualification	Diploma	10 (10.0)
	Bachelor	73 (73.0)
	Master	17 (17.0)
Years of Experience - years	1 ≥ 5	5 (5.0)
	1-5	19 (19.0)
	6-10	20 (20.0)
	11-15	36 (36.0)
	>16	20 (20.0)
Position in Hospital	Registered Nurse (RN)	74 (74.0)
	Charge Nurse	13 (13.0)
	Head Nurse	13 (13.0)
Training on Sepsis	No	39 (39.0)
	Yes	61 (61.0)

The results in Table 2 indicated that most nurses (60.0%) correctly identified sepsis as the body having a severe reaction to an infection. However, 35.0% believed it to be an infection occurring in a specific part of the body, and 5.0% mistakenly thought it was a disease that spreads rapidly from person to person.

Regarding sepsis symptoms, 48.0% of participants incorrectly identified slow heart rate as a symptom, whereas confusion (32.0%) and fever/chills (20.0%) were also selected. Most participants (77.0%) correctly identified altered mental status as a sign of severe sepsis, while only 17.0% chose dry skin and 6.0% selected polyuria. When asked about sepsis severity criteria, 74.0% correctly recognized the presence of two or more systemic inflammatory response syndrome (SIRS) criteria, while hypoglycemia and elevated procalcitonin were each selected by 13.0% of participants.

For initial sepsis management, 55.0% of participants correctly identified antibiotic therapy as the first step, while 26.0% selected intravenous fluid resuscitation, and 19.0% chose airway management. Additionally, 47.0% recognized urine output as a key indicator of fluid resuscitation success, while 34.0% focused on vital signs, and 19.0% considered the Glasgow Coma Scale (GCS) (Table 2).

Table 2: Distribution of Nurses' Knowledge & Management Regarding Sepsis

Question	Response	N (%)
What is sepsis?	The body has a really bad reaction to an infection	60 (60.0%)
	An infection that occurs usually in a part of the body	35 (35.0%)
	Disease that can spread rapidly from person to person	5 (5.0%)
All of the following are signs of sepsis EXCEPT	Fever or feeling chills	20 (20.0%)
	Confusion	32 (32.0%)
	Slow heart rate	48 (48.0%)
Severe sepsis may be manifested as	Altered mental status	77 (77.0%)
	Dry skin	17 (17.0%)
	Polyuria	6 (6.0%)
A patient meets severe sepsis criteria if they have the following:	Hypoglycemia	13 (13.0%)
	2 or more SIRS criteria	74 (74.0%)
	Elevated procalcitonin	13 (13.0%)
By Bundles of care sepsis, one can expect to see	Cough management	25 (25.0%)
	Hypotension management	54 (54.0%)
	Increased urine output management	21 (21.0%)
What is the first step in the initial management of a suspected sepsis patient?	Antibiotic therapy	55 (55.0%)
	Intravenous fluid resuscitation	26 (26.0%)
	Airway management	19 (19.0%)
How can you establish whether appropriate fluid resuscitation has been achieved in sepsis? A Patient	Check vital signs, especially body temperature	34 (34.0%)
	Indicated by urine output of > 0.5 to 1 mL/kg/hour	47 (47.0%)
	Monitoring the level of concentration and GCS	19 (19.0%)
How much fluid is recommended in the management of sepsis and hypotension using the sepsis guidelines?	Administration of 100 mL/kg crystalloids	55 (55.0%)
	Administration of 30 mL/kg crystalloids	25 (25.0%)
	Administration of 60 mL/kg crystalloids	20 (20.0%)
What lactate level would warrant a critical value report?	7 mmol/L	27 (27.0%)
	≥ 4 mmol/L	66 (66.0%)
	< 2 mmol/L	7 (7.0%)
Within how many hours should blood cultures be obtained and the first antibiotics administered?	Administering antibiotics within 4 hours	25 (25.0%)
	Administering antibiotics within 2 hours	30 (30.0%)
	Administering antibiotics within 1 hour	45 (45.0%)
Assuming you are following protocol with physician order included and the patient has a patent central line IV, the most important intervention to immediately initiate after recognizing a sepsis patient is	Draw 2 sets of blood cultures	59 (59.0%)
	Place Foley Catheter	13 (13.0%)
	Start broad-spectrum antibiotics	28 (28.0%)
If fluid resuscitation alone is insufficient to restore hemodynamic stability, the nurse would anticipate starting	Angiogenesis inhibitors	17 (17.0%)
	Norepinephrine	69 (69.0%)
	Amikacin	14 (14.0%)
The APACHE II score is	It describes a person's awareness and understanding	21 (21.0%)
	To assess disease severity & predict the risk of death	57 (57.0%)
	It describes the patient's response during the evaluation	22 (22.0%)
When should the APACHE II score be applied?	Within 48 hours of admission to ICU	40 (40.0%)
	After 24 hours of admission to ICU	24 (24.0%)
	Within 24 hours of admission to ICU	36 (36.0%)

Significance of qSOFA score	Identify patients with suspected infection and greater risk outside the ICU	53 (53.0%)
	Used to describe the level of consciousness	31 (31.0%)
	To determine the sedation level and measure the severity of agitation	16 (16.0%)
All the parameters used in assessing sepsis patients using the qSOFA EXCEPT	Glasgow Coma Scale (GCS) <15	39 (39.0%)
	Body Temperature	38 (38.0%)
	Systolic blood pressure ≤ 100 mmHg	23 (23.0%)
Is there a test for sepsis?	Yes	60 (60.0%)
	No	22 (22.0%)
	I don't know	18 (18.0%)
The most common sites of infection among patients with sepsis are	Abdominal tract	14 (14.0%)
	Respiratory tract	67 (67.0%)
	Skin and soft tissue	19 (19.0%)

When assessing nurses' knowledge scores, Table 3 revealed that nearly half of the participants (48.0%) had an average knowledge level, while 44.0% had weak knowledge, and only 8.0% had high knowledge. The mean knowledge score was 9.16 ± 3.23, ranging from 2 to 17 points, with a statistically significant association ($p < 0.001$).

Table 3: Distribution of Nurses' Knowledge & Management for Initial Sepsis Management

Knowledge Score	**N (%)**	**Range**	**Mean ± SD**
Weak	44 (44.0%)	2-17	9.160 ± 3.228
Average	48 (48.0%)		
High	8 (8.0%)		
Total	**100 (100.0%)**		
X^2	**29.12**		
P-value	**<0.001***		

The findings in Table 4 demonstrated that 70.0% of participants agreed that screening patients for sepsis is part of their role ($p < 0.000$). Similarly, 67.0% felt confident in screening for sepsis, although 18.0% strongly agreed, and 25.0% remained neutral. Moreover, 64.8% of the participants agreed that they would escalate a sepsis case to a physician or critical care outreach team ($p < 0.000$), while 62.0% believed they were responsible for initiating and completing the sepsis compliance bundle.

Regarding workload concerns, 60.2% agreed that adequate staffing is necessary for following sepsis guidelines, while 57.6% reported a lack of time to follow sepsis protocols. Additionally, 62.2% of participants prioritized sepsis guidelines over other tasks, and 54.8% acknowledged that prescribing delays occur in sepsis cases ($p < 0.000$) (Table 4).

Table 4: Distribution of Nurses' Attitudes Related to Sepsis Management

Statement	**Strongly Disagree**	**Disagree**	**Neutral**	**Agree**	**Strongly Agree**	**% Agreement**	**X^2**	**P-value**
Screening patients for sepsis is part of my role	13	9	15	41	22	70.0%	32.000	0.000
I am confident in screening patients for sepsis	12	11	25	34	18	67.0%	18.500	0.001
If I had a sick patient, I would escalate to a doctor or Critical Care Outreach to perform a sepsis screen	10	14	29	36	11	64.8%	27.700	0.000

It is part of my role to decide when to initiate and complete the sepsis guidelines compliance bundle	14	11	37	27	11	62.0%	26.800	0.000
There is adequate staffing for me to carry out sepsis guidelines on septic patients within 1 hour	8	21	39	26	6	60.2%	36.900	0.000
I often do not have enough time to perform sepsis guidelines within an hour	12	26	28	30	4	57.6%	26.000	0.000
I prioritize carrying out sepsis guidelines on a septic patient over other tasks	12	15	33	30	10	62.2%	22.900	0.000
There is often a delay in prescribing when patients are in sepsis	15	27	32	21	5	54.8%	22.200	0.000

When evaluating attitudes toward sepsis, Table 5 showed that 51.0% of nurses had an average attitude score, 28.0% had high attitudes, and 21.0% had weak attitudes. The mean attitude score was 24.93 ± 7.43 within a range of 8 to 40, with a statistically significant difference ($p < 0.001$).

Table 5: Distribution of Nurses' Attitudes Towards Sepsis Management

Attitude Score	N (%)	Range	Mean ± SD
Weak	21 (21.0%)	8-40	24.93 ± 7.431
Average	51 (51.0%)		
High	28 (28.0%)		
Total	**100 (100.0%)**		
X^2	**14.78**		
P-value	**<0.001***		

According to Table 6, 81.8% of nurses reported following sepsis guidelines within an hour, with 64.8% frequently initiating fluid resuscitation and 83.2% administering broad-spectrum antibiotics within the first hour. Additionally, 84.2% began crystalloid resuscitation when indicated, and 83.0% re-measured lactate levels within 2-4 hours.

Table 6: Distribution of Nurses' Practice Related to Sepsis Management

Practice Item	Never	Rarely	Occasionally	Sometimes	Always	% Agreement	X^2	P-value
Do you carry out sepsis guidelines on sepsis patients within 1 hour?	1	10	11	35	43	81.8%	64.800	0.000
Do you give broad-spectrum antibiotics after cultures are withdrawn within the first 1 hour of sepsis being identified?	1	6	14	34	45	83.2%	70.700	0.000
Do you begin rapid crystalloid fluid resuscitation if hypotensive or lactate ≥4mmol/L within 1 hour?	0	5	20	24	51	84.2%	44.080	0.000
Do you re-measure lactate level within 2-4 hours if initial lactate level is elevated?	2	4	13	39	42	83.0%	73.700	0.000

As detailed in Table 7, nurses' practice scores varied, with 78.0% having a high practice score, 18.0% at an average level, and 4.0% showing weak practice. The mean practice score was 16.61 ± 3.12, ranging from 7 to 20, with a statistically significant difference ($p < 0.001$).

Table 7: Distribution of Nurses' Practice Related to Sepsis Management

Practice Score	N (%)	Range	Mean ± SD
Weak	4 (4.0%)	7-20	16.610 ± 3.127
Average	18 (18.0%)		
High	78 (78.0%)		
Total	**100 (100.0%)**		
X^2	**92.72**		
P-value	**<0.001***		

As presented in Table 8, a significant positive correlation (r = 0.374, p < 0.001) was observed between knowledge and attitudes, indicating that nurses with higher knowledge demonstrated more positive attitudes. Similarly, a significant correlation (r = 0.327, p < 0.001) was found between knowledge and practice, confirming that nurses with higher knowledge had better clinical practice. However, no significant correlation was found between attitudes and practice (r = -0.123, p = 0.221).

Table 8: Matrix Correlation Between Knowledge, Attitudes, and Practices

Correlation	Knowledge	Attitudes
Attitudes	r = 0.374	P-value < 0.001*
Practice	r = 0.327	r = -0.123
	P-value < 0.001*	P-value = 0.221

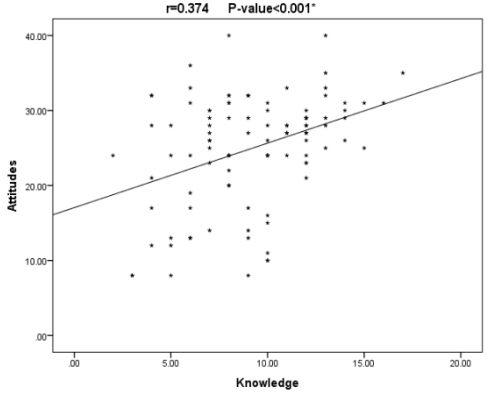

Figure 1: scatterplot for the correlation between knowledge and attitudes level

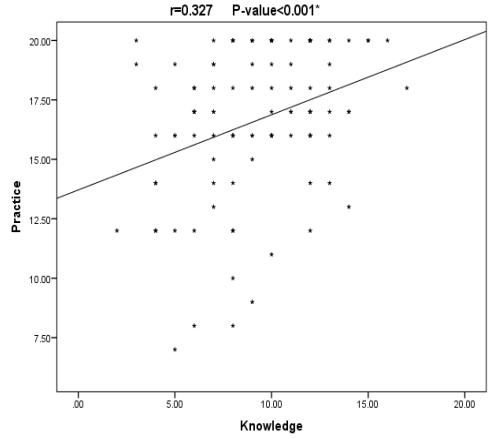

Figure 2: scatterplot for the correlation between knowledge and practice level

In Table 9, knowledge was significantly higher among male nurses (p < 0.001), non-Saudis (p = 0.002), and those with a bachelor's degree (p = 0.009). In contrast, attitudes were significantly associated with the nurses' position in the hospital (p = 0.031), where charge nurses had the highest scores. Additionally, practice scores were significantly higher among non-Saudi nurses (p = 0.003).

Table 9: The Relation Between Knowledge, Attitudes, Practice, and Demographic Data

Variable	Category	Knowledge (Mean ± SD)	P-value (Knowledge)	Attitudes (Mean ± SD)	P-value (Attitudes)	Practice (Mean ± SD)	P-value (Practice)
Age	<25	7.50 ± 2.08	0.246	24.50 ± 11.03	0.944	16.75 ± 4.03	0.714
	26-35	8.91 ± 3.07		24.72 ± 7.46		16.70 ± 3.14	
	36-45	9.52 ± 3.44		25.14 ± 7.31		16.57 ± 3.09	
	≥56	14.00 ± -		29.00 ± -		13.00 ± -	
Gender	Female	8.98 ± 3.24	<0.001*	24.84 ± 7.65	0.160	16.63 ± 3.21	0.824
	Male	12.00 ± 0.89		26.33 ± 1.63		16.33 ± 1.37	
Nationality	Saudi	8.51 ± 3.26	0.002*	24.73 ± 7.22	0.681	16.01 ± 3.00	0.003*
	Non-Saudi	10.67 ± 2.64		25.40 ± 8.01		18.00 ± 3.02	
Marital Status	Single	8.50 ± 3.20	0.059	25.20 ± 7.74	0.743	16.54 ± 3.28	0.845
	Married	9.72 ± 3.18		24.70 ± 7.22		16.67 ± 3.02	
Qualification	Diploma	6.70 ± 2.45	0.009*	25.50 ± 8.45	0.135	15.90 ± 3.73	0.206
	Bachelors	9.70 ± 3.16		25.62 ± 7.02		16.95 ± 3.00	
	Masters	8.29 ± 3.22		21.65 ± 8.13		15.59 ± 3.20	
Years of Experience	≤1	7.80 ± 2.49	0.060	26.00 ± 4.53	0.075	17.40 ± 3.29	0.595
	1-5	8.89 ± 3.09		24.16 ± 7.46		16.95 ± 3.60	
	6-10	8.15 ± 3.05		21.35 ± 8.86		17.35 ± 2.89	
	11-15	10.39 ± 3.38		27.22 ± 6.57		16.19 ± 2.86	
	>16	8.55 ± 2.95		24.85 ± 6.95		16.10 ± 3.40	
Position in the Hospital	Registered Nurse (RN)	9.27 ± 3.33	0.057	25.09 ± 7.02	0.031*	16.61 ± 3.05	0.325
	Charge Nurse	10.31 ± 2.39		28.23 ± 5.78		17.54 ± 3.36	
	Head Nurse	7.38 ± 2.81		20.69 ± 9.52		15.69 ± 3.30	
Training on Sepsis	No	9.59 ± 3.37	0.289	26.18 ± 7.57	0.180	17.21 ± 2.73	0.129
	Yes	8.89 ± 3.13		24.13 ± 7.29		16.23 ± 3.32	

Regarding clinical decision-making (Table 10), nurses' knowledge, attitudes, and practice were assessed based on patient scenarios. However, no significant differences were found among nurses' performance in managing sepsis cases ($p > 0.05$).

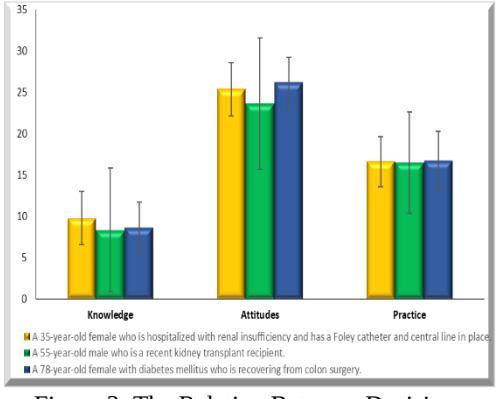

Figure 3: The Relation Between Decision-Making ability and Knowledge, Attitudes, and Practices

Discussion

The findings of this study provide valuable insights into nurses' knowledge, attitudes, and practices related to sepsis management, revealing strengths and gaps that align with and diverge from findings in the existing literature. Comparisons with relevant studies further contextualize these results and highlight areas requiring targeted interventions.

The study found that the majority of participants were female (94.0%), which is consistent with global nursing workforce trends. Rababa et al. (2022) and Chua et al. (2023) similarly reported a predominance of female nurses in their studies on sepsis management. This is reflective of broader workforce patterns

in the healthcare sector, where nursing remains a predominantly female profession.

The age distribution of participants indicated that the majority (95.0%) were between 26-45 years, suggesting that most nurses were in their mid-career phase. This finding is consistent with Ahmed Sayed (2020), who observed that nurses in this age group tend to have greater clinical competence due to accumulated experience. However, the study by Hamad et al. (2024) found that younger nurses (under 30 years) had higher levels of training in sepsis due to recent curricular updates emphasizing early sepsis recognition, suggesting a potential generational gap in training and knowledge acquisition.

Additionally, the study reported that 70.0% of participants were Saudi, while 30.0% were non-Saudi. A significant finding was that non-Saudi nurses had higher knowledge and practice scores ($p = 0.003$), which aligns with the study by Ayyub et al. (2024), where expatriate nurses in Gulf healthcare institutions demonstrated higher adherence to evidence-based guidelines. This may be attributed to differences in pre-employment training or prior work experience in high-resource healthcare settings. Hamad et al. (2024) also emphasized that non-national nurses may receive additional training upon recruitment, contributing to better sepsis management practices.

The study found that 60.0% of nurses correctly identified sepsis as the body's severe reaction to infection, while 35.0% mistakenly believed it to be a localized infection. This gap in knowledge is concerning, as early recognition of sepsis is crucial for timely intervention. Nucera et al. (2018) similarly reported inconsistencies in sepsis knowledge among Italian nurses, with a significant proportion failing to recognize its systemic nature.

Regarding clinical symptoms, nearly half (48.0%) of the nurses incorrectly identified slow heart rate as a symptom of sepsis, while 77.0% correctly recognized altered mental status. This finding aligns with Rababa et al. (2022), who highlighted that misinterpretation of sepsis symptoms is a common barrier to early detection. The study by Chua et al. (2023) also found that while most nurses were familiar with classic sepsis signs, knowledge gaps persisted in differentiating sepsis from other conditions with similar presentations.

When assessing initial sepsis management, 55.0% of participants correctly identified antibiotic therapy as the first step, whereas 26.0% chose intravenous fluid resuscitation, and 19.0% selected airway management. This inconsistency mirrors findings from Umemura et al. (2022), who noted that despite clear guidelines emphasizing the need for early antibiotic administration, many nurses still prioritized fluid resuscitation. The Surviving Sepsis Campaign (SSC) recommends the completion of sepsis care bundles within one hour (Umemura et al., 2022), highlighting the importance of reinforcing evidence-based practices through ongoing education.

The study also revealed that nearly half (48.0%) of nurses had an average knowledge level, while 44.0% had weak knowledge and only 8.0% had high knowledge. These findings are consistent with the systematic review by Rababa et al. (2022), which emphasized that structured training programs significantly improve sepsis knowledge among nurses. Similarly, Chua et al. (2022) found that nurses who underwent targeted training demonstrated higher competency in sepsis recognition and intervention.

The study found that 70.0% of participants agreed that screening for sepsis was part of their role, while 67.0% expressed confidence in performing sepsis screening. However, 25.0% remained neutral, indicating a level of uncertainty or lack of confidence. Chua et al. (2023) similarly reported that nurses' confidence in sepsis management significantly influenced their willingness to take early action. This highlights the importance of reinforcing nurses' self-efficacy through continuous professional development.

Furthermore, 64.8% of nurses agreed that they would escalate a sepsis case to a physician or critical care outreach team. This is in line with the findings of Nucera et al. (2018), who reported that nurses with a positive attitude toward interdisciplinary collaboration were more likely to follow sepsis guidelines effectively. Additionally, 62.0% of participants believed they were responsible for initiating and completing the sepsis compliance bundle, reinforcing the role of nurses as key stakeholders in sepsis management.

Despite positive attitudes, workload constraints were a concern, with 57.6% of nurses reporting insufficient time to follow sepsis protocols. This aligns with Hamad et al. (2024), who found that nurse-to-patient ratios and administrative burdens were significant barriers to implementing sepsis guidelines. Adequate staffing and time allocation are crucial for improving adherence to evidence-based practices.

The study found that 81.8% of nurses reported following sepsis guidelines within an hour, with 83.2% administering broad-spectrum antibiotics within the first hour. These findings are consistent with the study by Chua et al. (2022), which emphasized that adherence to early sepsis intervention protocols significantly improves patient outcomes. Additionally, 84.2% of participants initiated crystalloid resuscitation when indicated, mirroring findings from Umemura et al. (2022), who stressed the importance of timely fluid resuscitation in preventing sepsis progression.

The study also showed that nurses' practice scores were generally high, with 78.0% achieving high practice scores. This is supported by Hamad et al. (2024), who found that perceived facilitators, such as structured protocols and staff training, significantly contributed to better sepsis management practices. However, despite high adherence, challenges such as prescribing delays (reported by 54.8% of participants) were noted, suggesting a need for streamlined communication between nurses and physicians.

The study identified a significant positive correlation between knowledge and attitudes ($r = 0.374$, $p < 0.001$) and between knowledge and practice ($r = 0.327$, $p < 0.001$), indicating that nurses with higher knowledge demonstrated more positive attitudes and better clinical practice. This finding is in line with Chua et al. (2023), who reported that knowledge plays a key role in shaping nurses' attitudes and adherence to sepsis protocols.

However, no significant correlation was found between attitudes and practice ($r = -0.123$, $p = 0.221$). This contrasts with findings from Rababa et al. (2022), who observed that positive attitudes towards sepsis management were associated with higher levels of compliance with clinical guidelines. This discrepancy suggests that while knowledge directly influences practice, attitudes alone may not be sufficient to drive behavioral change, emphasizing the need for structured training and reinforcement strategies.

Conclusion

Despite high adherence to guidelines, knowledge and attitudinal gaps remain. Most of the participants level of knowledge between weak and average regarding sepsis management. In the same line participants' attitude towards management of sepsis ranged between weak and average.

Recommendations

Educational interventions, including simulation-based training and interdisciplinary workshops, are essential to enhance competency. Future research should evaluate long-term educational impacts on clinical decision making. Additionally, healthcare institutions should address barriers such as workload constraints and prescribing delays to optimize sepsis management practices.

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Author Contribution

This study is based on original research conducted by Maram Mohammad Alhazmi under the supervision of Dr. Nagwa Abbas. Maram Mohammad Alhazmi was responsible for study conception, data collection, statistical analysis, and initial manuscript drafting. Dr. Nagwa Abbas provided guidance on study design, contributed to data interpretation, and supervised manuscript revisions. Both authors approved the final version of the manuscript.

Conflict of Interest

The authors declare no conflict of interest regarding the publication of this paper. This study was conducted independently and did not receive any external funding.

Ethical Consideration

This study was conducted in accordance with the ethical principles outlined in the Declaration of Helsinki. Ethical approval was obtained from the Institutional Review Board (IRB) before data collection. Written informed consent was obtained from all participants, ensuring confidentiality, anonymity, and voluntary participation. Participants were informed of their right to withdraw from the study at any time without consequences.

Data Availability

The data supporting the findings of this study are available from the corresponding author upon reasonable request. To protect participant privacy, all data have been anonymized and securely stored in compliance with ethical guidelines.

WORKS CITED

Ahmed Sayed, Z. (2020). Effect of evidence-based sepsis care bundle on patient outcome in medical intensive care unit. Egyptian Journal of Health Care, 11(2), 826–836. https://doi.org/10.21608/ejhc.2020.826836

Ayyub Mohammed.,Joshua George Thomas. Rawad Hodeify and Rawad Hodeify.(2024). An Overview of the Characteristics, Pathogenesis, Epidemiology, and Detection of Human Enterovirus in the Arabian Gulf Region. Viruses 2024, 16, 1187. https://doi.org/10.3390/v16081187.

Bleakley Greg 1, Cole Mark 2. (202). Recognition and management of sepsis: the nurse's role. Br J Nurs. 2020 Nov 26;29(21):1248-1251. doi: 10.12968/bjon.2020.29.21.1248.

Carmean, A., Fortenberry, J. D., McCracken, C., & Hebbar, K. B. (2015). A survey of attitudes and practices regarding steroid supplementation in pediatric sepsis. Pediatric Emergency Care, 31(10), 694–698. https://doi.org/10.1097/PEC.0000000000000522

Chua, W. L., Teh, C. S., Basri, M. A. B. A., Ong, S. T., Phang, N. Q. Q., & Goh, E. L. (2023). Nurses' knowledge and confidence in recognizing and managing patients with sepsis: A multi-site cross-sectional study. Journal of Advanced Nursing, 79(2), 616–629. https://doi.org/10.1111/jan.15518

Edwards, E., & Jones, L. (2021). Sepsis knowledge, skills and attitudes among ward-based nurses. British Journal of Nursing, 30(15), 920–927. https://doi.org/10.12968/bjon.2021.30.15.920

Goulart, L. D. S., Ferreira Júnior, M. A., Sarti, E. C. F. B., Sousa, Á. F. L. D., Ferreira, A. M., & Frota, O. P. (2019). Are nurses updated on the proper management of patients with sepsis? Escola Anna Nery, 23, e20190013. https://doi.org/10.1590/2177-9465-ean-2019-0013

Hamad, D. B., Rababa, M., Mu'ath, I. T., & Abuali, R. (2024). The predictors of perceived barriers and facilitators of applying sepsis six guidelines among critical care nurses. Cureus, 16(3). https://doi.org/10.7759/cureus.31290

Harley, A., Johnston, A. N. B., Denny, K. J., Keijzers, G., Crilly, J., & Massey, D. (2019). Emergency nurses' knowledge and understanding of their role in recognizing and responding to patients with sepsis: A qualitative study. International Emergency Nursing, 43, 106–112. https://doi.org/10.1016/j.ienj.2018.09.003

Harley, A., Massey, D., Ullman, A. J., Reid-Searl, K., Schlapbach, L. J., Takashima, M., & Johnston, A. N. (2021). Final year nursing students' exposure to education and knowledge about sepsis: A multi-university study. Nurse Education Today, 97, 104703. https://doi.org/10.1016/j.nedt.2020.104703

Ismail, M., Aftab, U., Azizi, K., & Khan, B. A. (2021). Knowledge, attitudes, practices, and perceived barriers of emergency health care providers regarding sepsis and septic shock in a tertiary care center: A cross-sectional study.

Kabil, G., Hatcher, D., Alexandrou, E., & McNally, S. (2021). Emergency nurses' experiences of the implementation of early goal-directed fluid resuscitation therapy in the management of sepsis: A qualitative study. Australasian Emergency Care, 24(1), 67–72. https://doi.org/10.1016/j.auec.2020.06.003

Masood, S. M., Khattab, M. A., Negm, E. M., & Alfakharany, M. M. A. (2023). Impact of an educational program on physicians' and nurses' knowledge and performance in management of sepsis in the intensive care unit. The Egyptian Journal of Hospital Medicine, 91(1), 4349–4356. https://doi.org/10.21608/ejhm.2023.168114

Michiel Schinkel, Prabath W B Nanayakkara , W Joost Wiersinga. (2022). Sepsis Performance Improvement Programs: From Evidence Toward Clinical Implementation. Crit Care. 2022 Mar 22;26:77. doi: 10.1186/s13054-022-03917-1

Mitchell M Levy 1, Laura E Evans 2, Andrew Rhodes 3.(2018). The Surviving Sepsis Campaign Bundle: 2018 update. Intensive Care Med. 2018 Jun;44(6):925-928. doi: 10.1007/s00134-018-5085-0.

Nakiganda, C., Atukwatse, J., Turyasingura, J., & Niyonzima, V. (2022). Improving nurses' knowledge on sepsis identification and management at Mulago National Referral Hospital: A quasi-experimental study. Nursing: Research and Reviews, 12, 169–176. https://doi.org/10.2147/NRR.S362592

Nucera, G., Esposito, A., Tagliani, N., Baticos, C. J., & Marino, P. (2018). Physicians' and nurses' knowledge and attitudes in management of sepsis: An Italian study. Journal of Health and Social Sciences, 3(1), 13–26.

Öztürk Birge, A., Karabag Aydin, A., & Köroğlu Çamdeviren, E. (2022). Intensive care nurses' awareness of identification of early sepsis findings. Journal of Clinical Nursing, 31(19–20), 2886–2899. https://doi.org/10.1111/jocn.16150

Rababa, M., Bani Hamad, D., & Hayajneh, A. A. (2022). Sepsis assessment and management in critically ill adults: A systematic review. PLOS ONE, 17(7), e0270711. https://doi.org/10.1371/journal.pone.0270711

Rababa, M., Bani-Hamad, D., Hayajneh, A. A., & Al Mugheed, K. (2022). Nurses' knowledge, attitudes, practice, and decision-making skills related to sepsis assessment and management. Electronic Journal of General Medicine, 19(6), em414. https://doi.org/10.29333/ejgm/12434

Storozuk, S. A., MacLeod, M. L., Freeman, S., & Banner, D. (2019). A survey of sepsis knowledge among Canadian emergency department registered nurses. Australasian Emergency Care, 22(2), 119–125. https://doi.org/10.1016/j.auec.2018.10.002

Umemura, Y., Abe, T., Ogura, H., Fujishima, S., Kushimoto, S., Shiraishi, A., & Gando, S. (2022). Hour-1 bundle adherence was associated with reduced in-hospital mortality among patients with sepsis in Japan. PLoS One, 17(2), e0263936. https://doi.org/10.1371/journal.pone.0263936

Valičević, G., Friganović, A., Kurtović, B., Rotim, C., Ledinski Fičko, S., & Krupa, S. (2021). Knowledge of sepsis in nursing students—A cross-sectional study. International Journal of Environmental Research and Public Health, 18(23), 12443. https://doi.org/10.3390/ijerph182312443

Wei Ling Chua 1,, Chin Shim Teh 2, Muhammad Amin Bin Ahmad Basri 3, Shi Ting Ong 4, Noel Qiao Qi Phang 3, Ee Ling Goh 5. (2022). Nurses' knowledge and confidence in recognizing and managing patients with sepsis: A multi-site cross-sectional study. J Adv Nurs. 2022 Sep 7;79(2):616–629. doi: 10.1111/jan.15435

Yousefi, H., Nahidian, M., & Sabouhi, F. (2012). Reviewing the effects of an educational program about sepsis care on nurses' knowledge, attitude, and practice in intensive care units. Iranian Journal of Nursing and Midwifery Research, 17(2 Suppl1), S91–S95.

Yo Lin.(2021). Effectiveness of the sepsis six bundle in the management of acute adult sepsis in the UK. Emerg Nurse Journal. 2021 Mar 2;29(2):26-29. doi: 10.7748/en.2020.e2064.