Critical Care Nursing Knowledge and Practices Regarding Sepsis Bundle among Critical Ill Patient

Sherein Elsayed Elsayed*, Dr. Jackleen Faheem Gendy, Dr. Zeinab Hussein Bakr****
*B. Sc.Nursing Science, Faculty of Nursing - Fayoum University
**Assistant professor of Medical Surgical Nursing, Faculty of Nursing, Ain Shams University, Egypt.

Abstract

Background: Sepsis is a global health issue associated with increased morbidity and mortality worldwide. Critical care nurses play a vital role in the early assessment and management of sepsis through applying sepsis bundle. **Aim**: assess the critical care nursing knowledge and practices regarding sepsis bundle among critically ill patients**. Research Design:** A descriptive exploratory design was used. **Settings:** The study was conducted at Intensive Care Units (ICUs) at Fayoum university hospital. **Sample**: A convenience sample of 30 nurses in the previous mentioned setting. **Tools for Data Collection:** data was collected by using Sepsis bundle knowledge questionnaire and Nurse's observational checklist. **Result:** the present study reveals that, 76.7% of studied nurses didn't attend training courses about nebulizer therapy, 46.7% of studied nurses had satisfactory level of knowledge, 33.3% of studied nurses had competent about level of practice. Also, there were highly statistically significant correlation between total score of knowledge of the studied nurse's and their total score of practice. **Conclusion**: The study revealed that less than half of studied nurses had satisfactory level of knowledge regarding Sepsis Bundle among Critical Ill Patients, while, one third of them had competent level of practice. Additionally, there were highly statistically significant correlation between total score of knowledge of the studied nurse's and total score of practice. **Recommendations**: Replication of the current study on large sample and different hospitals settings to be able to generalize the results.

Keywords: Sepsis, Sepsis Bundle

Introduction:

Sepsis, a clinical syndrome of dysregulated host response to infection leading to life-threatening organ dysfunction, is a leading cause of global morbidity and mortality. It is a major challenge for healthcare systems worldwide because it leads to significant consumption of healthcare resources. Sepsis imposes a large economic burden, sepsis survivors who have an increased risk of recurrent infections and hospital readmissions, and this comes with grave physical and financial consequences **(Rudd et al., 2020).**

Incidence of sepsis will continue to rise with interplay of multiple factors including aging population with more predisposing comorbidities, use of immunosuppressive therapy, and emergence of multi-drug antimicrobial resistance. The considerable impact of sepsis highlights the importance of raising awareness to promote early recognition and treatment. Nurses play a pivotal role in the early recognition and management of sepsis because they are uniquely positioned to make the first crucial assessment in detecting sepsis and implementing timely intervention to prevent clinical deterioration **(Rababa & Al-Rawashdeh 2021)**.

Sepsis is a wide spread illness entity that is accompanied by increased rate of mortality and morbidity especially within critical care settings. Globally, it is appraised that more than 30 million people are admitted hospitals for sepsis every year, and sepsis may lead to every year more than 5.3 million deaths **(Gyawali et al., 2019).**

Sepsis is recurrently triggered by viral, bacterial, or fungal infections, with the infections greatest to be predictable progress into sepsis being abdominal pneumonia, and renal infections. Sepsis includes a complex collection of inflammatory response that effects in tissue integrity and hemodynamic disorder that fails to adequately tissue perfuse of vital organs **(Khan, & Divatia, 2020).**

Bundles of care are a collection of "therapies" created round the greatest evidence-based strategies, which, when applied collectively, provide more advantage in terms of outcome than the separate therapeutic

interventions. Sepsis is a time sensitive condition, so early identification and response by nurse and health team member can encourages rapid treatment progression, reducing patient deterioration, sepsis morbidity, fatality rates, and decrease ICU length of stay which rely on the early recognition and ongoing management of sepsis, and death, so that evidence-based sepsis bundle is introduced to improve patient outcomes **(Harley et al., 2019).**

Sepsis remains a major challenge facing health care providers internationally. One of the central nursing intervention is the use of innovation nursing care protocols (Sepsis care bundles), which comprise categorization resuscitation care which include intravenous fluids, oxygen supply, antibiotics, low dose steroid, insulin and blood glucose monitoring, collection of specific tests (cultures, Lactate) and vasopressors **(Teles et al., 2017).**

Sepsis Management Bundle consists of evidence-based objectives that must be completed within 24 h for patients with severe sepsis, septic shock, and/or lactate >4 mmol/L (36 mg/dL). For patients with severe sepsis, as many as four bundle elements must be accomplished within the first 24 h of presentation. The objective should be to adhere to the norms of performing all the indicated tasks as detailed below each and every time within the first 24 h of presentation. Administer low-dose steroids for septic shock in accordance with a standardized Intensive CareUnit policy. If not administered, then document why the patient did not qualify for low-dose steroids based on the standardized protocol. Maintain glucose control lower than limit of normal, but < 180 mg/dL(10 mmol/L. Maintain a median Inspiratory Plateau Pressure (IPP) < 30 cm H2 O for patients under mechanical ventilation **(Rababa & Al-Rawashdeh 2021).**

The role of the ICU nurses in septic patient's care highlight the important role that nurses plays a critical role in monitoring for primary detection of sepsis, resuscitation of sepsis protocols to facilitate attaining blood cultures and beginning primary resuscitation procedures, and nurse-led sepsis response groups have revealed the influence of nurse-led multi-professional team-based management in diminishing death, ICU length of stay, and readmission of ICU rates **(Maclay, 2017**).

Significance of the study

Nursing care in ICU and a long recovery time for patients with sepsis come at a high cost, and the mortality rate for patients with severe sepsis and septic shock remains high at 30–40% and 40–50%, respectively**(Olander, et al., 2021**).In the Fayoum University Hospital reported **1132** case in the Intensive Care Unit in 2020 and approximately 4 case developed to sepsis weekly. Sepsis is a time-sensitive illness, so early identification and fast response by nurses at the initial points of care can improve the patient outcome, reducing the patient deterioration. The appropriateness and speed of sepsis care bundle protocol directed in the initial times after onset of sepsis are expected to influence the patient outcome. Therefore, the current study will carry out to assess critical care nurses' knowledge and practices about sepsis bundle.

Aim of the study:

This study aims to assess the critical care nursing knowledge and practices regarding sepsis bundle among critically ill patients**.**

Research question:

To fulfill the aim of this study, the following research questions are formulated:

Q1: What is the critical care nurses level of knowledge regarding sepsis bundle among critically ill patients**?**

Q2: What is the critical care nurses level of practice regarding sepsis bundle among critically ill patients**?**

Subjects and methods:

Research design: A descriptive exploratory research design was used to conduct this study. Descriptive research design is a type of research design that aims to obtain information to systematically describe a phenomenon, situation, or population

Study setting: The study was conducted at the Intensive Care Units (ICUs) at Fayoum university hospital. Intensive care unit 2 contains 15 beds, 7 ventilators, 15 monitors. The unit divided into two sections. The unit also contains one room for nurses, one room for administering lectures for doctors, room for medication storage and preparation.

Sample: A convenience sample of all available nurses (No-30 nurses) working at the Intensive Care Units (ICUs) at Fayoum university hospital who have experiences more than 6 months in intensive care, from both

genders, with different educational level and accepted participate in the study.

Tools: The data collection tools included a questionnaire developed by the researcher, which consisted of two tools:

Tool I: Sepsis bundle knowledge questionnaire. (Appendix 1):

It was developed by the investigator based on the related literatures and written in simple English language. It was divided into two parts as the following:

Part 1: It was used to assess demographic characteristic of the studied nurses as age, gender, level of education, years of experience and training courses.

Part II: It was developed by the investigator based on the related literature ***(Aithal & Jagmohan, 2017; Douglas et al., 2017; Prassana et al., 2019)***. It was used to assess nurse's level of knowledge regarding Sepsis bundle for critical care nurses. It was filled by the studied nurses themselves. The questionnaire consisted of 99 questions in the form of yes or no questions.

It was used to assess nurses' level of knowledge regarding Sepsis bundle for critical care nurses. It included 99 questions which distributed to assess nurses' knowledge regarding Sepsis bundle as the following: Definition of sepsis (1question), risk factors (7 question), Causes of sepsis (6 question), symptoms (11question), Stages of sepsis (3 question), complications (7 question), Diagnostic tests of sepsis (10 question), Sepsis bundle criteria (8 question), Sepsis prevention (9 question), Treatment during sepsis bundle (13 question), Role of Nurse during caring of patient with sepsis (24 question).

Scoring system:

Each correct answer was given one degree and the incorrect answer was given zero. Total score was 99 degrees. The total score of knowledge was 99 degrees it was consider that:

- ≥ 85 % was satisfactory level of knowledge (≥ 84 degrees).
- < 85 % was unsatisfactory level of knowledge (<84 degrees).

Tool 2: Nurses' practice observational checklist (Appendix III):

It was developed by the investigator based on the related literature ***(Aloushan et al., 2019; Shakor, 2019; Prassana et al., 2019).*** This tool was written in English language. It was used to assess nurses' level of practice regarding Sepsis bundle for critical care nurses. It included 132 steps, it consists of 5 parts as the following:

Part 1: it was used to assess Criteria for initiating the bundle through Does patient look sick? (1 step), Could this be due to an infection? (7 steps), Is any ONE this symptom present? (10 steps), Any of this criteria present? (10 steps), the answer for this part through present or not present.

Part 2: it was used to assess laboratories and procedures (19 steps) the answer for this part through done or not done.

Part 3: it was used to assess Hemodynamic monitoring (3 steps) the answer for this part through done or not done.

Part 4: it was used to assess Treatment protocol (7 steps) the answer for this part through done or not done.

Part 5: it was used to assess Therapeutic and maintained goals after ICU admission, consisted of First nursing intervention (5 steps), Second nursing intervention (6 steps), Third nursing intervention (12 steps), Fourth nursing intervention (11 steps) the answer for this part through done or not done.

The total score of nurses ' practice was 91 degrees, it was considered that:

- ≥ 85 % was competent level of the nurses ' practice (≥77 degrees).
- < 85 % was incompetent level of the nurses ' practice (< 77 degrees).

Field work: Data were collected from beginning of May 2022 to the end of December 2022. Permission to carry out the study from responsible authorities in the faculty of nursing at Ain Shams University after explanation of the purpose of the study was obtained. An interview was conducted with head nurses of the previous mention settings to inform them about the purpose of the study and request their assistance to facilitate the work.

The investigator visited the study settings for two days weekly (Saturday and Sunday) from 8:00 AM to 8:00Pm. Estimate 60 visits all the study duration. First, the investigator filled the observational checklist in the morning and afternoon shifts during actual nurses' work and documented steps of nurses' performance during applying sepsis bundle for critical ill patient. The observational checklist was filled prior to administration of the questionnaire to ensure the

maximal realistic observation of the nurses' practice and minimize the possibility of bias. Each nurse was observed by the investigator during practice of the nursing procedures and it took about 10:15 minutes for each procedure. Then, the self-administered questionnaire was filled by the nurses themselves in their free time and it took about 20-30 minutes. The answers were recorded by the nurses themselves regarding demographic characteristics in 5:10 minutes, and Knowledge in 20:25 minutes.

Validation of tool: Testing validity of the tools was done by using face and content validity. Face validity aimed at inspecting the items to determine whether the tools measure what supposed to measure. Content validity was conducted to determine whether the content of the tools cover the aim of the study. Validity tested through a jury of 5 experts, one of them were professor and three assistant professors and one of them was lecturer of medical surgical nursing department at faculty of nursing Ain Shams University. The expertise reviewed the tools for clarity, relevance, comprehensiveness, simplicity and applicability, minor modifications are done.

Reliability of the tool: Testing reliability of proposed tools was done statistically by alpha Cronbach test and score was (0.946, 0.768 and 0.866) for total knowledge, total practice and total questionnaire respectively.

Pilot study:

A pilot study was conducted to test feasibility and applicability of the study tools used in this study. It was carried out on 10% of the studied nurses. No modifications done after pilot study so that, the pilot nurses were included in the main study group.

Ethical considerations:

The ethical research considerations in this study included the following: The research approval of protocol was obtained from scientific research ethical committee in faculty of nursing at Ain Shams University before starting the study. The researcher clarified the objective and aim of the study to the nurses included in the study. The researcher assured maintaining anonymity and confidentiality of the subject data. Nurses were informed that they allowed choosing to participate or not in the study and that they had the right to withdraw from the study at my time without giving any reasons. Ethics, values, culture and beliefs were respected.

Administrative design:

An official permission was obtained from Faculty of Nursing Ain Shams University to Medical Director and Nursing director of Intensive Care Unit, Al Fayoum university Hospitals in which the study was conducted.

Statistical analysis:

Recorded data were analyzed using the statistical package for social sciences, version 20.0 (SPSS Inc., Chicago, Illinois, USA). Quantitative data were expressed as mean± standard deviation (SD). Qualitative data were expressed as frequency and percentage.

The following tests were done:

- The Comparison between qualitative data was done by using **Fisher's exact test** when the expected count in any cell less than 5.
- ***Pearson's correlation coefficient (r)*** test was used to assess the degree of association between two sets of variables.
- The confidence interval was set to 95% and the margin of error accepted was set to 5%. So, the p-value was considered significant as the following:
- Probability (P-value)

– P-value <0.05 was considered significant.

– P-value <0.001 was considered as highly significant.

– P-value >0.05 was considered insignificant.

Results:

Table (1): reveals that, 83.4%of the studied nurses were the age group 20-30 years and 70% are female. Additionally, 66.7% were single, regarding the educational level, it was noticed that 46.7% are bachelor degree.

Figure (1): Percentage distribution of demographic characteristics for the studied nurses regarding years of experience.

Figure 1 reveals that 36.7% of studied nurses had ≥ 5 years experience and < 1years.

Figure (2): Percentage distribution of demographic characteristics for the studied nurses regarding Sepsis Bundle among Critical Ill Patients.

Figure2 reveals that 76.7% of studied nurses didn't attend training courses regarding Sepsis Bundle among Critical Ill Patients.

Table (2) illustrates that 60% of the studied nurses had satisfactory level of total knowledge regarding Definition, Risk factors and Sepsis bundle criteria respectively. While 63.33 % of studied nurses had unsatisfactory knowledge regarding Stages of sepsis.

Figure (3): percentage distribution of the studied Nurse's level of knowledge regarding Sepsis Bundle among Critical Ill Patients (n=30).

Figure 3 reveals that, 46.7% of studied nurses had satisfactory level of knowledge; meanwhile, 53.3%of them were unsatisfactory.

Table (3) shows that 90% of the studied nurses had competent total level of practices regarding Total Hemodynamic monitoring. While 66.67% of the studied nurses had incompetent total level of practices regarding Total nurses' practice about laboratories and procedures.

Figure (4): percentage distribution of the studied Nurse's level of practice regarding Sepsis Bundle among Critical Ill Patients (n=30).

Figure 4 reveals that 33.3% of studied nurses had competent about level of practice; meanwhile, 66.7% of them had not competent.

Table 4: presents that, there were highly statistically significant correlation between total score of knowledge of the studied nurse's and their total score of practice.

Table (1): Frequency and percentage distribution of demographic characteristics for the studied nurses (n=30).

Items	No.	%
Age (years)		
<20 years	1	3.3
20-30 years	25	**83.4**
30-40 years	3	10.0
>40 years	1	3.3
Mean±SD	26.43±4.49	
Gender		
Male	9	30.0
Female	21	**70.0**
Marital status		
Single	20	**66.7**
Married	10	33.3
Educational level		
Nursing diploma	3	10.0
Nursing institute	12	40.0
Bachelor degree	14	**46.7**
Post graduate	1	3.3

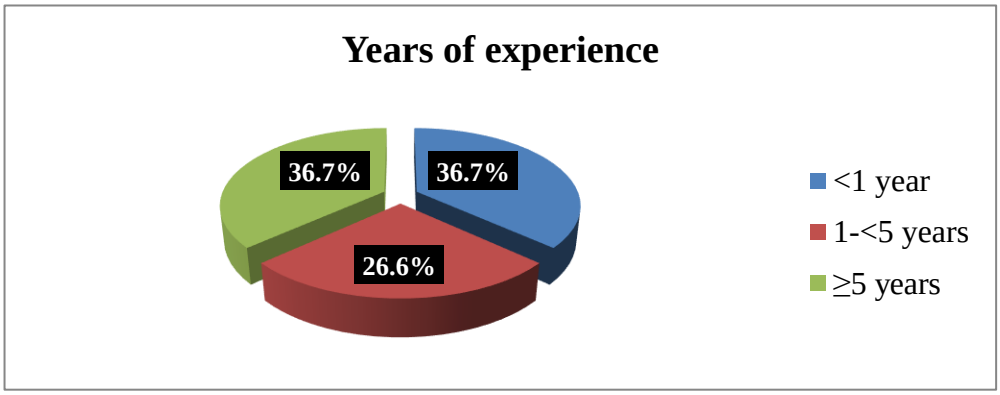

Figure (3): Percentage distribution of demographic characteristics for the studied nurses regarding years of experience.

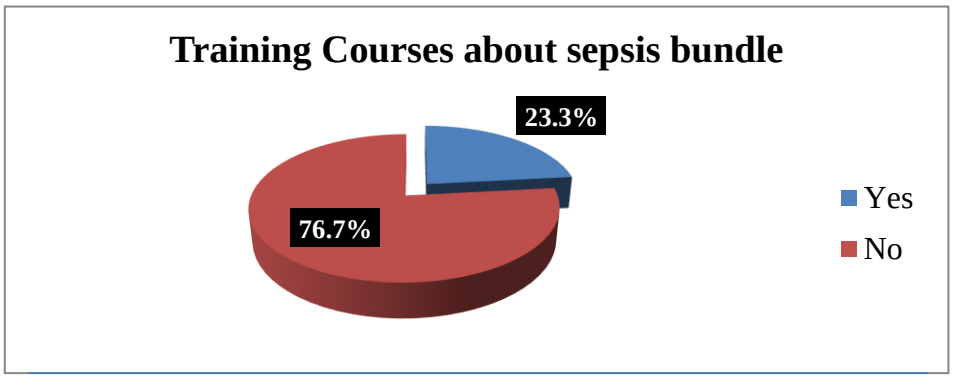

Figure (4): Percentage distribution of demographic characteristics for the studied nurses regarding Sepsis Bundle among Critical Ill Patients.

Table (2): Distribution of nurses' knowledge according to their total knowledge about sepsis bundle (N=30).

Total Knowledge about sepsis bundle	Satisfactory		Unsatisfactory	
	No.	%	No.	%
Definition	18	60.0	12	40.0
Risk factors	18	60.0	12	40.0
Causes	15	50	15	50
Symptoms	16	53.3	14	46.7
Stages of sepsis	11	36.67	19	63.33
Sepsis complications	14	46.67	16	53.33
Diagnostic tests of sepsis	16	53.33	14	46.67
Sepsis bundle criteria	18	60.0	12	40.0
Sepsis prevention	13	43.3	17	56.7
Treatment during sepsis bundle	16	53.3	14	46.7
Role of Nurse during caring of patient with sepsis	14	46.7	16	53.3

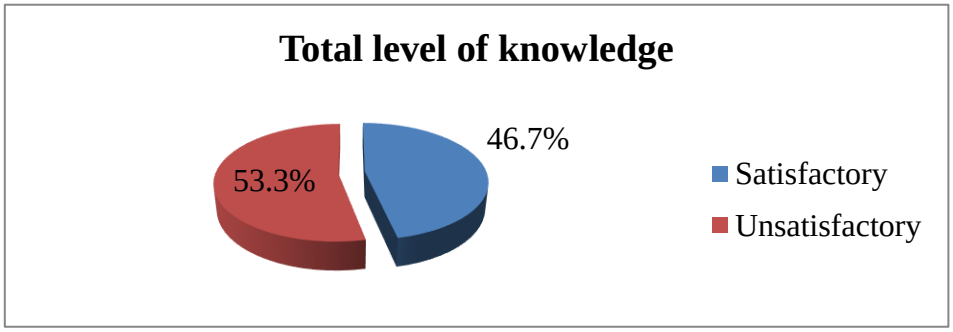

Figure (3): percentage distribution of the studied Nurse's level of knowledge regarding Sepsis Bundle among Critical Ill Patients (n=30).

Table (3): Number and percentage distribution of studied nurses according to their total level of practices regarding sepsis bundle (N=30).

Total practices about sepsis bundle	Competent		Incompetent	
	No.	%	No.	%
Total nurses' practice about Criteria for initiating the bundle	12	40	18	60
Total nurses' practice about laboratories and procedures	10	33.33	20	66.67
Total Hemodynamic monitoring	27	90	3	10
Total Sepsis bundle treatment protocol	13	43.3	17	56.7
Total Therapeutic and maintained goals after ICU admission	11	36.67	19	63.33

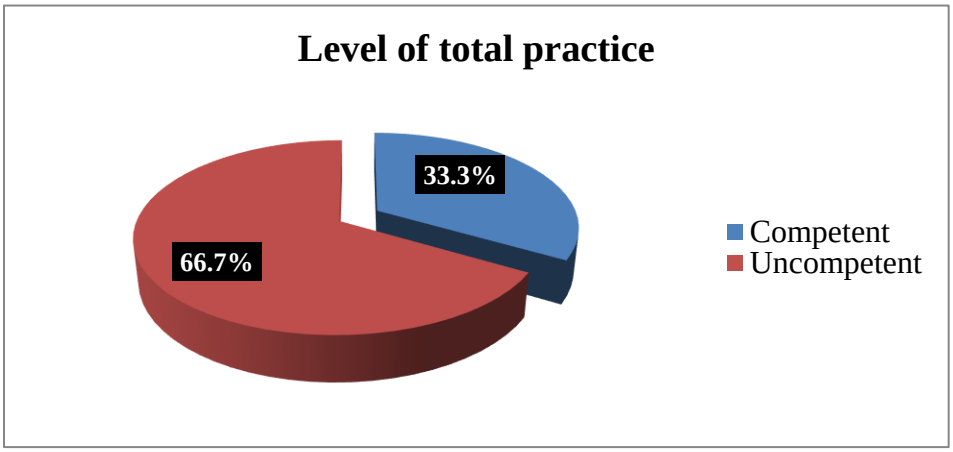

Figure (4): percentage distribution of the studied Nurse's level of practice regarding Sepsis Bundle among Critical Ill Patients (n=30).

Table (12): Relation between total score of knowledge among studied nurses regarding Sepsis Bundle among Critical Ill Patients according to their total score practice (N=30).

		Total score of practice
Total score knowledge	r-value	0.687
	p-value	<0.001**
	N	30

***Highly statistical significant differences (p<0.001). *A statistical significant difference (p<0.05)*
r-Pearson Correlation Coefficient

Discussion:

Sepsis is a medical emergency and requires prompt treatment to prevent its progression to severe sepsis, multiple organs failure and death. Success in sepsis care requires a nurse to quickly suspect and react promptly when faced with a deteriorating patient or patients whose vitals fail to improve. Early detection and timely management are however challenging **(Bleakley & Cole, 2020)**

Regarding demographic characteristics of the studied nurses the present study results demonstrated that, majority of the studied nurses were in the age group 20-30 years. This may be working in intensive care units need hard effort, so young age nurses are suitable. These results were matching with **Harley, et al., (2019**) who conducted a study entitled " Emergency nurses' knowledge and understanding of their role in recognizing and responding to patients with sepsis: A qualitative study " and mentioned that the most of nurses age were between 26-30 years old.

The present study also showed that less than three quarters of the nurses are female. This might be due to the nurse profession in Egypt was for women only and recently become for both genders. In the same line with **Khan, & Divatia, (2020)** who conducted a study entitled " Severe sepsis bundles " and mentioned that less than three quarters of nurses were female less.

As regard marital status slightly more than two thirds of studied nurses were single. From investigator point of view due to the young and newly graduate. In the same line with **Macdonald, et al, (2017)** who conducted a study entitled " Sepsis in the emergency department–Part 1: Definitions and outcomes " and mentioned that less than three quarters of nurses were female less.

Regarding the educational level, the present study noticed that less than half of study nurses were bachelor degree, and two fifth of them were graduated from nursing institute. The result disagrees with **Teles, et al. (2017),** who conducted a study entitled " Impact of a sepsis bundle in wards of a tertiary hospital " and reported that more than three quarters of the staff nurses had done bachelor nursing.

The present study also showed that more than one third of them had ≥ 5 years' experience and < 1years. This result was disagreement with **Ahmed, (2020)** who conducted a study entitled" Effect of Evidence Based Sepsis Care Bundle

on Patient Outcome in Medical Intensive Care Unit" and mentioned that most of nurses have 1-5 years. This might be due to in the ICU have a variety of nurses with different years of experience to fulfill different duties required in this specialized unit.

The present study also showed that more than three quarters of them didn't attend training courses about nebulizer therapy. This result was contrasted with **Choy, et al, (2022)** who conducted a study entitled" Impact of sepsis education for healthcare professionals and students on learner and patient outcomes: A systematic review " and demonstrated that most of nurses didn't attended training courses about sepsis bundle.

Regarding to total level of nurses' knowledge according to their total knowledge about sepsis bundle, less than two third of the studied nurses had satisfactory level of total knowledge regarding Definition, Risk factors and Sepsis bundle criteria respectively. While, less than two third of studied nurses had unsatisfactory knowledge regarding Stages of sepsis. Finally, less than half of studied nurses had satisfactory level of knowledge; meanwhile, more than half of them were unsatisfactory. This result was in agreement with **Nakiganda, et al, (2022),** who conducted a study entitled" Improving Nurses' Knowledge on Sepsis Identification and Management at Mulago National Referral Hospital: A Quasi Experimental Study " and found that less than three quarter of nurses have unsatisfactory level of knowledge about Sepsis Identification and Management.

Also, this result was in agreement with **Delaney, et al, (2015),** who conducted a study entitled" Impact of a sepsis educational program on nurse competence " and found that most of nurses have unsatisfactory level of knowledge about Sepsis Management. Additionally, this result was disagree **with Stanislaus, (2019),** who conducted a study entitled" Impact of a sepsis educational program on nurse competence " and found that two third of nurses have satisfactory level of knowledge about Sepsis Management.

According to total level of nurses practices regarding sepsis bundle, most of the studied nurses had competent total level of practices regarding Total Hemodynamic monitoring. While, two third of the studied nurses had incompetent total level of practices regarding Total nurses' practice about laboratories and procedures. Also, one third of studied nurses had competent about level of practice; meanwhile, two third of them had not competent. This result was disagreement with **Choy, et al, (2022),** who conducted a study entitled" Impact of sepsis education for healthcare professionals and students on learner and patient outcomes: A systematic review " and found that more than half of nurses' have competent practice about sepsis bundle application.

Regarding to the correlation between total score of knowledge among studied nurses regarding Sepsis Bundle among Critical Ill Patients according to their total score practice, there were highly statistically significant correlation between total score of knowledge of the studied nurse's and their total score of practice.

These findings were matching with **Rahman, et al, (2019)** who conducted a study entitled " Knowledge, practice and attitude towards identification of systemic inflammatory response syndrome (SIRS) and sepsis among emergency personnel in tertiary teaching hospital." and mentioned that there was a positive strong relationship between knowledge and practice regarding sepsis bundle during care for critical ill patient.

Conclusion:

Based on the study findings, the study revealed that less than half of studied nurses had Satisfactory level of knowledge regarding sepsis bundle among critically ill patients, Additionally, one third of them had competent about level of practice. There was highly statistically significant relation between level of nurse's total knowledge and educational level. Also there are statistically significant relation between level of nurse's total practice and their years of experience, educational level and training courses**.** Additionally, there were highly statistically significant correlation between total score of knowledge of the studied nurse's and total score of practice.

Recommendation

Based on the results of the present study the following recommendations are suggested: -

1. Provide nurses with continuous educational programs with evidence based guidelines to improve their knowledge and practice regarding sepsis bundle among critically ill patients.

2. Provide nurses with periodic training sessions to improve their practices regarding sepsis bundle among critically ill patients.

3. Sepsis bundle should be included partially in the patient's assessment sheet.

4. Handling of barriers to sepsis bundle application among critically ill patients.

5. Similar study is recommended to include large sample size in other hospitals which provide care for sepsis bundle to confirm these findings.

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