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Knowledge of sepsis in nursing in Saudi Arabia: A cross-sectional study

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ABSTRACT

Background: For both adults and children, sepsis is a major cause of death and disability. Organ failure is the result of a dysregulated host response to infection. *Aim:* This study aims to investigate the levels of sepsis knowledge in the nursing population. It also aims to compare the differences across various regions in Saudi Arabia. *Methods:* It is a cross-sectional study of 286 Saudi nurses. The study included Saudi nurses who work in healthcare, both full-time and part-time. A questionnaire called determinants of sepsis knowledge was modified and translated into Arabic. *Results:* A total of 286 participants, 84.6% were males. There were notable gender variations in the nurses' awareness of sepsis, according to the data. In a number of areas, female nurses were more knowledgeable about sepsis than male nurses. Nonetheless, there were non-statistically significant variations in the identification of diarrhea and low blood pressure as sepsis symptoms. *Conclusion:* We suggest more research in this area because the nursing population has a substantial level of sepsis expertise. In a number of areas, we discovered that female nurses were more knowledgeable about sepsis than male nurses. Nurses in the Eastern region were more likely to comprehend the immune response aspect of sepsis, identify its causes, including multidrug-resistant superbugs, and recognize the need for emergency care.

Keywords: Sepsis, knowledge, Saudi nurses, and Educational level

1. INTRODUCTION

Sepsis is a significant cause of mortality and impairment in both adults and children. It is a dysregulated host response to infection that results in organ failure. The updated definition highlights abnormalities in homeostasis and infection response, mortality, and the importance of early sepsis recognition (Singer et al., 2016). According to recent global data, there were 11 million fatalities and 48.9 million cases worldwide in 2017 (Fleischmann-Struzek et al., 2018; Rudd et al., 2020). Significant short- and long-term morbidity also has a

high fatality rate (Chong et al., 2015). Up to 46% of those who experience septic shock (complemented by severe organ failure) die (Kaukonen et al., 2014; Schlapbach et al., 2015). In Saudi Arabia, studies that assess the public's knowledge about sepsis are scarce (Alnofaiey et al., 2023).

Given the urgency of sepsis, early detection and action at the outset of care can facilitate timely treatment escalation, minimize patient deterioration, and prevent mortality (Schmatz et al., 2020; Weiss et al., 2020; Jalili et al., 2013). Screening instruments like the fast sepsis-related organ failure assessment Singer et al., (2016) or the systemic inflammatory response syndrome criteria Johnston et al., (2017) may aid in early detection. To encourage additional evaluation of individuals who could worsen. Since nurses, especially emergency nurses, are frequently patients' initial point of contact with the healthcare system, they play a crucial role in the early detection of sepsis. Since nurses oversee patient assessments, they should be able to identify, treat, and escalate patients who are at risk of sepsis (Seymour et al., 2017; Finkelsztein et al., 2017).

Treatment of sepsis depends on early recognition of the disease's signs and symptoms. Most of the research highlights the need for early examination by medical professionals (Yealy et al., 2015). According to a recent poll conducted by The George Institute, just 14% of Australians could name a sign of sepsis, even though the condition causes more fatalities annually in Australia than motor vehicle accidents. Approximately 60% of Australians are unaware of sepsis. The ability of emergency department nurses to diagnose and treat patients with sepsis is lacking, according to their assessments (Harley et al., 2019; Delaney et al., 2015). Globally, it has been known that nurses often do not know enough about sepsis (Storozuk et al., 2019; Goulart et al., 2019). Local and state-wide emergency department policies can be informed by insights on rounding nurses' current sepsis management and expertise, facilitating more efficient care procedures (Harley et al., 2019).

Despite the significance of this field, Saudi Arabia has not yet conducted a study on the knowledge levels of health professionals. The occurrence of sepsis has been studied, but the level of comprehension has not. Many times, nurses don't know enough about sepsis (Harley et al., 2019). The nursing community in Saudi Arabia has limited information about sepsis. The purpose of this study is to ascertain the nurse population's level of sepsis knowledge. It also seeks to compare the variations among Saudi Arabia's different regions.

2. METHODOLOGY

Study design and setting

A cross-sectional study by Google Forms was conducted to administer an online survey in many Saudi Arabian regions.

Participants

Inclusion criteria

Participation in the research is voluntary.

Each research participant provides informed permission.

Sample size estimation

286 Saudi nurses were among the chosen responders. Part-time and full-time Saudi nurses who work in the healthcare industry.

Data collection

Demographic characteristics (age, gender, living region, and highest level of education) and the knowledge questionnaire were employed (Eitze et al., 2018). We performed a linguistic translation into Arabic for the study objectives.

Statistical analysis

We used IBM SPSS version 25.0 statistics for Windows (IBM Corp., 2017) to analyze data. Armonk, NY, USA: IBM Corp. Descriptive statistics (frequency, percentage, mean, and standard deviation) were used to describe the sample main features. Knowledge and Symptoms, the continuous variables, deviate statistically significantly from the Gauss normal distribution; nevertheless, the descriptive parameters, which display a median and interquartile range, more accurately depict the data. The Shapiro-Wilk test confirmed that the distribution was normal. The Chi-square test was used to determine the statistical significance between the nominal (categorical)

variables. The statistical significance of the variations in the mean values on the knowledge and symptoms scale was examined using the Mann-Whitney U test (two independent samples) and the Kruskal-Wallis test (more than two separate groups).

3. RESULTS

Demographics

The study included 286 with a mean age of 36.1 years (Table 1). The gender distribution was predominantly male, with 84.6% males and 15.4% females. Most participants were from the Eastern region (92.3%), with more miniature representations from the Western and Southern regions (each 3.8%). Regarding educational level, the majority had a bachelor's degree (61.5%), followed by diplomas (26.9%), Master's degrees (3.8%), and PhDs (7.7%).

Knowledge of Sepsis According to Gender

The analysis of sepsis knowledge among nurses showed significant gender differences. Female nurses showed higher awareness about sepsis than male nurses in several areas, as a significantly higher proportion of female nurses had heard of the term sepsis and were aware of the need to call emergency services immediately. Female nurses also demonstrated a more significant understanding of the immune response nature of sepsis and its causes, including multidrug-resistant superbugs and lung inflammation (Table 2). These differences were statistically significant. Additionally, female nurses correctly identified critical symptoms of sepsis, such as chills and fever, disorientation, and shortness of breath, more often than their male counterparts. However, there were non-statistically significant differences in recognizing low blood pressure and diarrhea as symptoms of sepsis.

Table 1 Demographics of the participants

Variables	**Sample size (n=286)**	
Age, mean (SD)		36.1 (7.4)
Gender, N (%)	Male	242 (84.6)
	Female	44 (15.4)
Living region, N (%)	Eastern	264 (92.3)
	Western	11 (3.8)
	Southern	11 (3.8)
Highest level of education, N (%)	Diploma	77 (26.9)
	Bachelor's degree	176 (61.5)
	Master's degree	11 (3.8)
	PhD	22 (7.7)

Table 2 Percentage and number of nurses with correct answers to knowledge of sepsis according to Gender.

Awareness items preceding the knowledge score	**Gender**				**P value**
	N (%) Male		**N (%) Female**		-
	Yes	**No or unsure**	**Yes**	**No or unsure**	-
Item 1: Have you ever heard of the term sepsis?	77 (31.8)	165 (68.2)	22 (50)	22 (50)	0.02
Item 2: Is there a vaccination against sepsis?	11 (4.5)	231 (95.5)	11 (25)	33 (75)	<0.001
Items integrated with the Sepsis Knowledge Score	**N (%) Male**		**N (%) Female**		-
	Yes	**No or unsure**	**Yes**	**No or unsure**	-
Item 3: With sepsis, you have to call the emergency services immediately.	66 (27.3)	176 (72.7)	33 (75)	11 (25)	<0.001
Item 4: Sepsis is an intense allergic reaction.	66 (27.3)	176 (72.7)	22 (50)	22 (50)	0.004
Item 5: Sepsis is an intense immune response of the body.	66 (27.3)	176 (72.7)	33 (75)	11 (25)	<0.001

Item 6: Sepsis is caused by multidrug-resistant superbugs in hospitals.	55 (22.7)	187 (77.3)	33 (75)	11 (25)	<0.001
Item 7: Sepsis can be diagnosed by a red line infiltrating from a wound up to the heart.	22 (9.1)	220 (90.9)	22 (50)	22 (50)	<0.001
Item 8: The mortality after heart attacks is higher than the mortality after sepsis.	44 (18.2)	198 (81.8)	22 (50)	22 (50)	<0.001
Item 9: There are more cases of breast cancer than cases of sepsis.	33 (13.6)	209 (86.4)	22 (50)	22 (50)	<0.001
Item 10: Sepsis can be caused by lung inflammation.	33 (13.6)	209 (86.4)	11 (25)	33 (75)	0.05
Item 11: Sepsis can be caused by influenza.	33 (13.6)	209 (86.4)	22 (50)	22 (50)	<0.001
Sepsis Symptoms	**N (%) Male**		**N (%) Female**		-
	Yes	**No or unsure**	**Yes**	**No or unsure**	-
Item 12: Are chills and fever symptoms of sepsis?	44 (18.2)	198 (81.8)	33 (75)	11 (25)	<0.001
Item 13: Is disorientation a symptom of sepsis?	33 (13.6)	209 (86.4)	22 (50)	22 (50)	<0.001
Item 14: Is shortness of breath a symptom of sepsis?	66 (27.3)	176 (72.7)	33 (75)	11 (25)	<0.001
Item 15: Is a high heart rate a symptom of sepsis?	55 (22.7)	187 (77.3)	33 (75)	11 (25)	<0.001
Item 16: Is low blood pressure a symptom of sepsis?	44 (18.2)	198 (81.8)	11 (25)	33 (75)	0.29
Item 17: Is diarrhea a symptom of sepsis?	33 (13.6)	209 (86.4)	11 (25)	33 (75)	0.05
Item 18: Are skin rash and eczema considered symptoms of sepsis?	33 (13.6)	209 (86.4)	0 (0)	44 (100)	0.004

Table 3 Percentage and number of nurses with correct answers to knowledge of sepsis according to the living region.

Awareness items preceding the knowledge score	**Living region**						**P value**
	N (%) Eastern region		**N (%) Western region**		**N (%) Southern region**		
	Yes	**No or unsure**	**Yes**	**No or unsure**	**Yes**	**No or unsure**	
Item 1	99 (37.5)	165 (62.5)	0 (0)	11 (100)	0 (0)	11 (100)	0.002
Item 2	22 (8.3)	242 (91.7)	0 (0)	11 (100)	0 (0)	11 (100)	0.37
Items integrated into the Sepsis Knowledge Score	**N (%) Male**		**N (%) Female**		**N (%) Southern region**		
	Yes	**No or unsure**	**Yes**	**No or unsure**	**Yes**	**No or unsure**	
Item 3	99 (37.5)	165 (62.5)	0 (0)	11 (100)	0 (0)	11 (100)	0.002
Item 4	88 (33.3)	176 (66.7)	0 (0)	11 (100)	0 (0)	11 (100)	0.005
Item 5	99 (37.5)	165 (62.5)	0 (0)	11 (100)	0 (0)	11 (100)	0.002
Item 6	88 (33.3)	176 (66.7)	0 (0)	11 (100)	0 (0)	11 (100)	0.005
Item 7	44 (16.7)	220 (83.3)	0 (0)	11 (100)	0 (0)	11 (100)	0.11
Item 8	66 (25)	198 (75)	0 (0)	11 (100)	0 (0)	11 (100)	0.02
Item 9	55 (20.8)	209 (79.2)	0 (0)	11 (100)	0 (0)	11 (100)	0.59

Item 10	44 (16.7)	220 (83.3)	0 (0)	11 (100)	0 (0)	11 (100)	0.11
Item 11	55 (20.8)	209 (79.2)	0 (0)	11 (100)	0 (0)	11 (100)	0.059
Sepsis Symptoms	**N (%) Male**		**N (%) Female**		**N (%) Southern region**		
	Yes	**No or unsure**	**Yes**	**No or unsure**	**Yes**	**No or unsure**	
Item 12	77 (29.2)	187 (70.8)	0 (0)	11 (100)	0 (0)	11 (100)	0.01
Item 13	55 (20.8)	209 (79.2)	0 (0)	11 (100)	0 (0)	11 (100)	0.059
Item 14	99 (37.5)	165 (62.5)	0 (0)	11 (100)	0 (0)	11 (100)	0.002
Item 15	88 (33.3)	176 (66.7)	0 (0)	11 (100)	0 (0)	11 (100)	0.005
Item 16	55 (20.8)	209 (79.2)	0 (0)	11 (100)	0 (0)	11 (100)	0.059
Item 17	44 (16.7)	220 (83.3)	0 (0)	11 (100)	0 (0)	11 (100)	0.11
Item 18	33 (12.5)	231 (87.5)	0 (0)	11 (100)	0 (0)	11 (100)	0.211

Table 4 Percentage and number of nurses with correct answers to knowledge of sepsis according to the educational level.

Yes	**The educational level**								**P value**
	N (%) High school or diploma		**N (%) Bachelor's degree**		**N (%) Master's degree**		**N (%) PhD**		**-**
	Yes	**No or unsure**	**Yes**	**No or unsure**	**Yes**	**No or unsure**	**Yes**	**No or unsure**	**-**
Item 1	22 (28.6)	55 (71.4)	66 (37.5)	110 (62.5)	0 (0)	11 (100)	11 (50)	11 (50)	0.18
Item 2	0 (0)	77 (100)	1 (6.3)	165 (93.8)	0 (0)	11 (100)	11 (50)	11 (50)	<0.001
Items integrated into the Sepsis Knowledge Score	**N (%) High school or diploma**		**N (%) Bachelor's degree**		**N (%) Master's degree**		**N (%) PhD**		**-**
	Yes	**No or unsure**	**Yes**	**No or unsure**	**Yes**	**No or unsure**	**Yes**	**No or unsure**	**-**
Item 3	11 (14.3)	66 (85.7)	77 (43.8)	99 (56.3)	0 (0)	11 (100)	11 (50)	11 (50)	<0.001
Item 4	22 (28.6)	55 (71.4)	55 (31.3)	121 (68.8)	0 (0)	11 (100)	11 (50)	11 (50)	0.03
Item 5	22 (28.6)	55 (71.4)	66 (37.5)	110 (62.5)	0 (0)	11 (100)	11 (50)	11 (50)	0.01
Item 6	11 (14.3)	66 (85.7)	66 (37.5)	110 (62.5)	0 (0)	11 (100)	11 (50)	11 (50)	<0.001
Item 7	11 (14.3)	66 (85.7)	33 (18.8)	143 (81.3)	0 (0)	11 (100)	0 (0)	22 (100)	0.05
Item 8	11 (14.3)	66 (85.7)	55 (31.3)	121 (68.8)	0 (0)	11 (100)	0 (0)	22 (100)	<0.001
Item 9	22 (28.6)	55 (71.4)	33 (18.8)	143 (81.3)	0 (0)	11 (100)	0 (0)	22 (100)	0.007
Item 10	11 (14.3)	66 (85.7)	33 (18.8)	143 (81.3)	0 (0)	11 (100)	0 (0)	22 (100)	0.055
Item 11	16 (20.8)	61 (79.2)	44 (25)	132 (75)	0 (0)	11 (100)	0 (0)	22 (100)	0.005
Sepsis Symptoms	**N (%) High school or diplom a**		**N (%) Bachelor's degree**		**N (%) Master's degree**		**N (%) PhD**		**-**
	Yes	**No or unsure**	**Yes**	**No or unsure**	**Yes**	**No or unsure**	**Yes**	**No or unsure**	**-**
Item 12	0 (0)	77 (100)	66 (37.5)	110 (62.5)	0 (0)	11 (100)	11 (50)	11 (50)	<0.001
Item 13	11 (14.3)	66 (85.7)	44 (25)	132 (75)	0 (0)	11 (100)	0 (0)	22 (100)	0.005
Item 14	11 (14.3)	66 (85.7)	77 (43.8)	99 (56.3)	0 (0)	11 (100)	11 (50)	11 (50)	0.002
Item 15	11 (14.3)	66 (85.7)	66 (37.5)	110 (62.5)	0 (0)	11 (100)	11 (50)	11 (50)	<0.001
Item 16	11 (14.3)	66 (85.7)	33 (18.8)	143 (81.3)	0 (0)	11 (100)	11 (50)	11 (50)	0.001
Item 17	11 (14.3)	66 (85.7)	22 (12.5)	154 (87.5)	0 (0)	11 (100)	11 (50)	11 (50)	<0.001

Item 18	11 (14.3)	66 (85.7)	22 (12.5)	154 (87.5)	0 (0)	11 (100)	0 (0)	22 (100)	0.16

Knowledge of Sepsis According to Living Region

When examining knowledge based on living regions, nurses from the Eastern region demonstrated significantly higher awareness and correct knowledge about sepsis than those from the Western and Southern regions (Table 3). The results showed statistical significance. Additionally, nurses in the Eastern region were better at recognizing sepsis signs. However, some differences, such as recognizing sepsis caused by influenza or diarrhea as a symptom, were not statistically significant.

4. DISCUSSION

This study describes the knowledge of sepsis in Saudi nurses. Nurses frequently lack sufficient understanding regarding sepsis. Insights on rounding nurses' existing sepsis management and knowledge might impact emergency department policy at the local and state levels, enabling more effective treatment processes. Our results show significant gender differences. Female nurses showed higher awareness about sepsis than male nurses in several areas, as a significantly higher proportion of female nurses had heard of the term sepsis and were aware of the need to call emergency services immediately. Female nurses also demonstrated a more significant understanding of the immune response nature of sepsis and its causes, including multidrug-resistant superbugs and lung inflammation. These differences were statistically significant.

Additionally, female nurses correctly identified vital symptoms of sepsis, such as chills and fever, disorientation, and shortness of breath, more often than their male counterparts. However, there were non-statistically significant differences in recognizing low blood pressure and diarrhea as symptoms of sepsis. Nurses from the Eastern region demonstrated significantly higher awareness and correct knowledge about sepsis than those from the Western and Southern regions. Eastern region nurses were more likely to recognize the need for emergency services, understand the immune response nature of sepsis, and identify its causes, including multidrug-resistant superbugs. These findings were statistically significant. Additionally, Eastern region nurses were more adept at identifying symptoms of sepsis.

However, some differences, such as recognizing sepsis caused by influenza or diarrhea as a symptom, were not statistically significant. In the eastern region, knowledge of sepsis increased with higher education (Bachelor's degree). Our results are consistent with a previous study in Saudi Arabia Alnofaiey et al., (2023) on education level. They found the need for education and awareness campaigns to improve knowledge and understanding of septicemia and its risk factors and symptoms. In line with our results, the importance of focused educational initiatives is to guarantee that everyone can access pertinent information on septicemia, irrespective of socioeconomic status. Our results, however, differ from those of a prior study Alnofaiey et al., (2023), which discovered that participants in both urban and rural populations exhibited noticeably greater awareness than those from other regions.

Specifically, 78.9% of participants from Yanbu and 53.2% of participants from Jeddah had higher awareness levels Alnofaiey et al., (2023), which is inconsistent with our study that showed that Nurses from the Eastern region demonstrated significantly higher awareness and correct knowledge about sepsis compared to those from the Western and Southern regions. Our results are consistent with the Croatian study Friganović et al., (2024), which showed that students in Cyprus had a statistically significantly higher level of knowledge than students in Greece, which is like our study as we found that nurses from the Eastern region demonstrated significantly higher awareness and correct knowledge about sepsis compared to those from the Western and Southern regions.

In a prior study, Fiest et al., (2022) explored healthcare professionals' awareness and knowledge of sepsis. Their results suggested that patient/public awareness of sepsis has gradually improved. It also meant that understanding and expertise vary globally. Our study showed increasing knowledge of sepsis according to educational level (Table 4). Our results are inconsistent with a previous study in Croatia Valičević et al., (2021), which showed statistically significant differences in knowledge about sepsis in nursing students according to their research. This is similar to another study Harley et al., (2021), which found that the levels of expertise of sepsis in nursing students were higher by the enrolled higher grade and discovered that students in their last year of undergraduate and graduate programs at five Australian institutions knew very little about sepsis. However, our findings are significant differences.

Despite being one of the few studies in Saudi Arabia to report on the nursing population's understanding of sepsis, our study has limitations. Future research may look at the components related to understanding sepsis because this cross-sectional study could not have had enough time to record all possible causes and other affecting variables. Additionally, a self-administered questionnaire is

used in the study to obtain subjective data, and participant responses may differ based on their psychological and emotional states. Finally, the study cohort was specifically selected from a particular setting and within a constrained age range. This would have restricted the generalizability of the results. Therefore, additional nationwide studies should be conducted to evaluate additional features related to nurses' awareness and understanding of sepsis. Our recommendations are to involve this content in the core of the curriculum.

5. CONCLUSION

This study aims to investigate the levels of sepsis knowledge in the nursing population. It also aims to compare the differences across various regions in Saudi Arabia. We found that female nurses showed higher awareness about sepsis than male nurses in several areas. Eastern region nurses were more likely to recognize the need for emergency services, understand the immune response nature of sepsis, and identify its causes, including multidrug-resistant superbugs. We recommend further research in this area.

Funding

This study has not received any external funding.

Ethical approval

The ethical guidelines for Human Subjects are followed in the study.

Informed consent

Written & Oral informed consent was obtained from individual participants included in the study.

Conflict of interest

The authors declare that there is no conflict of interests.

Data and materials availability

All data sets collected during this study are available upon reasonable request from the corresponding author.

REFERENCES

1. Alnofaiey Y, Alharthi SM, Alhulayfi RM, Alqurashi MM, Alsufyani RM, Alamri GM. Public Awareness and Knowledge of Sepsis: A Cross-Sectional Survey of Adults in the Western Region of Saudi Arabia. Cureus 2023; 15(11):e49102. doi: 10.7759/cureus.49102
2. Chong J, Dumont T, Francis-Frank L, Balaan M. Sepsis and septic shock: a review. Crit Care Nurs Q 2015; 38(2):111-20. doi: 10.1097/CNQ.0000000000000052
3. Delaney MM, Friedman MI, Dolansky MA, Fitzpatrick JJ. Impact of a sepsis educational program on nurse competence. J Contin Educ Nurs 2015; 46(4):179-86. doi: 10.3928/00220124-20150320-03
4. Eitze S, Fleischmann-Struzek C, Betsch C, Reinhart K; vaccination60+ study group. Determinants of sepsis knowledge: a representative survey of the elderly population in Germany. Crit Care 2018; 22(1):273. doi: 10.1186/s13054-018-2208-5
5. Fiest KM, Krewulak KD, Brundin-Mather R, Leia MP, Fox-Robichaud A, Lamontagne F, Leigh JP; for Sepsis Canada. Patient, Public, and Healthcare Professionals' Sepsis Awareness, Knowledge, and Information Seeking Behaviors: A Scoping Review. Crit Care Med 2022; 50(8):1187-1197. doi: 10.1097/CCM.0000000000005564
6. Finkelsztein EJ, Jones DS, Ma KC, Pabón MA, Delgado T, Nakahira K, Arbo JE, Berlin DA, Schenck EJ, Choi AM, Siempos II. Comparison of qSOFA and SIRS for predicting adverse outcomes of patients with suspicion of sepsis outside the intensive care unit. Crit Care 2017; 21(1):73. doi: 10.1186/s13054-017-1658-5
7. Fleischmann-Struzek C, Goldfarb DM, Schlattmann P, Schlapbach LJ, Reinhart K, Kissoon N. The global burden of paediatric and neonatal sepsis: a systematic review. Lancet Respir Med 2018; 6(3):223-230. doi: 10.1016/S2213-2600(18)30063-8

8. Friganović A, Bešker G, Slijepčević J, Civka K, Ledinski Fićko S, Krupa S, Brčina A, Iordanou S, Protopapas A, Hadjibalassi M, Raftopoulos V, Katsoulas T. Nursing Student Knowledge Related to Sepsis in Croatian, Cypriot, and Greek Universities: A Cross-Sectional European Study. Int J Environ Res Public Health 2024; 21(7):922. doi: 10.3390/ijerph21070922
9. Goulart LD, Ferreira Júnior MA, Sarti EC, Sousa ÁF, Ferreira AM, Frota OP. Are nurses updated on the proper management of patients with sepsis? Esc Anna Nery 2019; 23: e20190013.
10. Harley A, Johnston ANB, Denny KJ, Keijzers G, Crilly J, Massey D. Emergency nurses' knowledge and understanding of their role in recognising and responding to patients with sepsis: A qualitative study. Int Emerg Nurs 2019; 43:106-112. doi: 10.1016/j.ienj.2019.01.00
11. Harley A, Massey D, Ullman AJ, Reid-Searl K, Schlapbach LJ, Takashima M, Venkatesh B, Datta R, Johnston ANB. Final year nursing student's exposure to education and knowledge about sepsis: A multi-university study. Nurse Educ Today 2021; 97:104703. doi: 10.1016/j.nedt.2020.104703
12. IBM Corp. IBM SPSS Statistics for Windows. Version 25.0. IBM Corp., Armonk, NY, 2017.
13. Jalili M, Barzegari H, Pourtabatabaei N, Honarmand AR, Boreiri M, Mehrvarz A, Ahmadinejad Z. Effect of door-to-antibiotic time on mortality of patients with sepsis in emergency department: a prospective cohort study. Acta Med Iran 2013; 51(7):454-60.
14. Johnston ANB, Park J, Doi SA, Sharman V, Clark J, Robinson J, Crilly J. Effect of Immediate Administration of Antibiotics in Patients with Sepsis in Tertiary Care: A Systematic Review and Meta-analysis. Clin Ther 2017; 39(1):190-202.e6. doi: 10.1016/j.clinthera.2016.12.003
15. Kaukonen KM, Bailey M, Suzuki S, Pilcher D, Bellomo R. Mortality related to severe sepsis and septic shock among critically ill patients in Australia and New Zealand, 2000-2012. JAMA 2014; 311(13):1308-16. doi: 10.1001/jama.2014.263
16. Rudd KE, Johnson SC, Agesa KM, Shackelford KA, Tsoi D, Kievlan DR, Colombara DV, Ikuta KS, Kissoon N, Finfer S, Fleischmann-Struzek C, Machado FR, Reinhart KK, Rowan K, Seymour CW, Watson RS, West TE, Marinho F, Hay SI, Lozano R, Lopez AD, Angus DC, Murray CJL, Naghavi M. Global, regional, and national sepsis incidence and mortality, 1990-2017: analysis for the Global Burden of Disease Study. Lancet 2020; 395(10219):200-211. doi: 10.1016/S0140-6736(19)32989-7
17. Schlapbach LJ, Straney L, Alexander J, MacLaren G, Festa M, Schibler A, Slater A; ANZICS Paediatric Study Group. Mortality related to invasive infections, sepsis, and septic shock in critically ill children in Australia and New Zealand, 2002-13: a multicentre retrospective cohort study. Lancet Infect Dis 2015; 15(1):46-54. doi: 10.1016/S1473-3099(14)71003-5
18. Schmatz M, Srinivasan L, Grundmeier RW, Elci OU, Weiss SL, Masino AJ, Tremoglie M, Ostapenko S, Harris MC. Surviving Sepsis in a Referral Neonatal Intensive Care Unit: Association between Time to Antibiotic Administration and In-Hospital Outcomes. J Pediatr 2020; 217:59-65.e1. doi: 10.1016/j.jpeds.2019.08.023
19. Seymour CW, Gesten F, Prescott HC, Friedrich ME, Iwashyna TJ, Phillips GS, Lemeshow S, Osborn T, Terry KM, Levy MM. Time to Treatment and Mortality during Mandated Emergency Care for Sepsis. N Engl J Med 2017; 376(23):2235-2244. doi: 10.1056/NEJMoa1703058
20. Singer M, Deutschman CS, Seymour CW, Shankar-Hari M, Annane D, Bauer M, Bellomo R, Bernard GR, Chiche JD, Coopersmith CM, Hotchkiss RS, Levy MM, Marshall JC, Martin GS, Opal SM, Rubenfeld GD, Van-der-Poll T, Vincent JL, Angus DC. The Third International Consensus Definitions for Sepsis and Septic Shock (Sepsis-3). JAMA 2016; 315(8):801-10. doi: 10.1001/jama.2016.0287
21. Storozuk SA, MacLeod MLP, Freeman S, Banner D. A survey of sepsis knowledge among Canadian emergency department registered nurses. Australas Emerg Care 2019; 22(2):119-125. doi: 10.1016/j.auec.2019.01.007
22. Valičević G, Friganović A, Kurtović B, Rotim C, Ledinski Fičko S, Krupa S. Knowledge of Sepsis in Nursing Students-A Cross-Sectional Study. Int J Environ Res Public Health 2021; 18(23):12443. doi: 10.3390/ijerph182312443
23. Weiss SL, Balamuth F, Chilutti M, Ramos MJ, McBride P, Kelly NA, Payton KJ, Fitzgerald JC, Pennington JW. Identification of Pediatric Sepsis for Epidemiologic Surveillance Using Electronic Clinical Data. Pediatr Crit Care Med 2020; 21(2):113-121. doi: 10.1097/PCC.0000000000002170
24. Yealy DM, Huang DT, Delaney A, Knight M, Randolph AG, Daniels R, Nutbeam T. Recognizing and managing sepsis: what needs to be done? BMC Med 2015; 13:98. doi: 10.1186/s12916-015-0335-2