KNOWLEDGE ON SEPSIS AMONG HEALTH CARE PROVIDERS OF BIRAT MEDICAL COLLEGE AND TEACHING HOSPITAL

Bajracharya A[1], Rajbanshi LK[2], Arjyal B[1]*

Affiliation

1. *Lecturer, Department of Anesthesia and Intensive Care, Birat Medical College and Teaching Hospital, Biratnagar, Nepal.*
2. *Associate Professor, Department of Anesthesia and Intensive Care, Birat Medical College and Teaching Hospital, Biratnagar, Nepal.*

ARTICLE INFO

Received : 12 February, 2020

Accepted : 26 March, 2020

Published : 30 June, 2020

ORA 166

DOI: https://doi.org/10.3126/bjhs.v5i1.29635

**** Corresponding Author***

Dr. Akriti Bajracharya

Lecturer

Department of Anesthesia and Intensive Care

Birat Medical College and Teaching Hospital

Budhiganga-2, Tankisinuwari, Morang

Email: akriti854@gmail.com

ORCID ID: 0000-0001-5948-161X

Citation

Bajracharya A, Rajbanshi LK, Arjyal B. Knowledge on Sepsis Among Health Care Providers of Birat Medical College and Teaching Hospital BJHS 2020;5(1)11:964-969.

ABSTRACT

Introduction

Knowledge and awareness of sepsis among various health care professionals is essential for prompt diagnosis and appropriate initial resuscitation and management of patient with sepsis.

Objective

To assess and compare the knowledge and awareness of sepsis among health care professionals working at Birat Medical College and Teaching Hospital.

Methodology

This was a questionnaire-based survey with comparative study in 200 health care professionals conducted at Birat Medical College and Teaching Hospital from July–September, 2019. Questions were designed to assess the knowledge on diagnosis, initial resuscitation and management of sepsis. The knowledge level of the participants was assessed with scoring system as good, average and poor which was finally compared between the various health care professionals.

Result

Out of 200, only 180 health care professionals were included for statistical analysis. While assessing the knowledge on diagnosis of sepsis, 55.6% consultant doctors, 42.8% medical officers and 21.5% nursing/paramedics answered correctly on an average. Similarly, 51.7 % consultant doctors, 33.7% medical officers and 26.6% nursing/ paramedics gave correct answers while assessing knowledge on initial resuscitation and management. The nursing/paramedics had comparatively lower knowledge level on sepsis than the doctors. Around 31.7%, 51.2% and 17% of health care professionals working in Emergency, ICU and Anesthesiology departments had good, average and poor knowledge on sepsis respectively as compared to 14.2%, 28.5% and 57.1% of participants working in other departments.

Conclusion:

The nursing/paramedics had lower knowledge level on sepsis as compared to the doctors while health care professionals working in Emergency,ICU and Anesthesiology departments had better knowledge on sepsis as compared to staffs working in other departments.

KEYWORDS

Awareness, knowledge, sepsis, septic patient.

INTRODUCTION

Sepsis is the leading cause of death from infection worldwide which has a major impact on the quality of life and global health economics.[1,2] Sepsis affects more than 750,000 patients and accounts for 215,000 deaths in the USA alone each year, at a cost of more than $16 billion.[2] Patients with severe sepsis are using 45% of all intensive care unit (ICU) bed days and 33% of all the hospital bed days.[1] Early recognition and prompt treatment are essential for increased survival rates and optimal outcome.[3,4] Studies have shown dramatic effect on survival rates if treatment of sepsis is started within the first hour from diagnosis.[5,6] Lack of knowledge and awareness among health professionals can lead to delayed diagnosis and late initial management which can have a negative impact on patient outcome. It is thus, essential to have adequate awareness and knowledge of sepsis among the health care professionals. The Surviving Sepsis Campaign has recommended to initiate resuscitation, diagnostic measures and appropriate antibiotic therapy with in one hour of sepsis diagnosis.[7] Unaware of these major recommendations by Surviving Sepsis Campaign can lead to unnecessary delay in diagnosis and management of sepsis.

Although sepsis has a major impact on functional life of patient and overall health care system, a little is known about sepsis by the public and health care professionals as compared to the other diseases.[8] This fact is supported by an international survey including 6021 participants from Europe and USA held in 2009 which showed that 88% had never heard of the term sepsis before.[9]

World Sepsis Day aims to increase awareness and knowledge regarding sepsis. A recent WHO resolution on sepsis demands "increased public awareness of the risk of progression to sepsis from infectious diseases through health education".[10,11] The Surviving Sepsis Campaign provides numerous helpful tools to increase awareness and education among health care professionals for the diagnosis and management of sepsis especially in patients with severe sepsis and septic shock.

Hence, this study is designed to assess the awareness and perception of sepsis among the various health care professionals working at Birat Medical College and Teaching Hospital which will help to formulate the awareness program on sepsis so that the outcome of patients can be improved.

METHODOLOGY

This is a questionnaire-based comparative study which was conducted at Birat Medical College and Teaching Hospital, for a duration of three months (July 2019 – September 2019). Ethical approval for the study was taken from Institutional Review Committee. Two hundred (200) participants were surveyed in the study considering 80% power of study and 5% as level of acceptance. Informed consent was taken from all the participants. A questionnaire was developed to assess the knowledge and awareness of sepsis among the doctors, nursing staffs and paramedics. First, knowledge and awareness of sepsis among participants was evaluated on the basis of their existing knowledge on various definition of sepsis components like systemic inflammatory response syndrome(SIRS), septicemia, sepsis, septic shock, multiorgan dysfunction syndrome (MODS) and qSOFA. Questions were designed to assess the knowledge on individual components and the correct answers were compared among the participants. Secondly, questions were designed to assess the knowledge on initial resuscitation and management which included questions on blood culture, lactate, fluid management, antibiotics, inotropes, procalcitonin and monitoring of resuscitation. Again, the correct answers were compared among the participants. Lastly, participants who work in Emergency, ICU and Anesthesiology departments were divided into Group A and the remaining departments of clinical medicine (Medicine, Surgery, Orthopedics, Pediatrics, Gynecology, ENT, etc) were in Group B. The comparative study of knowledge level was done between these two groups with the help of questionnaire. Ten questions on the knowledge and awareness of sepsis diagnosis and management were prepared by the consultant experts from the Intensive care unit and Emergency departments. One mark was given to correctly answered question with the maximum score of 10 and minimum score of 0. Knowledge level was classified as good if the score was 8 or more, average if the score was 5 to 7 and poor if the score was less than 4. The questionnaire tool used to assess knowledge level between the two groups are as follows.

1. Have you ever found a septic patient in your practice?
2. Do you know the components of SIRS criteria?
3. Do you know the definition of septic shock?
4. Have you ever heard about qSOFA for sepsis diagnosis?
5. Is crystalloid the first choice of fluid resuscitation in sepsis?
6. Is it necessary to assess mean arterial blood pressure and urine output in septic shock?
7. Do you think early administration of antibiotic can affect the outcome of septic patients?
8. Is there any specific inotrope of choice in the management of septic shock?
9. Do you think lactate is important as a monitoring marker in sepsis?
10. Do you agree that pro calcitonin can be used to guide antibiotic therapy in sepsis?

Data was collected and entered in Microsoft Office Excel 10. Then data was analyzed using Statistical Software IBM SPSS statistics Version 16. Continuous data were presented as mean and standard deviation whereas categorical data were presented as frequency and percentage. Paired t test was used to compare mean for continuous data and Chi square test was used for categorical data. P value < 0.05 was considered statistically significant.

RESULTS

A total of 200 health care professionals working at Birat Medical College and Teaching Hospital were surveyed with the questionnaires. Twenty questionnaires were incompletely filled so were excluded from the study. Out of

180 participants, 62 (34.4%) were consultant with MD certification, 33 (18.3%) were medical officers with MBBS certification and 85 (47.2%) were nursing and paramedics working in different departments.

Years of experiences of health care professionals. The participants had a wide range of work experience after academic certification (Figure: 1).

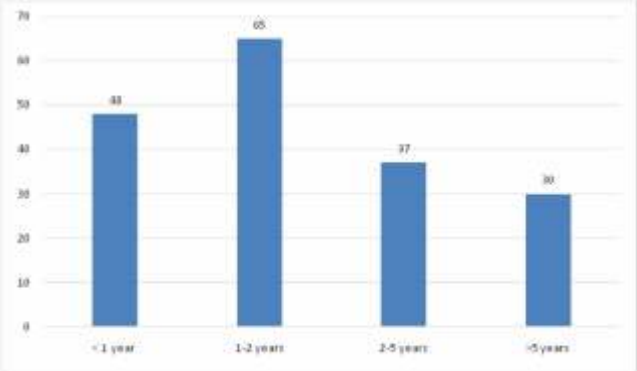

Figure 1: Years of experiences of the participants

The study included 82(46%) participants in Group A while 98(54%) participants were in Group B (Figure: 2).

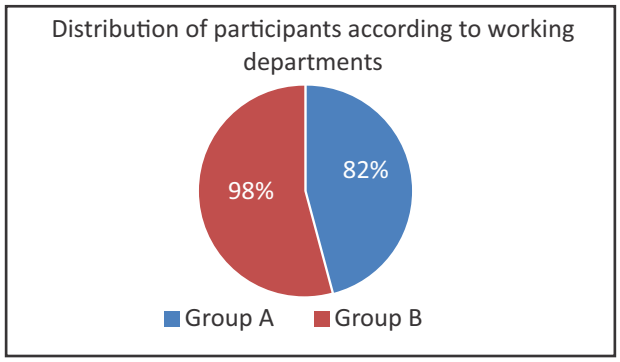

Figure 2: Distribution of participants according to working departments

Despite of participants working in different departments where patients with sepsis presentation might be of low possibility, majority of the participants (153, 85%) had managed or had opportunity to be involved in the team to manage patients with sepsis.

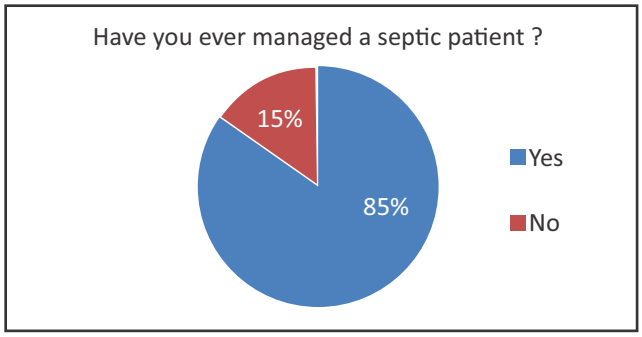

Figure 3: Clinical exposure to sepsis case management

The table 1 shows participants' response on the evaluation of knowledge on definition of sepsis. The lowest response was observed for defining septicemia among all the consultant doctors, medical officers and nurses/paramedics (43.5%, 36.3%, 21.1% respectively) while highest response was obtained for sepsis definition (74.1%). Similarly, among medical officers, highest score (51.5%) was for sepsis definition while lowest response (36.3%) was for septicemia. Among nurses/paramedics good response (25.8%) was seen in SIRS definition while poor response (17.6%) was observed for septic shock definition. On an average, 55.6% consultant doctors, 42.8% medical officers and 21.5% nurses/ paramedics had correctly answered questions based on the definition of sepsis components.

The Figure 4 shows the comparison of the correctly answered questions regarding definition of components of sepsis syndrome. The nurses/paramedics showed overall lower response level as compared to the doctors.

Table 1: Assessment of knowledge on definition of sepsis components among participants

Sepsis components	Consultants N=62	Medical officers N=33	Nursing/ paramedical staffs N=85	Total N=180
Systemic Inflammatory Response Syndrome	31(50%)	15(45.4%)	22 (25.8%)	68(37.7%)
Septicemia	27 (43.5%)	12 (36.3%)	18 (21.1%)	57(31.6%)
Sepsis	46(74.1%)	17 (51.5%)	19 (22.3%)	82(45.5%)
Septic shock	28 (45.1%)	13 (39.3%)	15 (17.6%)	56(31.1%)
Multiorgan Dysfunction Syndrome	34(54.8%)	15 (45.4%)	19 (22.3%)	68(37.7%)
qSOFA	41 (66.1%)	13 (39.3%)	17 (20%)	71(39.4%)
Average Percentages	**55.6%**	**42.87%**	**21.52%**	**37.16%**

Figure 4: Comparison of knowledge on definition of sepsis among health care professionals

Questions were designed to assess the knowledge on initial resuscitation and management which included questions on blood culture, lactate, fluid management, antibiotics, inotropes, procalcitonin and monitoring of resuscitation. The proportion of the participants who answered correctly was shown in the following table and was compared among the consultants, medical officers and nursing/paramedics.

The table 2 demonstrates the frequency of the participants who correctly answered the questions designed to evaluate the knowledge on initial resuscitation and management.

Among the various questions designed, the highest number of participants (77.4%) who answered correctly was the question based on the type of the fluid usedfor resuscitation while lowest number (40.3%) was for the question related with blood culture. Similarly, medical officerswith the highest percentages (72.7%) of correct answers werefor the

type of fluid used for resuscitation and lowest number (27.2%) was for the use of ultrasound in sepsis management. Similarly, highest number of nurses/ paramedics (47.0%) answered correctly for the type of fluid used for resuscitation while lowest number (22.3%) was for questions based on the role of lactate in sepsis management. On an average, 51.5% consultant doctors, 33.7.% medical officer and26.6% nurses/paramedics had correctly answered various questions designed to evaluate knowledge on initial resuscitation and management.

The Figure 5 shows the comparison of the correctly answered components of initial resuscitation and management of sepsis. It showed that the nurses had comparatively lower knowledge level as compared to the doctors for initial resuscitation and management of sepsis.

Table: 2 Assessment of knowledge on initial resuscitation and management

Variables	Consultant N=62	Medical officer N=33	Nursing/ paramedics N=85	Total N=180
Blood culture	25 (40.3%)	12(36.3%)	21(24.7%)	58(32.2%)
Role of lactate	30(48.3%)	14(42.4%	19 (22.3%)	63(35%)
Type of resuscitation fluid	48(77.4%)	24(72.7%)	40(47.0%)	112(62.2%)
Resuscitation fluid volume	31(50%)	15(45.4%	23(27.0%)	69(38.3%)
Use of ultrasound for resuscitation		9(27.2)	20 (23.5%)	57(31.6%)
Right time of antibiotics	38(61.2%)	15(45.4%)	26 (30.5%)	79(43.8%)
Inotrope/vasopressor	32(51.6%)	13(39.3%)	18(21.1%)	63(35%)
Shock monitoring	35(56.4%)	11 (33.3%)	21(24.7%)	67(37.2%)
Role of procalcitonin	21(33.8%)	10(30.3%)	16(18.8%)	47 (26.1%)
Average Percentages	**51.57%**	**33.71%**	**26.62%**	**37.93%**

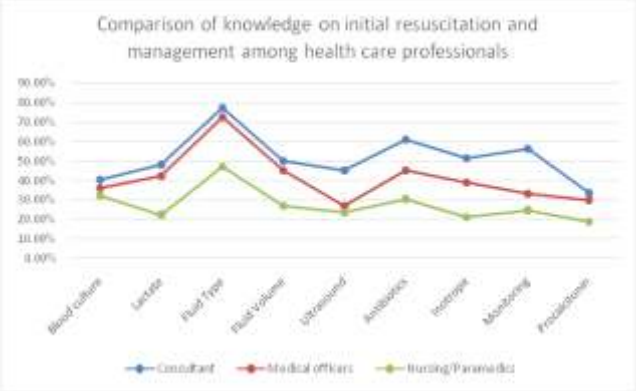

Figure 5: Comparison of knowledge on initial resuscitation and management among health care professionals.

Table 3 shows the comparison of the knowledge level in the participants who worked in Emergency, ICU and Anesthesiology departments with the participants who worked in Medicine, Surgery, ENT, Orthopedics, and Gynecology etc. In Group A, the level of understanding was good,average and poor in 31.7%, 51.2% and 17.0% of participants respectively. In Group B,the knowledge level was 14.2% good, 28.5% average and 57.1% poor. There was statistically significant difference (P<0.05) in the understanding of sepsis between the two groups of the participants with the better understanding in the participants of Group A.

Table: 2 Assessment of knowledge on initial resuscitation and management

Knowledge level	Group A (82)	Group B(98)	P value
Good	26(31.7%)	14(14.2%)	0.026
Average	42(51.2%)	28((28.5%)	0.040
Poor	14(17.0%)	56(57.1%)	0.0001

DISCUSSION

The knowledge and awareness of sepsis is major factor that affects the clinical management and outcome of sepsis patient. The knowledge of health care workers depends on the level of education, years of experience, working departments and additional educational training during the course of the job. This study was designed to evaluate the knowledge and awareness of the various healthcare professionals in managing the patient with sepsis at Birat Medical College and Teaching Hospital. The study has primarily put an emphasis to assess the knowledge of sepsis of the consultant doctors, medical officers, nursing staffs and paramedics as they are the front liners to manage the patients with sepsis in our hospital.

The study did the questionnaire-based survey on 62 consultant doctors, 33 medical officers and 85 nursing and paramedical staffs working in different departments of the institute. This has led to a better evaluation of the knowledge level of the staffs who are actually involved in the initial management of the patient with sepsis. The study by Stamataki P et al had nicely elaborated the importance of nursing awareness and knowledge on sepsis in the patient outcome.[12] They concluded that nurses can have an advanced role in early recognition and treatment of septic patients that may be critical for their survival.[12]

The years of working experiences have a crucial effect on the knowledge of sepsis in the health care professionals. The study showed that 36.1 % of the participants had 1-2 years of experience in their job while only 16.6% had more than five years of job experiences. Clinical experiences in the management of the patients with sepsis and continuous work based educational training could help to improve the understanding of sepsis in a better way as illustrated by the study done by You sefi H et al.[13]

The study showed that 45.5% of participants had worked in the departments like Emergency, ICU and Anesthesiology departments where there is a high probability of managing patients with sepsis and hence, possible improvement in the understanding of sepsis among those participants. However, 85% of the participants answered that they had previous knowledge about sepsis during the time of their academic training or had managed cases of sepsis during their clinical practice.

The study evaluated the knowledge and awareness in two aspects of sepsis; one definition and another in initial resuscitation and management. Questions were designed to assess both the components.55.6% consultants, 42.87% medical officers and 21.52% nursing/paramedical staffs were able to give correct answers for the current definition of the sepsis components. This showed an apparent difference

in the knowledge level among the different health care professionals with nursing /paramedics having lowest level while the consultants having highest level. A study by Gabriella Nucera showed a similar difference in the knowledge between doctors and nurses.[14] This difference was found in both the initial diagnosis and management. Knowledge level is definitely affected by the level of education and training during academic certification. It clearly demonstrates that the educational training during academic certification might not be sufficient to make them efficient to work in their clinical practice. Having said that, there are lot of evidences which show that even among the doctors, there is a wide variability in the knowledge level. In an international survey conducted among 1058 physicians, there was lack of agreement on the definition of sepsis.[15] Similarly, Rhee C et al.[16] demonstrated that diagnosing sepsis is extremely subjective and variable even when the study was conducted among intensivists.

Similarly, questions were designed to assess the knowledge on initial resuscitation and management of sepsis. It was found that only 51.57% consultants, 33.71% medical officers and 26.62% nursing/paramedical staffs on average answered the questions correctly. Comparatively, nursing and paramedics showed lower knowledge level for initial resuscitation and management. Though 85% of the participants answered that they had managed patient with sepsis during their clinical practice, but the knowledge level on sepsis as a whole showed that there was a lack of adequate knowledge in identifying and managing septic patient. This observation demanded a specific training program for all the health care professionals working in the institute in order to manage septic patients in a better way. Similar to our study, Shrestha GS found that there was a sub optimal level of knowledge regarding severe sepsis and septic shock among medical officers working in emergency department and ICU.[17] Contradictory to our finding, Stamataki P et al.[12] observed that the knowledge of sepsis among Greek nurses was only satisfactory but they recommended the need of inclusion of sepsis education in detail in the certification course itself. The reason behind this discrepancy is probably because of academic degree, training and exposure. This hypothesis is proved by the study which shows that educational training can influence the level of knowledge among doctors and nurses.[14] Tromp M et al.[18] showed that residents' knowledge about sepsis improved significantly following educational intervention. A survey conducted in Dutch emergency department nurses showed that knowledge regarding sepsis raises with more exposure and recent education.[19] It is also observed that a good educational program can help those who have low exposure to septic patients.[19]

The study compared the knowledge level between the health care professionals working in Emergency, ICU and Anesthesiology departments (Group A) and those working in other departments (Group B). It showed that the participants in Group A had comparatively better knowledge on sepsis as compared to Group B ($P< 0.05$). The knowledge level was statistically good ($p=0.026$) for the health care staffs working in Emergency, ICU and Anesthesiology departments while it was significantly poor for the health care professionals working in other departments ($p=0.001$). It is obvious that the septic patient are being managed in Emergency, ICU and Operation the atres very frequently and staffs are better trained to treat the septic patient. So, this possibly explains the better knowledge of the participants working in these departments. This finding developed the necessity of ongoing training and education for the staffs working in other departments. Poeze M et al.[15] showed a significant difference between ICU and non ICU health workers regarding knowledge of sepsis. Stamataki P et al.[12] also demonstrated the differences seen between ICU nurses and non ICU nurses for recognition of signs of sepsis focusing on importance on expertise. A survey showed that paramedics working in emergency department had good knowledge of sepsis.[20] An audit which was done to assess knowledge of sepsis among nurses working in medicine, surgery and orthopedic wards showed poor result.[21] In this study health professionals working in departments other than Emergency, Anesthesiology and Critical care had comparatively poor level of knowledge regarding sepsis.

CONCLUSION

The nurses/paramedics had comparatively lower knowledge level of sepsis as compared to the doctors while the health care professionals working in Emergency, ICU and Anesthesiology departments had better knowledge level of sepsis as compared to the staffs working in other departments.

LIMITATIONS

Since the questionnaire was not validated the study has less significance. Sepsis is a very broad topic and to assess the knowledge with only 10 questions at a single point of time doesn't have good significance. Also, the study was conducted in a single center so, the findings of the study cannot be generalized.

RECOMMENDATION

Regular CMEs, trainings and classes to be taken by the experts involved in the management of sepsis to all the nursing staffs and paramedics.

CONFLICT OF INTEREST

None

ACKNOWLEDGEMENT

We would like to thank all the doctors, nurses and paramedics who participated in this survey.

REFERENCES

1. Padkin A, Goldfrad C, Brady AR, Young D, Black N, Rowan K. Epidemiology of severe sepsis occurring in the first 24 hrs in intensive care units in England, Wales, and Northern Ireland. CritCare Med 2003; 31:2332–8. PMID:14501964DOI:10.1097/ 01.CCM. 0000085141.75513.2B
2. Picard KM, O'Donoghue SC, Young-Kershaw DA, Russell KJ. Development and implementation of a multidisciplinary sepsis protocol. Critical Care Nursing 2006;26: 43–54. PMID: 16717386
3. Brindley PG, Zhu N, Sligl W. Best evidence in critical care medicine. Early antibiotics and survival from septic shock: it's about time. Can J Anaesth 2006;53:1157–60. PMID:17079643 DOI:10.1007/ BF03022884
4. Rivers EP, Mclntyre L, Morro DC, Rivers KK. Early and innovative interventions for severe sepsis and septic shock: taking advantage of a window of opportunity. CMAJ 2005;173: 1054–65. PMID: 16247 103 PMCID: PMC1266331DOI:10.1503/cmaj.050632
5. Bone RC, Balk RA, Cerra FB, Dellinger RP, Fein AM, Knaus WA, et al. "Definition for Sepsis and organ failure and guidelines for the use of innovative therapies in Sepsis. Chest 1992;101:1644 –55. https:// doi.org/10.1378/chest.101.6.1644
6. Rivers E, Nguyen B, Havstad S, Ressler J, Muzzin A, Knoblich B, et al. Early goal-directed therapy in the treatment of severe sepsis and septic shock. N Engl J Med2001;345:1368–77. doi:10.1056/ NEJMoa 010307
7. Dellinger RP, Levy MM, Rhodes A, Annane D, Gerlach H, Opal SM, et al. Surviving sepsis campaign: international guidelines for management of severe sepsis and septic shock: 2012. Crit Care Med 2013;41: 580–637. doi: 10.1097/CCM.0b013e31827e83af
8. Vincent J. Increasing awareness of sepsis: World Sepsis Day.Critical Care 2012; 16:152. https://doi.org/10.1186/cc11511
9. Rubulotta FM, Ramsay G, Parker MM, Dellinger RP, Levy MM, Poeze M. An international survey: public awareness and perception of sepsis. Crit Care Med. 2009;37(1):167-70.PMID:19123265 DOI:10.1097/ccm.0b013e3181926883
10. WHA. Improving the prevention, diagnosis and clinical management of sepsis. 2017. http://apps.who.int/ gb/ebwha/pdf_ files/ WHA70/ A70_R7-en.pdf?ua=1. Accessed 15 May 2018.
11. Reinhart K, Daniels R, Kissoon N, Machado FR, Schachter RD, Finfer S. Recognizing sepsis as a global health priority—a WHO resolution. N Engl J Med. 2017;377(5):414–7.doi: 10.1056/NEJMp1707170
12. Stamataki P, Papazafiropoulou A, Kalaitzi S, Sarafis P, Kagialari M, Adamou E et al. Knowledge regarding assessment of sepsis among Greek nurses. J Infect Prev. 2014;15(2):58-63. doi:10.1177/ 1757177413513816 PMCID: PMC5074121PMID: 28989356
13. Yousefi H, Nahidian M, Sabouhi F. Reviewing the effects of an educational program about sepsis care on knowledge, attitude, and practice of nurses in intensive care units. Iran J Nurs Midwifery Res. 2012;17(2 Suppl 1):S91-5 PMID: 23833608PMCID: PMC3696963
14. Nucera G, Esposito A, TaglianN ,BaticosC,MarinoP. Physicians' and nurses' knowledge and attitudes in management of sepsis: An Italian study . Journal of Health and Social Sciences 2018; 3(1):13-26 DOI 10.19204/2018/phys2
15. Poeze M, Ramsay G, Gerlach H, Rubulotta F, Levy M. An international sepsis survey: a study of doctors' knowledge and perception about sepsis. Crit Care 2004;8(6):R409-13. PMID:15566585 PMCID:PMC 1065059DOI 10.1186/cc2959
16. Rhee C, Kadri S, Danner R, Suffredini A, Massaro A, Kitch B, et al. Diagnosing sepsis is subjective and highly variable: a survey of intensivists using case vignettes. Crit Care 2016;20:89. PMID: 27048508P MCID:PMC4822273DOI 10.1186/s13054-016-1266-9
17. Shrestha GS, Parajuli BP, Acharya SP, Banstola A, Upadhyaya B, Bajracharya T; Understanding of Severe Sepsis and Septic Shock Among Emergency Department and Intensive Care Unit Medical Officers in a Developing Country Nepal: A Survey Study BJHS 2016;1(1):47-9. doi: https://doi.org/10.3126/bjhs.v1i1.17096
18. Tromp M, Bleeker-Rovers CP, van Achterber T, Kullberg BJ, Hulscher M, Pickkers P. Internal medicine residents' knowledge about sepsis: effects of a teaching intervention. Neth J Med. 2009;67(9):312–5. PMID: 19841491
19. Van den Hengal LC, Visseren T, Meima Cramer PE, Rood PPM, Schuit SCE. Knowledge about systemic inflammatory response syndrome and sepsis : a survey among Dutch emergency department nurses. International Journal of Emergency Medicine 2016;9:19 https:// doi.org/ 10.1186/s12245-016-0119-2
20. Seymour C, Carlbom D, Engelberg R, Larsen J,Bulger E, Copass M et al. Understanding of sepsis among Emergency Medical Services : A survey study. J Emerg Med. 2011;42(6):666-77doi:10. 1016/j. jemermed.2011.06.013PMID: 22070877 PMCID: PMC3288490
21. Robson W, Beavis S, Spittle N. An audit of ward nurses' knowledge of sepsis. NursCrit Care 2007;12(2):86-92 PMID:17883633 DOI: 10.1111/ j.1478-5153.2007.00210.x