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Awareness and Perception of Sepsis Among the Urban and Rural Population in India

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Abstract

Traditionally, immunity has been defined as a defence against, or as a resistance to, contagious and infectious diseases. However, in modern understanding, it has become apparent that the immune system's mechanisms that protect against disease can also react against harmless substances. In some instances of severe infection, it's important to be aware that the immune response generated may have unintended adverse consequences. These conditions are associated with sepsis and may even turn out to be life-threatening in certain cases. Sepsis is a whole spectrum of diseases with a systemic and dysregulated host response to an infection. Therefore, it is of utmost importance to investigate and understand the level of awareness among the general public regarding this condition. This study aimed to understand the level of awareness about sepsis among the general population and to compare the perspectives of urban and rural populations. This study revealed that the awareness among both populations is low. Efforts should be made to increase awareness in India.

Keywords: *General Population Awareness, Perception, Rural, Semi-Rural, Sepsis, Urban.*

Introduction

Sepsis is a whole spectrum of diseases with a systemic and dysregulated host response to an infection. The presentation may range from non-specific or non-localizing symptoms to severe signs with evidence of multi-organ dysfunction and septic shock [1]. Septicemia is a state of microbial invasion from a portal of entry into the bloodstream which causes signs of illness. In clinical practice, less than one-half of the patients with signs and symptoms of sepsis have positive results on blood culture. Moreover, not all patients with bacteremia have signs of sepsis. Therefore, it should be noted that sepsis and septicemia are not identical [2].

Sepsis can also lead to severe sepsis, a condition complicated by predefined organ dysfunction. Sepsis may exist on a continuum of severity ranging from basic infection and bacteremia to sepsis and septic shock. Septic shock can lead to fatal multiple organ dysfunction syndrome (MODS) [3, 4]. Septic shock is defined as a condition in which cardiovascular system collapse is observed related to severe sepsis despite adequate fluid resuscitation [5]. The term severe sepsis refers to sepsis that is associated with tissue hypoperfusion (eg, elevated lactate, oliguria) or organ dysfunction (eg, elevated creatinine, coagulopathy), and the term systemic inflammatory response syndrome (SIRS) have been now put out of use since 2016, as the current definition of sepsis and septic shock definitions include patients with evidence of tissue hypoperfusion and organ dysfunction [6].

Sepsis leads to numerous alterations in normal physiological processes. These alterations can impact the body at different levels. While some impacts happen at the cellular level, other effects may include major organs of the body. The proinflammatory cytokines cause systemic hypotension, interstitial edema, and small vessel thrombosis,

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leading to decreased delivery of oxygen and nutrients to the tissues [7]. The limited amount of nutrients that do reach the tissues also fails to be properly utilized due to cellular hypoxia. The increased amounts of inflammatory cytokines also lead to a lowering of myocardial contractibility and lowered cardiac output [8]. Endothelial injury and increased vascular permeability may also lead to acute respiratory distress syndrome. All these cumulatively fail multiple organs, particularly the kidneys, liver, lungs, and heart, and can gradually become fatal.

Multiple diagnostic procedures may be prescribed by doctors to determine the exact source of sepsis and the causative agent. These diagnostic procedures are often instrumental in trying to pinpoint the underlying infection. Laboratory tests are important tools that help in the diagnosis of sepsis. These tests play a major role in distinguishing sepsis from other conditions and continue to monitor and assess organ function, blood oxygenation and the acid–base balance. In the diagnosis of sepsis, the contribution of laboratory haematological, biochemical and microbiological tests is essential. However, it is to be noted that culture-based diagnosis can often be time-consuming. Therefore, major efforts have been undertaken to determine effective biomarkers that allow early diagnosis of this disease.

Biomarkers are objectively quantifiable and evaluable characteristics as an indicator of normal biological processes, pathogenic processes, or pharmacologic responses to a therapeutic intervention [9]. Biomarkers are utilized by physicians for different types of laboratory diagnoses and treatment of patients. In clinical practice, biomarkers are also utilized for diagnostic or prognostic purposes, or as an associate to treatment. This is done to recognize the patients who may benefit most from a specific therapy or to predict its efficacy or toxicity [10]. The use of biomarkers is becoming more popular with each passing day and there is a high demand for new molecules able to identify sepsis and septic shock.

Public awareness can have a major impact on spreading knowledge and leading to demands for improvement in treatment approaches [11]. In such medical scenarios, it is of utmost importance to involve the entire healthcare system, coupled with strong public and political support, to reduce mortality in the septic patient population.

Materials and Methods

In this study, for data collection, a questionnaire was sent to the public to collect proper and relevant data to analyze the awareness of Sepsis. Inclusion criteria set for this study were people who can read English from the selected population. After detailing the purpose of the study, the online link or offline survey form related to the Sepsis awareness survey was provided to the participants. The first part of the survey collected demographic data from the participants consisting of their nationality, state, education qualification, profession, age, gender, and annual income. They were asked about their location area and the participants were given the option to choose from the following options: ‘Rural’, ‘Semi-rural’, and ‘Urban’. The second part of the survey consisted of questions about sepsis and its awareness. The responses from the urban and rural populations were compared. A chi-square test was undertaken to test if the correct responses reflected a genuine understanding. The level of confidence was set at 95% ($p \geq 0.05$) to identify questions to which responses were randomly distributed between correct and incorrect options. A single-factor Analysis of Variance (ANOVA) test was also performed to test for significant differences in the percentage of correct answers between the different groups of participants. The analyses were performed using SPSS version 26.

Results

The survey was conducted with a total of 3501 participants across the Indian states of Andhra Pradesh, Arunachal Pradesh, Assam, Bihar, Delhi, Goa, Gujarat, Karnataka, Kerala, Maharashtra, Mizoram, Odisha, Rajasthan, Sikkim, Tamil Nadu, Telangana and West Bengal. The participants were from all wakes of life and were involved in different professions.

To recognize how many of the participants were aware of sepsis the survey started by asking the participants: 'Have you ever heard about the medical term Sepsis?'. Those participants who responded negatively were considered to be unaware of the subject and were not included in the further study. Only those participants who responded to this question with a 'Yes', were asked about their primary source of information regarding sepsis and were included to investigate how accurate their understanding of sepsis was. Here the findings of the survey are presented as per the questions and the responses of the participants.

The participants were first asked if they had heard about the term sepsis to identify the level of awareness among the participants regarding sepsis. In response to the question, 3441 out of the 3501 participants reported that they had never heard of the term. This revealed that 98.28% of the participants were entirely unaware of sepsis. Out of the total 54, 22 were from rural and semi-rural areas and 32 were from urban areas (Figure 1). These were the only participants who were considered for further questioning.

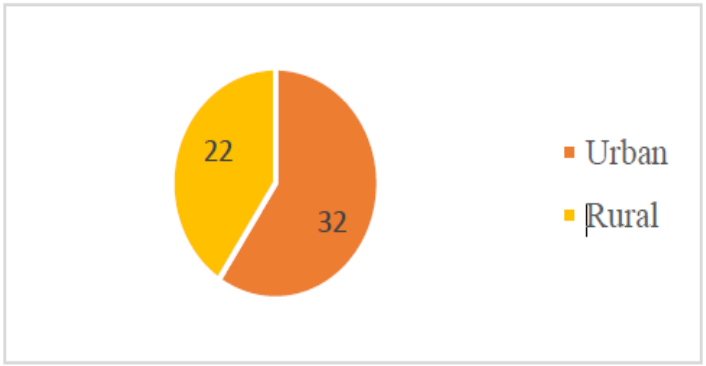

Figure 1. Distribution of Population Aware of Sepsis

The participants who responded positively were then inquired about their source of information by presenting the question, 'How did you hear about sepsis?'. In the urban population, the participants had come to know about sepsis from other sources (50%) and from family members who had experienced the condition (25%). In the rural and semi-rural populations, most people heard about sepsis from other sources (59.09%) or had sepsis themselves (18.18%) (Figure 2).

The participants were then asked if they think Sepsis, is a medical emergency. They were given four options to choose from. These options were: strongly agree, disagree, agree, and strongly agree. Among these options, the correct response was to strongly agree. Among the Rural and semi-rural population, 7 (31.81%) out of 22 chose the correct answer. 11 participants (50.00%) seem to only agree. 46.80% of the urban population chose the correct answer and 37.50% only agreed that sepsis is a medical emergency.

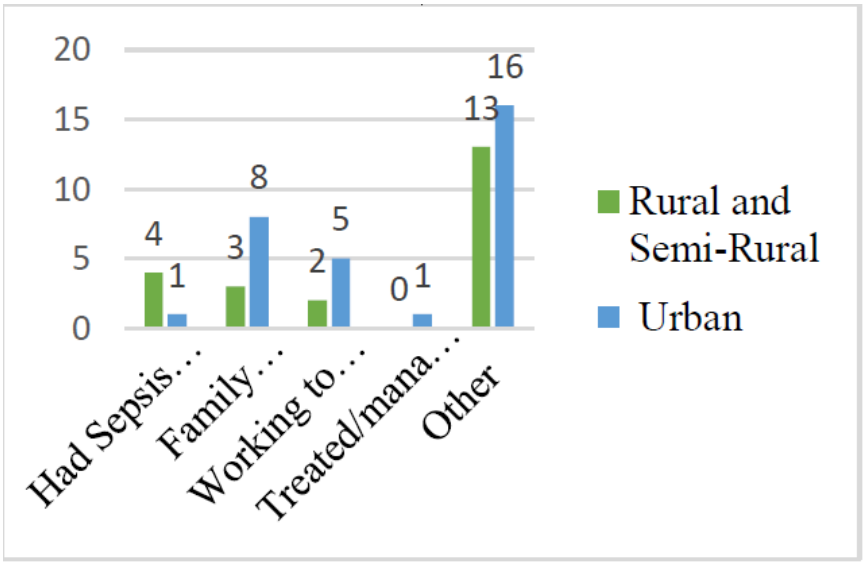

Figure 2. Source of Knowledge About Sepsis

The participants were then presented with the statement, 'Tetanus is the synonym of Sepsis' with the options, 'I think so', 'I don't think so', 'Wrong statement' and 'Don't know'. Among these given choices, the correct option to be chosen was 'Wrong statement'. The correct answer was chosen by 18.18% of the rural and semi-rural population and 31.25% of the urban population.

To check the depth of awareness among the participants, they are next given the question regarding the date of 'World Sepsis Day'. Each participant was given four options. These options were: '13th February', '13th June', '13th September' and '13th December'. Among these options, the correct answer was '13th September'. 36.36% of the rural and semi-rural participants and 59.37% of the urban participants knew the correct answer.

In an attempt to understand how deep, the awareness regarding sepsis is among the population, the participants were asked 'According to Global Sepsis Alliance every ___ someone dies of sepsis globally?' The participants were given four options to choose from: '2.8 days', '2.8 hours', '2.8 minutes', and '2.8 seconds. Among these options, the correct answer was '2.8 seconds. The responses of the two groups are represented in the graph (Figure 3). Statistical analysis revealed that a significant portion of the participants answered this question randomly (chi-square = 60.2, p = 0.64).

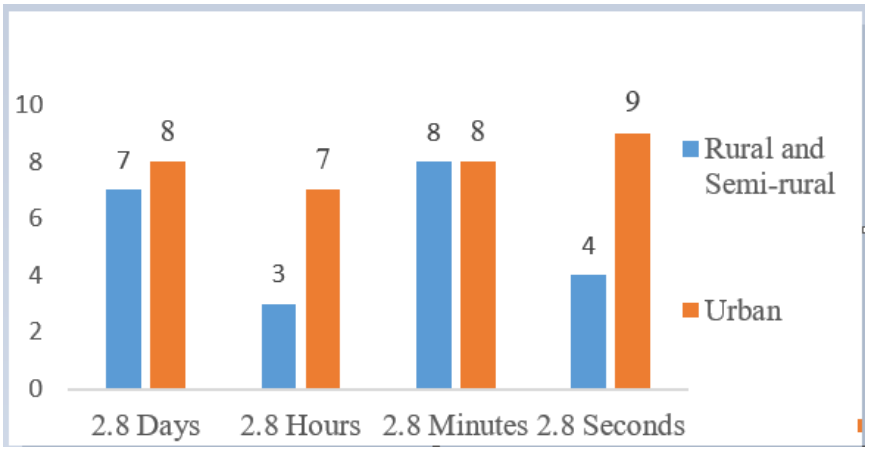

Figure 3. Response to the Question, According to the Global Sepsis Alliance Every - Someone Dies of Sepsis

The participants were then asked what kind of infections can lead to sepsis and were given the options, 'Bacterial', 'Viral', 'Fungal', 'All of the above' and 'None of the above', with the correct response being 'All of the above'. The correct answer was selected by 45.45% of the rural and semi-rural population and by 59.37% of the urban population.

In an attempt to understand how deep, the awareness regarding sepsis is among the population, the participants were asked, 'As per WHO, in every 5 deaths worldwide how many are associated with Sepsis?' The participants were given four options to choose from: '1', '2', '3', and '4'. The correct answer was '1' death. Most participants of both populations seem to know the correct answer. 68.18% of the rural population and 68.75% of the urban population knew the correct answer.

The participants were asked 'As per CDC for nearly 80% of patients, Sepsis begins ___ 'Inside the hospital', 'Outside the hospital', 'Inside ICU', and 'Don't know' were the options given. The correct answer to this question was 'Outside the hospital'. This question was posed to participants to test their awareness of global steps taken on sepsis. 27.27% of the rural and semi-rural population and 40.62% of the urban population chose the correct answer (Figure 4).

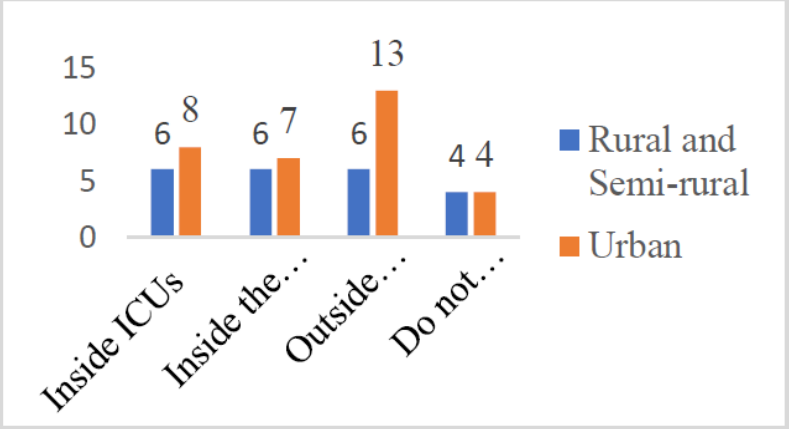

Figure 4. Response To the Question to Understand Where Sepsis Begins

To test their understanding of sepsis treatment, the participants were presented with the question, 'Do you think Sepsis can be easily cured with antibiotics?' They were given three responses to choose from, 'Yes', 'No', and 'Don't know'. The correct response is 'No'. Only 28.12% of the urban population and 13.63% of the rural and semi-rural population chose the correct answer (Figure 5).

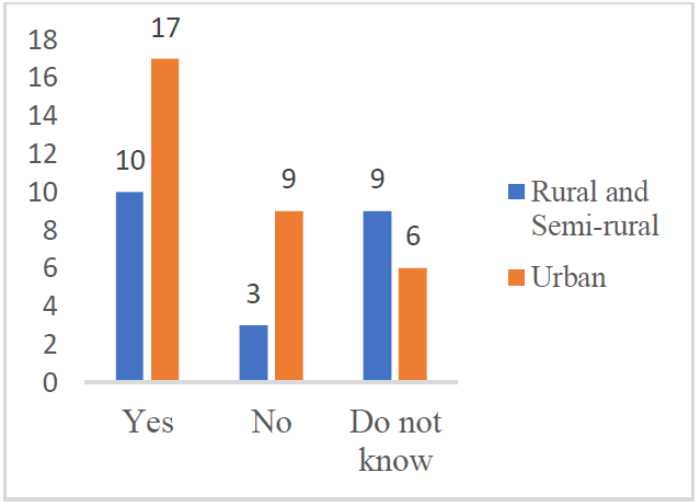

Figure 5. Response To the Question Whether Sepsis Can Be Easily Cured with Antibiotics

To understand the awareness regarding post-sepsis syndrome among the population, the participants were asked, 'How much percentage of Sepsis survivors suffer from post-sepsis syndrome?' The participants were given four options, '25%', '50%', '75%', and 'Never heard about post-sepsis syndrome'. The correct answer to this question was '50%'. This option was chosen by 13.63% of the rural and semi-rural population and 25.00% of the urban population. 43.75% of urban participants and 50.00% of rural and semi-rural participants had never heard of post-sepsis syndrome.

Discussion

The survey revealed that the awareness regarding sepsis in India is low. 3441 out of the 3501 participants reported that they have never heard of the term Sepsis. This revealed that 98.28% of the participants were entirely unaware of sepsis. This finding was comparable to international survey reports conducted over the last few decades across the globe. The rate was only little higher than that reported by Rubulotta *et al.* from the United States of America and certain other European countries in 2009 [12]. Similar lower values of awareness were also reported by a public awareness survey conducted from Sweden, where 21% of participants had heard of sepsis [13]. A study conducted in Singapore also revealed similar lack of awareness, with only 5% of survey participants having heard the term sepsis. A more recent survey from Saudi Arabia presented better results with 56.72% of participants stating that they had heard the term 'sepsis' [14]. Higher rate of awareness was also observed from South Korea, where 76.9% of the participants had heard of sepsis [15].

Globally there are about 30 million cases of sepsis each year, of which 6 million are fatal [16]. This makes sepsis a major cause of morbidity and mortality, and it is often estimated to be the second leading cause of death worldwide [17]. Epidemiologic data on sepsis has been found to vary depending on the origin of the database– community-based or hospital-based, nature of data collection-retrospective chart review, discharge diagnoses, diagnosis in death certificates, or prospective observational studies [18]. The participants in the present survey appeared to be unaware of the life-threatening nature of the condition. The awareness regarding what constitutes 'sepsis' is still underdeveloped in India.

The next question presented to the participants was non-intuitive and required knowledge of the condition, as the participants were asked to identify the 'World Sepsis Day'. This question was posed to identify if there were any ongoing attempts to raise awareness about sepsis among the rural and urban populations. Surprisingly enough, more than 60% of the urban participants answered correctly. This might be indicative of some success of the awareness programs undertaken by the government. However, this was not the case with the rural population. The awareness among them was low.

In some cases, our study revealed that when it came to more in-depth knowledge about up-to-date information regarding sepsis knowledge, there was a considerable lack of information. Chi-square analysis revealed that in certain such questions, the correct responses were generated randomly. The randomness was found to be significant when the participants were asked if sepsis was curable by applying antibiotics.

The rate of correct response across all the groups could not be significantly separated from random chance. This revealed that there was still a considerable lack of knowledge regarding the current status of sepsis. There was however an exception when the participants were asked, how many 'As per WHO, in every 5 deaths worldwide how many are associated with Sepsis?'. To this question, more than 50% of the respondents chose the correct option. This finding was similar to previous reports generated from Malaysia [19] and Brazil [20].

In the present survey, when the participants were asked about what kind of infection can lead to sepsis, more than 50% of the urban participants and 45% of rural and semi-rural participants agreed that sepsis can originate from bacterial, viral, and/or fungal sources. This once again highlighted the lack of awareness among the participants. However, it should be noted that bacterial infection remains till date to be the major cause behind sepsis. Gram-positive bacteria, as a cause of sepsis have increased in frequency over time and are now almost as common as gram-negative infections. The latest European Prevalence of Infection in Intensive Care (EPIC II) study reported more gram-negative organisms (62.2% vs. 46.8%) [21].

The lack of public knowledge about sepsis may partly explain why there have been no such work previously done from India and why there is only a small number of resources allocated towards sepsis research in the country.

Conclusion

The presented work was undertaken with an aim to fill the gap of knowledge regarding sepsis awareness in India. It is of utmost importance that public awareness campaigns for sepsis be carried out. These campaigns should be designed to convey core messages like what the disease is, along with, what the signs and symptoms are, and lastly how prompt presentation and intervention can improve outcomes. Steps with regard to improving the public education system may also help to change the present scenario observed in India.

Conflict of Interest

There is no conflict of interest between the authors.

Acknowledgement

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References

[1] Singer, M., Deutschman, C. S., Seymour, C. W., Shankar-Hari, M., Annane, D., Bauer, M., Bellomo, R., Bernard, G.R., Chiche, J.D., Coopersmith, C.M. and Hotchkiss, R. S., 2016, The third international consensus definitions for sepsis and septic shock (Sepsis-3). *Jama*, *315*(8), pp.801-810.

[2] Komori, A., Abe, T., Kushimoto, S. *et al*. Characteristics and outcomes of bacteremia among ICU-admitted patients with severe sepsis, *Sci Rep* ,**10**, 2983 (2020).

[3] Gustot T., 2011, Multiple organ failure in sepsis: prognosis and role of systemic inflammatory response. *Curr Opin Crit Care*, Apr. 17(2):153-9.

[4] Goh, A. Y. T., Chan, P. W. K., & Lum, L. C. S., 1999, Sepsis, severe sepsis and septic shock in paediatric multiple organ dysfunction syndrome. *Journal of Paediatrics and Child Health*, *35*(5), 488-492.

[5] Vincent, J. L., & Gerlach, H., 2004, Fluid resuscitation in severe sepsis and septic shock: an evidence-based review. *Critical Care Medicine*, *32*(11), S451-S454.

[6] Ziesmann, M. T., & Marshall, J. C., 2018, Multiple organ dysfunction: the defining syndrome of sepsis. *Surgical Infections*, *19*(2), 184-190.

[7] Dolmatova, E. V., Wang, K., Mandavilli, R., & Griendling, K. K., 2021, The effects of sepsis on endothelium and clinical implications. *Cardiovascular Research*, *117*(1), 60-73.

[8] Rudiger, A., & Singer, M., 2007, Mechanisms of sepsis-induced cardiac dysfunction. *Critical Care Medicine*, *35*(6), 1599-1608.

[9] Biomarkers Definitions Working Group, Atkinson Jr, A. J., Colburn, W. A., DeGruttola, V. G., DeMets, D. L., Downing, G. J., Hoth, D. F., Oates, J. A., Peck, C. C., Schooley, R. T. and Spilker, B. A., 2001. Biomarkers and surrogate

endpoints: preferred definitions and conceptual framework. *Clinical Pharmacology & Therapeutics*, *69*(3), pp. 89-95.

[10] Cazalis, M.A., Friggeri, A., Cavé, L., Demaret, J., Barbalat, V., Cerrato, E., Lepape, A., Pachot, A., Monneret, G. and Venet, F., 2013. Decreased HLA-DR antigen-associated invariant chain (CD74) mRNA expression predicts mortality after septic shock. *Critical Care*, *17*(6), pp.1-10.

[11] Quale, D.Z. and Droller, M.J., 2007, July. Cancer patient advocacy: New opportunities for treatment advances. In *Urologic Oncology: Seminars and Original Investigations* , Vol. 25, No. 4, pp. 351-352.

[12] Rubulotta, F. M., Ramsay, G., Parker, M. M., Dellinger, R. P., Levy, M. M., Poeze, M. and Surviving Sepsis Campaign Steering Committee, 2009. An international survey: public awareness and perception of sepsis. *Critical Care Medicine*, *37*(1), pp.167-170.

[13] Mellhammar, L., Christensson, B. and Linder, A., 2015, December. Public awareness of sepsis is low in Sweden. In *Open Forum Infectious Diseases* , Vol. 2, No. 4, p. ofv161, *Oxford University Press.*

[14] Al-Orainan, N., El-Shabasy, A. M., Al-Shanqiti, K. A., Al-Harbi, R. A., Alnashri, H.R., Rezqallah, R. A. and Mirghani, A. A., 2020. Public Awareness of Sepsis Compared to Acute Myocardial Infarction and Stroke in Jeddah, Saudi Arabia: Questionnaire Study. *Interactive Journal of Medical Research*, *9*(2), p.e16195.

[15] Park, M., Kim, K., Lee, J. H., Kang, C., Jo, Y. H., Kim, D. H., Kang, K. W., Lee, S. H., Park, C., Kim, J. and Chung, H., 2014. Awareness and knowledge of sepsis in the general Korean population: comparison with the awareness and knowledge of acute myocardial infarction and stroke. *Clinical and Experimental Emergency Medicine*, *1*(1), p.41.

[16] Kissoon, N., Reinhart, K., Daniels, R., Machado, M. F. R., Schachter, R. D. and Finfer, S., 2017. Sepsis in children: global implications of the world health assembly resolution on sepsis. *Pediatric Critical Care Medicine*, *18*(12), pp.e625-e627.

[17] Cecconi, M., Evans, L., Levy, M., & Rhodes, A. (2018). Sepsis and septic shock. *The Lancet*, *392*(10141), 75-87.

[18] Bladon, S., 2023, Primary and secondary care patient health record data linked to examine risk factors, mortality and antibiotic use in sepsis , Doctoral dissertation, The University Of Manchester.

[19] Rahman, N. I. A., Chan, C. M., Zakaria, M. I., & Jaafar, M. J., 2019, Knowledge and attitude towards identification of systemic inflammatory response syndrome (SIRS) and sepsis among emergency personnel in tertiary teaching hospital. *Australasian Emergency Care*, *22*(1), 13-21.

[20] Salluh, J. I., Soares, M., & Singer, M., 2017, Spreading the knowledge on the epidemiology of sepsis. *The Lancet Infectious Diseases*, *17*(11), 1104-1106

[21] Vincent, J. L., 2008, European prevalence of infection in intensive care. *EPIC II study*. *28th ISICEM*.