Public Awareness About Sepsis in Türkiye: A Survey Study

Cüneyt Kurum[1], Ali İşçanan[1], Aslıhan Alioğlu[1], Zeliha Sena Karataş[1], Youssef Alothman[1],
Kerem Ülker[1], Şeyma Nur Dik[1], Abdullah Palabıyık[1], Züleyha Aydın[2], İlker İnanç Balkan[3]

[1]İstanbul University-Cerrahpaşa, Cerrahpaşa Faculty of Medicine, İstanbul, Türkiye
[2]Department of Biostatistics and Medical Informatics, İstanbul University-Cerrahpaşa, Institute of Graduate Studies, İstanbul, Türkiye
[3]Department of Infectious Diseases and Clinical Microbiology, İstanbul University-Cerrahpaşa, Cerrahpaşa Faculty of Medicine, İstanbul, Türkiye

Abstract

Objective: Sepsis is a severe medical condition characterized by life-threatening organ dysfunction due to an imbalanced immune response to infection. Delayed diagnosis often leads to high mortality rates, with approximately 50 million cases and 11 million deaths globally each year. Despite its significant impact on health and economics, public awareness of sepsis is low, especially among non-healthcare professionals. This study, conducted by fifth-year students from İstanbul University-Cerrahpaşa, Cerrahpaşa Faculty of Medicine, aims to evaluate and enhance sepsis awareness among diverse segments of the Turkish population.

Methods: Ethical approval was obtained from the İstanbul University-Cerrahpaşa Clinical Research Ethics Committee on April 5, 2024. Data collection involved a survey adapted from literature, administered face-to-face and through Google Survey Form over 1 month. The sample size was adjusted for Türkiye's population, excluding physicians and those unable to respond independently. Data analysis utilized the Statistical Package for Social Sciences version 26.0 software (IBM Corp.; Armonk, NY, USA).

Results: The study comprised 852 participants, predominantly female (53.4%), with an average age of 32; 49% were university-educated. Only 40.3% had prior knowledge of sepsis. Awareness was significantly higher among females ($P < .001$), peaking among 22-27 year-olds. Higher education and healthcare professions correlated with increased awareness ($P < .001$).

Conclusions: The research highlights inadequate sepsis awareness in Türkiye, particularly among non-healthcare professionals. Despite awareness among university-educated individuals and healthcare workers, broader societal awareness remains deficient. Media coverage of sepsis fails to reflect its public health significance. Higher awareness among females suggests stronger health literacy. Further comprehensive research is crucial to address these findings effectively.

Keywords: Sepsis, sepsis awareness, sofa criteria, health literacy

Introduction

Sepsis is a clinical syndrome characterized by the development of organ failure symptoms due to the body's irregular immune response against infection. For diagnosis, the presence of infection along with the assessment of sequential organ failure assessment (SOFA) criteria is required, with the presence of at least 2 criteria. These criteria include:[1]

- Decreased Glasgow Coma Scale score.
- Decreased PaO_2/FiO_2 ratio in the lungs.
- Increased creatinine level or decreased urine output.
- Decreased platelet count.
- Elevated bilirubin level.

If there is a decrease in mean arterial pressure despite fluid therapy due to hypoperfusion requiring vasopressor support or high lactate levels (>2 mmol/L) added to the picture, it is characterized as septic shock.[1]

Sepsis is a clinically significant condition that is quite common worldwide. According to a study based on Global Burden of Disease (GBD) 2017 data, it was found that there were 48.9 million cases of sepsis worldwide in 2017, resulting in 11 million deaths. This number accounted for 19.7% of all deaths globally in 2017 when compared to total mortality.[2]

Additionally, retrospective studies conducted in the United States have shown that out of 100 million annual emergency department visits, 850 000 were diagnosed with sepsis. It was found that 84% of these patients were aged 45 and above.[3] Due to the fact that 13% of cases admitted due to sepsis result in death,[3] it is essential to recognize and identify sepsis early. Therefore, quick sequential organ failure assessment (qSOFA) criteria should be assessed in every patient presenting to the emergency department with an infection. If there are findings suggestive of sepsis, hospital admission should be arranged promptly. These criteria are:[4]

- Impaired level of consciousness.
- Respiratory rate exceeding 22 breaths per minute.
- Systolic blood pressure dropping below 100 mmHg.

Awareness studies regarding such an important cause of morbidity and mortality in society are limited. A survey conducted in

Canada in 2022 with 3200 individuals aged 18 and above showed that 61.4% of the population had heard of the concept of sepsis before, and 53% knew the correct definition of sepsis.[5] In the same study:

- Individuals who had previously experienced sepsis were found to have significantly higher awareness compared to those who hadn't.
- Healthcare professionals had higher awareness compared to non-healthcare professionals.
- University graduates had higher awareness compared to non-university graduates.
- Women had higher awareness compared to men.[5]

In Türkiye, awareness studies targeting the general population at Gazi University[6] and targeting students at Cerrahpaşa Faculty of Medicine have been conducted.[7] It was shown that as the class level of medical students increased, awareness levels also increased, but there were deficiencies in students' ability to make diagnoses and provide treatment.

Based on all of this, the aim of this study is to measure the level of sepsis awareness among various segments of the population in our country and to propose suggestions for conducting various studies and developing practices to improve the general public's awareness of sepsis and other medical issues based on the level of awareness revealed.

Methods

The study has been ethically approved by the Clinical Research Ethics Committee İstanbul University-Cerrahpaşa (Approval no: E-83045809-604.01-989726, Date: May 14, 2024) and conducted in accordance with the Declaration of Helsinki. A total of 852 individuals participated in the survey. Individuals under the age of 10 and over the age of 99 were not included in the study. The survey included questions about the participants' demographic characteristics (age, gender, education level, occupation), whether they had heard of sepsis, if so, where they had heard about sepsis from and their level of knowledge about the meaning of sepsis.

The sample size was calculated by the sampling formula for a known population. ($n = Nt^2pq/d^2 (N-1) + t^2pq$) where n was the sample size; N was the population size, and t was the value for the selected alpha level of 0.025 in each tail = 1.96.[8] Upon this calculation, the sample size n was determined to be 384 individuals.

The data collection phase of the study was conducted in the form of a survey via Google Forms within 1 month following the ethics committee approval date. Prior to entering the survey, the participants reviewed the informed consent page and ticked the box indicating their consent to participate in the study. The data obtained from the survey were analyzed using the Statistical Package for Social Sciences version 26.0 software (IBM Corp.; Armonk, NY, USA). The Chi-square method was used for the analysis of categorical variables. A significance level of $P < .05$ was accepted.

When categorizing participants by their occupations, they were first divided into students and non-students. Non-students with medical professions (e.g., physicians, specialists, etc.) were excluded from the analysis because they already demonstrated 100% awareness of sepsis.

- Teachers and preschool educators.
- Housewives.
- Healthcare professionals (nurses, physiotherapists, dietitians, psychologists, and health technicians).

- Technical fields such as engineering, architecture, interior architecture, and information technology (IT).
- Workers, civil servants, and retirees comprised 5 specific groups. Occupations that could not be included in any of these groups were grouped under the category "other."

When categorizing participants according to their education level, the groups were compared in order to have roughly equal sizes in the following 3 groups:

- University students.
- University graduates.
- Individuals who have never attended university.

To prevent potential bias, participants who responded "I just looked it up on the internet" to the question "Where did you hear about sepsis?" were considered to have not heard of sepsis. Additionally, the level of knowledge about the meaning of sepsis was separately examined for those who responded "I just looked it up on the internet."

Participants who had heard the term "sepsis" were asked where they had heard it from, with the following options provided:

- I am a healthcare professional.
- There is a healthcare professional in my family/circle.
- I heard it from TV series/movies.
- I heard it on a health program on TV.
- I heard it on a non-health program on TV.
- I had read about it somewhere before (book, newspaper, magazine, internet).
- I personally experienced an incident related to it.
- I saw it on social media posts (WhatsApp, Telegram, Instagram, Facebook, etc.).

However, as participants provided responses beyond these options, the categorization of information sources was conducted as follows:

- Those who heard about sepsis are healthcare professionals.
- Those who heard about sepsis through their environment.
- Those who heard about sepsis through television or social media.
- Those familiar with the term sepsis are because they read about it in a book or magazine.
- Those who heard about sepsis in the hospital or had experience with sepsis.
- Those who could not remember or did not specify where they heard about sepsis.

Since participants may have multiple sources of awareness about sepsis, the total number of information sources (376) was higher than the number of participants who correctly knew about sepsis (343).

To measure participants' level of knowledge about sepsis, they were asked, "What does sepsis mean to you?" with the following options provided:

- It is blood poisoning.
- It is a type of disinfection method associated with antisepsis.
- It is bacterial growth in the blood.
- It is a newly identified infectious disease transmitted through cats' fur, leading to the development of cancer and rheumatic diseases.

- It is the development of organ failure due to the spread of infection throughout the body and an impaired immune response.
- It is the general term for diseases that occur as a result of infections contracted by healthcare workers during the COVID-19 pandemic.

Results

The study included a total of 852 participants who appropriately responded to the survey. Of these participants, 53.4% (n = 455) were female, with a mean age of 32. When grouped by age distribution, the largest group (26.5%, n = 226) consisted of participants aged 21 and below. In terms of education level, the majority (49%, n = 418) were university graduates, while 311 (36.5%) were students.

While 40.3% of participants had heard the word "sepsis" at least once in their lives, 59.7% stated that they encountered this word for the first time during the survey. Among those who had heard the word "sepsis" before, the largest group (49.5%) consisted of healthcare professionals.

The proportion of participants who had previously heard the word "sepsis" was lower in both females and males, but the awareness level among females was significantly higher than that of males ($P < .001$). When compared by age groups, the awareness level was significantly lower among those aged 21 and below ($P < .001$).

The level of sepsis awareness according to the demographic characteristics of the participants is presented in Table 1.

When the relationship between sepsis awareness and education level was examined, no significant difference was observed between university graduates and university students ($P = .059$), while awareness was significantly lower among individuals who had never attended university, high school graduates, high school students, middle school graduates, middle school students, elementary school graduates, and individuals with no education ($P < .001$).

When participants were categorized according to their occupations, a significant difference in sepsis awareness was found between students and non-students, with students having significantly lower awareness levels ($P = .027$). Among non-students, the highest level of awareness was observed among healthcare professionals, with a level of 95.3% ($P < .001$). Since doctors had a 100% awareness level, they were not included in the analysis when comparing occupational groups. Awareness levels were significantly lower among technical fields such as architecture, interior architecture, engineering, and IT, as well as among housewives ($P < .001$).

Among the participants who had heard the word "sepsis" before, data regarding where they heard it from are shown in Table 2. According to this, approximately half (49.5%) of those who had heard the word "sepsis" before were healthcare professionals, and 60.6% of them defined sepsis as "organ damage caused by the irregular immune response to infection."

When looking at the distribution of participants' knowledge levels about sepsis according to information sources, it is observed that the majority of participants defined sepsis as "organ damage caused by the irregular immune response to infection." However, those who read about it from written sources such as books or magazines mostly defined it as "blood poisoning" (Table 2).

Participants were grouped according to their knowledge levels about sepsis as shown in Table 3. Accordingly, among those who had heard the word "sepsis" at least once in their lives:

- 54.6% defined it as "organ damage caused by the irregular immune response to infection."

Table 1. Sepsis Awareness According to Demographic Characteristics of Participants

| | Have You Heard the Word Sepsis? | | | | | |
| | Yes | | No | | | |
	n	%	n	%	χ^2	P
Sex						
Male	132	33.2	265	66.8	15.184	< .001
Female	211	46.4	244	53.6		
Age						
12-21	66	29.2	160	70.8		
22-27	95	45.7	113	54.3	16.397	< .001
28-44	87	41.8	121	58.2		
45-72	95	45.2	115	54.8		
Education						
University graduates	201	48.1	217	51.9		
University students	101	40.6	148	59.4	35.848	< .001
Never attended university	41	22.2	144	77.8		
Occupatıon						
Students	110	35.4	201	64.6	4.866	.027
Non-students	233	43.1	308	56.9		
Medical doctors	17	100	0	00.0		
Other healthcare professionals	82	95.3	4	4.7		
Teachers	27	32.1	57	67.9		
Workers, civil servants, retirees	28	35.0	52	65.0	133.314	< .001
Technical fields	13	19.7	53	80.3		
Housewives	13	21.0	49	79.0		
Others	52	35.6	94	64.4		

- 30.0% defined it as "blood poisoning."
- 13.1% defined it as "bacterial growth in the blood."

Among all participants, more than half (55%) of those who defined sepsis as "organ damage caused by the irregular immune response to infection" were healthcare professionals (Table 3).

The approach of the 108 participants who stated that they heard the word "sepsis" because they had just looked it up on the internet regarding the meaning of sepsis is shown in Table 4. According to this, 63% of the participants who entered the search engine to investigate sepsis described sepsis as "blood poisoning." Indeed, the first result shown when typing "sepsis" into the search engine was "blood poisoning."

Table 2. Responses to the Question "What do you think sepsis is?" According to the Sources of Knowledge of Those Who Have Heard the Word Sepsis Before n = 39 (11.3%)

Sources of Knowledge	Healthcare Professional n = 170 (49.5%)	Environment n = 69 (20.1%)	TV or Social Media n = 62 (18.0%)	Book or Magazine n = 39 (11.3%)	Hospital or Experience n = 25 (7.2%)	Unspecified n = 11 (3.2%)
Responses to the Question						
Organ damage caused by the irregular immune response to infection	103 (60.6)	36 (52.2)	33 (53.2)	13 (33.3)	15 (60.0)	3 (27.3)
Blood poisoning	38 (22.4)	26 (37.7)	23 (37.1)	20 (51.3)	4 (16.0)	3 (27.3)
Bacterial growth in the blood	27 (15.9)	5 (7.2)	5 (8.1)	3 (7.7)	6 (24.0)	3 (27.3)
Others	2 (1.1)	2 (2.9)	1 (1.6)	3 (7.7)	0 (0.0)	2 (18.1)

Table 3. Sources of Knowledge According to the Level of Knowledge of Those Who Have Heard the Word Sepsis Before

Responses	Organ Damage Caused by the Irregular Immune Response to Infection n = 187 (54.6%)	Blood Poisoning n = 103 (30.0%)	Bacterial Growth in the Blood n = 45 (13.1%)	Others n = 8 (2.3%)	Total* (%)
Sources of Knowledge					
Healthcare professional	103 (55.0)	38 (36.8)	27 (60.0)	2 (25.0)	**170 (49.5)**
Environment	36 (19.2)	26 (25.2)	5 (11.1)	2 (25.0)	**69 (20.1)**
TV or social media	33 (17.6)	23 (22.3)	5 (11.1)	1 (12.5)	**62 (18.0)**
Book or magazine	13 (6.9)	20 (19.4)	3 (6.6)	3 (37.5)	**39 (11.3)**
Hospital or experience	15 (8.0)	4 (3.8)	6 (13.3)	0 (00.0)	**25 (07.2)**
Unspecified	3 (1.6)	3 (2.9)	3 (6.6)	2 (25.0)	**11 (03.2)**

*Since participants in the survey could have multiple sources of knowledge, the total number of sources (376 individuals) was found to be higher than the total number of participants who had heard the word "sepsis" (343 individuals).

Discussion

It has been determined that the rate of hearing the word sepsis at least once in Turkish society is 40.3%. However, according to the criteria of the Rapid Estimate of Adult Literacy in Medicine (REALM) and the Newest Vital Sign (NVS), health literacy rates in the Turkish population are calculated as 58.7% and 28.1%, respectively.[9] In this regard, we can say that the results of our study are consistent with previous studies. Considering that 49.5% of those who had heard the word "sepsis" before were healthcare professionals, it is noteworthy that sepsis awareness among individuals without involvement in the healthcare field may be lower than expected.

Table 4. Responses to the Question "What is the meaning of sepsis?" by Individuals Who Searched the Word "sepsis" on the Internet While Answering the Survey

Blood poisoning	68 (63.0%)
Organ damage caused by the irregular immune response to infection	20 (18.6%)
Bacterial growth in the blood	14 (12.9%)
Others	6 (5.5%)

While the level of awareness about sepsis increases with age among participants, the highest level of sepsis awareness is observed in the age group of 22-27. Among the participants, 33.2% of male participants and 46.4% of female participants stated that they had heard the word "sepsis" before. In this regard, the level of sepsis awareness in women was found to be significantly higher than in men, suggesting that health literacy in women in our society may be at a better level than in men. However, in a study investigating the impact of gender on health literacy, it was found that women have higher health literacy than men.[10]

When the results were examined according to the participants' education levels, it was observed that the awareness of sepsis among university graduates or students was significantly higher than among those who had not attended university. This result is consistent with the expectation that education level is proportional to health literacy level, and validating the data in a cohort where healthcare professionals and students are completely separated will lead to more accurate results.

When healthcare professionals who had heard the word "sepsis" before were disregarded, it can be concluded that the sources from which they heard this word show a heterogeneous distribution. However, overall, sepsis disease/syndrome does not receive enough coverage as a term on television screens and social media platforms. In light of this data, it can be considered that emphasizing the life-saving importance of early diagnosis of sepsis in

television programs, such as "World Sepsis Day (September 13)," or in programs featuring stories of those who have lost their lives in hospitals could make a significant contribution to public health protection.

Among participants who stated that they had heard the word "sepsis" at least once, 45.4% defined sepsis differently from the correct definition (organ damage caused by the irregular immune response to infection). Additionally, it was observed that 63% of participants who searched the internet to check the meaning of sepsis during the survey defined sepsis as "blood poisoning." Based on these findings, it is evaluated that there is a significant need for education in the community in terms of accessing correct information in the field of health literacy, which is considered the most important component of health literacy.

The level of sepsis awareness identified in our research is lower compared to the results of a study conducted in the Canadian community. In addition to demographic, socio-cultural, and socio-economic differences between the 2 communities, it should be noted that the Canadian study was conducted during the ongoing COVID-19 pandemic, which may have influenced perceptions and awareness levels regarding disease and health to some extent.

Studies demonstrating health literacy in our country are limited. In a study conducted by Görkem Ü. and colleagues, the awareness rate of human papilloma virus (HPV) in the community was found to be 29.9%. Despite HPV's direct association with cervical cancer, which is a common type of cancer and critical for women's health, having lower awareness compared to sepsis provides meaningful insights into the level of health literacy in our country.[11] In this regard, it is recommended to utilize mass education tools more effectively in this field.

Conclusions

Our research can be considered a pioneering study in determining the awareness of sepsis in the community, which continues to be one of the leading causes of both community-originated and hospital-originated deaths in our country, where the elderly population is steadily increasing. It provides data that shed light on comprehensive studies to reveal the epidemiology of sepsis, offering valuable insights into the societal understanding of sepsis.

Availability of Data and Materials: The data that support the findings of this study are available on request from the corresponding author.

Ethics Committee Approval: Ethics committee approval was received for this study from the ethics committee of İstanbul University-Cerrahpaşa (Approval no: E-83045809-604.01-989726, Date: May 14, 2024).

References

1. Seymour CW, Liu VX, Iwashyna TJ, et al. Assessment of clinical criteria for sepsis: for the third international consensus definitions for sepsis and septic shock (Sepsis-3). *JAMA.* 2016;315(8):762-774. [CrossRef]
2. Rudd KE, Johnson SC, Agesa KM, et al. Global, regional, and national sepsis incidence and mortality, 1990-2017: analysis for the Global Burden of Disease Study. *Lancet.* 2020;395(10219):200-211. [CrossRef]
3. Wang HE, Jones AR, Donnelly JP. Revised national estimates of emergency department visits for sepsis in the United States. *Crit Care Med.* 2017;45(9):1443-1449. [CrossRef]
4. Singer AJ, Ng J, Thode HC Jr, Spiegel R, Weingart S. Quick SOFA scores predict mortality in adult emergency department patients with and without suspected infection. *Ann Emerg Med.* 2017;69(4):475-479. [CrossRef]
5. Parsons Leigh J, Brundin-Mather R, Moss SJ, et al. Public awareness and knowledge of sepsis: a cross-sectional survey of adults in Canada. *Crit Care.* 2022;26(1):337. [CrossRef]
6. Erel S, Ermiş O, Nadastepe Öztürk Ö, Karabıyık L. Evaluation of sepsis awareness among various groups in Turkey: a survey study. *e-ISICEM.* 2020;2020.
7. Uzunay YE. *Cerrahpaşa Tıp Fakültesi Öğrencilerinde Sepsis Farkındalığının Araştırılması. Dissertation.* İstanbul University-Cerrahpaşa; 2020.
8. Yazicioglu Y, Erdoga S. *SPSS Applied Scientific Research Methods.* Ankara: Detail Publishing; 2004.
9. Ozdemir H, Alper Z, Uncu Y, Bilgel N. Health literacy among adults: a study from Turkey. *Health Educ Res.* 2010;25(3):464-477. [CrossRef]
10. Shah LC, West P, Bremmeyr K, Savoy-Moore RT. Health literacy instrument in family medicine: the 'Newest Vital Sign' ease of use and correlates. *J Am Board Fam Med.* 2010;23(2):195-203. [CrossRef]
11. Görkem Ü, Arslan E, Toğrul C. Human Papilloma virüs enfeksiyonu farkındalığı açısından kimler hedef kitle olmalıdır: anket çalışması. *Türk Jinekol Onkol Derg.* 2015;3:93-98.