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Research Article

DETERMINANTS AND OUTCOME OF SEPSIS AMONG INTENSIVE CARE UNIT PATIENTS OF A TERTIARY CARE HOSPITAL, SOUTHERN INDIA- A RETROSPECTIVE CASE–CONTROL STUDY

DRAGO MELBA BAZEL[1]*, LATHA T[2], CHARLET JASMINE VAZ[3], LATHA S[1]

[1]Department of Medical-Surgical Nursing, Nitte (Deemed to be University), Nitte Usha Institute of Nursing Sciences, Mangaluru, Karnataka, India. [2]All India Institute of Medical Sciences, Bibinagar, Telangana, India. [3]Department of Fundamentals of Nursing, Manipal College of Nursing, Manipal Academy of Higher Education, Manipal, Karnataka, India.
*Corresponding author: Drago Melba Bazel; Email: dmbazel@nitte.edu.in

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ABSTRACT

Objective: To assess the determinants and outcome of sepsis among intensive care unit (ICU) patients.

Methods: A retrospective case–control design was used to assess the determinants and outcomes of sepsis among the patients hospitalized in the ICU from July 2016 to June 2017. Data were collected from the in-patient records of patients hospitalized in the ICU. The medical records were grouped as cases and controls based on the inclusion criteria and the presence or absence of sepsis. The patient list was prepared using the ICU admission register based on the ICD 10 classification of sepsis. From this list, medical records of 348 sepsis cases and 348 non-sepsis patients (controls) were reviewed. Data were collected using demographic pro forma, sepsis determinants checklist, and outcome determinants checklist.

Results: Multivariate logistic regression analysis revealed that the likelihood of patients with pre-existing chronic obstructive pulmonary disease and renal failure developing sepsis was twice higher than those who did not have it. Previous hospitalization, heart disease, and the use of antibiotics were the major contributing factors that contributed to the development of sepsis. Most of the cases had septic shock with multi-organ failure. The control group had a faster rate of recovery, and the highest mortality rate was seen among sepsis patients.

Conclusion: In the present study, the various risk factors for the development of sepsis were the presence of specific co-morbidities and multiple devices and catheters, such as central line, urinary catheter, Ryles tube, endotracheal tube, tracheostomy tube, and fulminating infections. Routine surveillance of infectious agents and infection control should be emphasized.

Keywords: Determinants, Outcome, Sepsis, Severe sepsis, Septic shock, Multi-organ dysfunction syndrome, Intensive care unit patients.

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INTRODUCTION

Sepsis is a fatal condition that is characterized by multiple organ failure and is due to the impaired response of a host to infection. It is a clinical entity where the infection is severe, complicated, and marked by disseminated inflammation and massive tissue injury [1]. Sepsis, a systemic inflammatory response triggered by infection, is associated with high rates of illness and death. One of its complications is sepsis-related liver injury, which is a manifestation of multiple organ dysfunction caused by sepsis. However, very little information is available on sepsis determinants and outcomes in Karnataka, specifically in the coastal region. Hence, the investigator felt the need to explore sepsis more in intensive care unit (ICU) patients admitted to tertiary care hospitals.

Significance of the study

Patients who are admitted to the ICUs are critically ill and are more prone to develop all types of infections, including sepsis. Several environmental and host-related factors contribute to the development of sepsis. Healthcare professionals will benefit by gaining insight regarding the burden of sepsis, its causes, and mortality and morbidity, which may help create awareness to reduce the burden of sepsis. Hospital administrators will benefit when the data are provided regarding the factors contributing to the development of sepsis to take appropriate administrative measures and chalk out protocols and policies related to hospital infection control.

Objectives

To assess the determinants and outcome of sepsis among ICU (ICU) patients.

Variables

Outcome variables

Occurrence, contributing factors, and consequences of sepsis.

Patient characteristics

Age, sex, medical diagnosis, and history of smoking and alcohol use.

METHODS

This study adopted a quantitative approach that incorporated a retrospective case–control design. The setting was the Medical Records Department (MRD) section of a tertiary care hospital in Karnataka. The study used a non-probability purposive sampling technique. The study sample consisted of medical records of patients admitted to the ICU from July 2016 to July 2017 and met the inclusion and exclusion criteria. The Sampling Selection criteria for the cases included the medical records of patients who were medically diagnosed with sepsis patients who were 18 years or above and who were confined to the ICU for over 24 h. For the controls, the inclusion criteria consisted of the medical records of patients 18 years or above, admitted to the ICU for more than 24 h, and not diagnosed with sepsis. The exclusion criteria included the medical records of patients treated for sepsis in wards.

The sample size was calculated using the formula "estimation of odds ratio" and according to the results of the previous study [2]. In consultation with the bio-statistician, the sample size was 348 cases and 348 controls with 1:1 match (1 case with one control).

To confirm content validity, the tool was validated by seven experts from the Department of Medical-Surgical Nursing with the help of a criteria checklist. Validation was obtained regarding the content's relevance, accuracy, and appropriateness. They were requested to give their views and valuable judgment on each item in the tool. The tools were validated based on the experts' percentage of agreement. An agreement of 80% or higher was considered valid. Certain items in the tool were modified based on the validators' justified suggestions.

Pre-testing of the tool was done on November 26, 2017 with five medical records of patients admitted to the ICU with sepsis. The total time taken for the pre-testing of the tool was twenty minutes. The medical records did not include details about External Jugular Vein cannulization and arterial line insertion. Hence, these items were removed from tool 2, and the final tool 2 contained 48 items.

Sample size calculation

The sample size was estimated using the formula for the odds ratio (OR) estimation.

$$n = \frac{2\,PQ\left(Z_{1-\alpha/2} + Z_{1-\beta}\right)^2}{\left(P_1 - P_2\right)^2}$$

$Z_{1-\alpha/2}$=1.96 at 0.5 level of significance

α=level of significance

$Z_{1-\beta}$=0.84 with 80% power

1-β=power

P_1=proportion of patients with IV lines among the cases

OR=anticipated OR

p2=0.75

q2=0.25

OR=1.7

$$P = \frac{p1 + p2}{2}$$

Q=1-P

$$P1 = \frac{p2 \times OR}{\left(p2 \times OR\right) + q2}$$

$$P1 = \frac{0.75 \times 1.7}{\left(0.75 \times 1.7\right) + 0.25}$$

p1=0.8360

p_2=anticipated proportion of patients with IV lines in the control group=0.75%

q1=1-p1

q1=1–0.8360

q1=0.164

$$P = \frac{p1 + p2}{2}$$

$$P = \frac{0.8360 + 0.75}{2}$$

P=0.793

Q=1-p=0.207

$$n = \frac{2 * 0.207 * 0.793\ \left(1.96 + 0.84\right)2}{\left(0.8360 - 0.75\right)2}$$

n=348

Therefore, the sample size is 348 cases and 348 controls (case: Control=1:1 match).

The reliability of the tools was established by collecting data from 20 medical records at a tertiary care hospital in Karnataka. The reliability of the sepsis determinants checklist was established by using 20 medical records from November 27, 2017 to November 28, 2017 after seeking administrative permission. The reliability of the tool was checked by using the inter-rater method. The tool was found to be reliable with a reliability coefficient of 0.98.

Inter–rater reliability formula (Sharma, 2015) used is:

$$r = \frac{\text{Total no. of agreements}}{\text{No. of agreements} + \text{no. of disagreements}}$$

$$r = \frac{732}{732 + 8}$$

$$r = \frac{732}{740}$$

r=0.98

Therefore, the reliability score of the tool is 0.98. The tool is reliable. The pilot study was conducted to assess the feasibility of the research and plan data analysis. It was carried out from December 01, 2017 to December 04, 2018 by collecting data from 40 medical records (20 cases and 20 controls). The study design was found to be feasible and practicable. The type of analysis to be used was confirmed with the help of a bio-statistician.

Procedure for data collection

Administrative permission and ethical clearance were obtained before the commencement of the study. The medical records of ICU patients were grouped as cases and controls based on the presence or absence of sepsis. The researcher collected the data from cases and controls based on inclusion criteria. The list of patients admitted to the ICU was prepared by using the ICU admission register. ICD 10 classification of sepsis was used to group sepsis and non-sepsis patients. From this list, medical records of 348 sepsis cases and 348 non-sepsis patients (controls) were reviewed. Data were collected using demographic pro forma, sepsis determinants checklist, and outcome determinants checklist. The data collection period was from December 10, 2017 to January 20, 2018. The data collected from the medical records was encoded and systematically categorized using Statistical Package for Social Sciences (SPSS) 16.0, and confidentiality was maintained.

Ethical approval

- Approval to conduct the study was obtained from:
  - The Dean, Manipal College of Nursing Manipal, Manipal Academy of Higher Education
  - Institutional Research Committee, Manipal College of Nursing Manipal

- The Institutional Ethics Committee (IEC), Kasturba Hospital, Manipal (IEC no. 811/2017)
- Medical Superintendent and Chief Operating Officer, Kasturba Hospital, Manipal.

Data collection tools

Data were collected by using demographic pro forma to obtain the demographic characteristics, a sepsis determinants checklist to collect data on various sepsis risk factors, and an outcome determinants checklist to gather data about the sepsis outcome. The following data collection instruments were developed by reviewing the literature, opinions, and suggestions from guides and experts.

Any potential biases: Nil.

Tool 1: Demographic pro forma

A six-item demographic pro forma was designed to collect background information from the case files of sepsis patients confined to the ICUs.

Tool 2: Sepsis determinants checklist

The sepsis determinants checklist consisted of dichotomous questions consisting of yes/no type of questions on the presence of various devices and catheters, such as implants, drain tubes, endotracheal tubes, tracheostomy tubes, external fixators, presence of fulminating infections, such as cellulitis, necrotizing fasciitis, etc., history of previous hospitalization, present surgical history, presence of co-morbidities, administration of antibiotics before the onset of sepsis, use of immunosuppressants, invasive diagnostic tests and procedures, etc.

Tool 3: Outcome determinants checklist

The outcome determinants checklist was developed to determine the outcome of sepsis among ICU patients. It consisted of seven items, such as the severity of sepsis in terms of organ failure, recovery, developing multi-organ dysfunction syndrome (MODS), Discharge Against Medical Advice (DAMA), or death.

Data analysis

The study findings were analyzed based on the study's objectives using descriptive (frequency and percentage) and inferential statistics (binary logistic regression analysis) with SPSS version 16.0.

RESULTS

Section 1: Overview of sample attributes

This section outlines patient characteristics based on demographic data, including age and gender, treatment expenditure, history of alcoholism, and smoking.

The above Table 1 illustrates that in most cases, specifically 186 individuals (53.45%), were within the 31–59 year age range; in contrast, among the control group, most of the samples, 209 (60.06%) were more than 60 years. The average age of the case group was 54.8 years with a standard deviation of 14.7 years, while the control group's average age was 60.2 years with a standard deviation of 15.6 years.

Table 1: Frequency (f) and percentage distribution of ICU patients based on sample characteristics, n=696 (348+348)

Items	Cases		Controls	
	Frequency (f)	Percentage	Frequency (f)	Percentage
Age (years)				
<30	21	6.03	23	6.61
31–59	118	33.91	186	53.45
>60	209	60.06	162	46.55
Gender				
Male	240	69	221	63.5
Female	108	31	127	36.5
Treatment expenditure met by				
Self	237	68.1	294	84.5
Insurance	111	31.9	54	15.5
Habits				
Smoker	46	13.2	39	11.2
Alcoholic	78	22.4	43	12.4

The mean age of the cases was 54.8±14.7 years, and the mean age of controls was 60.2±15.6 years. Most cases and controls belonged to the male gender (69 vs. 63.5%). The treatment expenditure in both groups was mainly met by themselves (68.1% and 84.5%). Smokers and alcoholics were found to be more among the cases (13.2%) and (22.4%), respectively.

Section 2: Description of the determinants of sepsis among ICU patients

This section describes the various determinants of sepsis, such as previous hospitalization, presence of co-morbidities, presence of invasive lines, and various procedures the patient has undergone, which were identified among the patients admitted in the ICUs. Binary logistic regression was computed for the variables (Table 2).

Table 2 presents the adjusted ORs derived from risks identified using Pearson's Chi-square test. The interpretation of the data in the above table was made by considering the odds ratio (OR) and 95% confidence interval (CI) (Upper and lower limit did not include 1) was regarded as clinically significant, also taking into consideration the $p<0.05$. If the

Table 2: Adjusted Odds ratio for determinants of sepsis among ICU patients, n=696 (348+348)

Determinants	Cases (n=348)		Controls (n=348)		OR (95% CI)	p-value
	f	%	f	%		
History of the previous hospitalization						
Hospitalized	202	58	300	86.2	1.485 (1.243, 1.775)	<0.001*
Not-hospitalized	146	42	48	13.7		
Diabetic status						
Diabetic	123	35.3	142	40.8	0.916 (0.758, 1.106)	0.360
Non-diabetic	225	64.6	206	59.2		
COPD						
Present	28	8	64	18.4	2.575 (1.607, 4.129)	<0.001*
Absent	320	91.9	284	81.6		
Renal failure						
Present	253	72.7	83	23.9	2.789 (2.207, 3.526)	<0.001*
Absent	95	27.2	265	76.1		
Liver disease						
Present	80	23	37	10.6	0.399 (0.261, 0.608)	<0.001*
Absent	268	77	311	89.3		

(Contd...)

Table 2: ***(Continued)***

Determinants	Cases (n=348)		Controls (n=348)		OR (95% CI)	p-value
	f	%	f	%		
Heart disease						
Present	85	24.4	124	35.6	1.459 (1.107, 1.922)	0.007*
Absent	263	75.5	224	64.3		
Anemia						
Anemic	157	45.1	61	17.5	0.389 (0.289, 0.522)	<0.001*
Non-anemic	191	54.8	287	82.4		
Malignancy						
Present	28	8	30	8.6	1.071 (0.640, 1.793)	0.793
Absent	320	91.9	318	91.3		
Autoimmune disease						
Present	9	2.6	5	1.4	0.556 (0.186, 1.658)	0.292
Absent	339	97.4	343	98.5		
Use of antibiotics before sepsis						
Used	207	59.5	284	81.6	1.372 (1.147, 1.641)	0.001*
Not used	141	40.5	64	18.3		
Central line						
Present	227	65.2	77	22.1	0.339 (0.262, 0.439)	<0.001*
Absent	121	34.7	271	77.8		
Urinary catheter						
Catheterized	345	99.1	270	77.6	0.783 (0.667, 0.918)	0.003*
Not catheterized	3	0.8	78	22.4		
Drain tube						
Present	26	7.5	31	8.9	1.192 (0.708, 2.008)	0.508
Absent	322	92.5	317	91		
Ryles tube						
Present	327	94	283	81.3	0.280 (0.167, 0.469)	<0.001*
Absent	21	6	65	18.6		
Orthopedic implants						
Present	7	2	7	2	1.000 (0.351, 2.851)	1.00
Absent	341	97.9	341	97.9		
External fixators						
Present	5	1.4	2	0.6	0.400 (0.078, 2.062)	0.273
Absent	343	98.5	346	99.4		
Endotracheal tube						
Present	322	92.5	156	44.8	0.484 (0.400, 0.587)	<0.001*
Absent	26	7.4	192	55.1		
Tracheostomy tube						
Tracheostomized	22	6.3	8	2.3	0.364 (0.162, 0.817)	0.014*
Not tracheostomized	326	93.6	340	97.7		
Surgery						
Performed	50	14.4	34	9.8	0.680 (0.440, 1.051)	0.083
Not performed	298	85.6	314	90.2		
Fulminating infections						
Present	75	21.6	23	6.6	0.307 (0.192, 0.489)	<0.001*
Absent	273	78.4	325	93.3		
Previous ICU admission						
Yes	18	5.2	12	3.4	0.667 (0.321, 1.384)	0.277
No	330	94.8	336	96.5		
Invasive diagnostic tests						
Performed	9	2.6	11	3.2	1.222 (0.506, 2.949)	0.655
Not performed	339	97.4	337	96.8		
Undergone hemodialysis						
Yes	39	11.2	46	3.2	1.179 (0.770, 1.807)	0.448
No	309	88.7	302	86.7		
Undergone CRRT						
Yes	2	0.6	8	2.3	4.000 (0.849, 18.836)	0.080
No	346	99.4	340	97.7		
Undergone CAPD						
Yes	7	2	2	0.6	0.286 (0.059, 1.375)	0.118
No	341	97.9	346	99.4		
Blood transfusion						
Transfused	87	25	38	11	0.437 (0.298, 0.639)	<0.001*
Not transfused	261	75	310	89		
Any other invasive procedures						
Performed	42	12.1	55	15.8	1.310 (0.876, 1.957)	0.188
Not performed	306	87.9	293	84.1		
Immuno-suppressants						
Used	6	1.7	1	0.3	0.167 (0.020, 1.384)	0.167
Not used	342	98.2	347	99.7		

*Level of significance $P<0.05$. COPD: Chronic obstructive pulmonary disease

OR was more than one, the risk factors were described in terms of OR; if OR was less than one, it was described in terms of the percentage of the OR.

The odds of developing sepsis were more than twice as high in patients with pre-existing chronic obstructive pulmonary disease (COPD) ([OR] 2.575, [CI] 1.607–4.129, p<0.001) and renal failure (OR=2.789, CI=2.207–3.526, p<0.001) compared to those without these conditions. Prior hospitalization ([OR] 1.485, [CI] 1.243–1.775, p<0.001), heart disease (OR=1.459, CI=1.107–1.922, p=0.007), and antibiotic use before the onset of sepsis (OR=1.372, CI=1.147–1.641, p<0.001) were significant risk factors contributing to the development of sepsis.

The odds of developing sepsis in patients with ryles tube was 72%, fulminating infections (69.3%), central line (66.1%), tracheostomy tube (63.6%), anemia (61.1%), liver disease (60.1%), blood transfusion (56.3%), endotracheal tube (51.6%) and urinary catheter (21.7%) were more than the odds of patients without these comorbidities and devices.

Section 3: Description of the outcome of sepsis

This section describes the severity of sepsis in terms of sepsis without organ failure, severe sepsis with septic shock, and septic shock with MODS.

The data presented in Table 3 highlights the severity of sepsis in the present study. Septic shock with multi-organ failure had the highest percentage (64.9%), followed by severe sepsis with septic shock (21.83%), and the lowest rate of cases had sepsis without organ failure (13.21%).

Table 3: Frequency and percentage distribution of the severity of sepsis, n=348

Severity of sepsis	Cases	
	Frequency (f)	Percentage
Sepsis without organ failure	46	13.21
Severe sepsis with septic shock	76	21.83
Septic shock with MODS	226	64.9

MODS: Multi-organ dysfunction syndrome

The data in Table 4 highlights the outcome of sepsis, that is, 64.9% of the cases developed MODS. The recovery rate was higher in the control group (83.6%) than in the cases (31.3%). The highest mortality rate was observed among the cases, with 56.9% succumbing to the condition, whereas in the control group, it was only 6%. When the condition and prognosis of the patients were explained to the relatives, some of them took their patients home against medical advice (DAMA). That is 41(53.24%) sepsis cases and 36 (46.75%) non-sepsis cases, mainly due to cost constraints or poor prognosis. Among 226 patients who developed MODS, 143 patients (63.27%) died, 57 (25.22%) patients recovered, and 26 (11.50%) patients went DAMA.

DISCUSSION

Sample characteristics of patients

The present study reveals that a good number of cases, 186 (53.45%), belonged to the age group between 31 and 59 years, whereas in the controls, most of the samples, 209 (60.06%), were more than 60 years old. The mean age of the cases was 54.8±14.7 years, and the mean age of controls was 60.2±15.6 years. Sixty-nine percent of the cases were males, and 63.5% of the controls also belonged to the male gender. The treatment expenditure in both groups was met by self (68.1 % and 84.5%). Among the cases, 13.2% had a history of smoking, whereas, among the controls, the percentage of smokers was 11.2%; alcoholics were identified more among the cases (22.4%) as compared to the controls (12.4%) [3]. A study in Hyderabad in 2015 to explore the occurrence, factors, and consequences of infections in medical ICUs at a referral hospital in India found that, out of 487 patients, men comprised 68% with an average age of 55.6±19 years. Sixty-eight percent of the samples were comprised of males [4]. This study supported the findings of the present study. When it comes to sepsis, it is not only adult patients with sepsis but also neonates battling with the same. Neonatal sepsis also adds to the global concern as it is a significant cause of neonatal mortality. It is estimated that over 40% of deaths among children under five occur in newborns, with approximately 3.1 million neonatal deaths worldwide each year [5]. A prospective observational study was conducted in the medical ICUs of a tertiary care hospital in Southern India to evaluate the factors predicting mortality in patients with severe sepsis. They found that among 80 samples, 57 (71.25%) were males and 23 (28.75%) were females. Most patients were in the age group between 50 and 80 years; the mean age of the study subjects was 60.97 years. These study findings align with those of the current research [6].

Determinants of sepsis

In the present study, the common co-morbidities seen were renal failure (OR=2.789, p≤0.001), heart diseases (OR=1.459, p=0.007), and anemia (OR=0.389, p<0.001). In contrast, the most common co-morbidities that were present among ICU patients with sepsis were diabetes mellitus (33.7%) and COPD (28.4%), followed by hypertension, chronic renal failure, chronic liver disease, benign prostatic hyperplasia, and carcinoma [7]. The majority of patients (81.2%) experienced severe sepsis, with most cases occurring in males (75.2%). The most common comorbidities were diabetes mellitus (51.2%), hypertension (44.8%), and chronic liver disease (30.4%) [8]. A 2023 U.S. study examining sepsis epidemiology in children and young adults partially supports the present study's findings. Among 736 patients across 26 hospitals, 442 (60.1%) had underlying conditions. Most patients, 613 (83.3%), experienced community-acquired sepsis; however, within this group, 344 cases (56.1%) were linked to Healthcare-associated infections. In addition, these patients had comorbidities, such as chronic immunosuppression [9]. A retrospective study conducted in a multidisciplinary ICU in South India to assess the epidemiology of sepsis and its various characteristics supported the present study findings in terms of the presence of multiple co-morbidities in about 76.3% of the patients, such as hypertension (62%), Diabetes mellitus (51.3%), CKD (26.6%) and Coronary artery disease (24.3%) [1].

Table 4: Frequency and percentage distribution of the outcome of sepsis, n=696 (348+348)

Outcome	Cases				Controls			
	Yes		No		Yes		No	
	f	%	f	%	f	%	f	%
Developed MODS	226	64.9	122	35.1	-	-	-	-
Recovered	109	31.3	239	68.7	291	83.6	57	16.4
Died	198	56.9	150	43.1	21	6.0	327	94.0

MODS: Multi-organ dysfunction syndrome

In contrast, a study found that the diseases responsible for causing sepsis were respiratory tract (37.2%), gastrointestinal/liver (22.4%), nervous system (20.1%), renal (8.2%), and trauma-related (5.9%). The most critical comorbidities were hypertension (41%), diabetes (31%), and COPD (15%). More than two co-morbidities were present in 32% of patients [10]. In the present study, the predisposing factors, such as prior hospitalization (OR=1.485, p≤0.001), antibiotic use before the onset of sepsis (OR=1.372, p=0.001), central line (OR=0.339, p≤0.001), urinary catheter (OR=0.783, p=0.003), endotracheal tube (OR=0.484, p≤0.001), tracheostomy tube (OR=0.364, p=0.014), presence of fulminating infections (OR=0.307, p≤0.001), and blood transfusion (OR=0.437, p≤0.001), were some of the factors which led to the development of sepsis among patients admitted in the ICUs [11].

A prospective outcome-surveillance study intended to characterize device-associated healthcare-associated infections (DA-HAI) in a tertiary care multidisciplinary ICU of a teaching hospital among 2157 ICU patients of a 760-bedded teaching hospital in Eastern India. With 8824 patient/bed/ICU days and 14,676 device days, a total of 114 episodes of DA-HAIs were recorded. The average monthly incidence rates per 1,000 device-days were DA-HAIs: 4.75, VAP: 2, CLABSI: 1.4, CAUTI: 1.25. The overall mean rates per 1,000 device days were VAP: 14.4, CLABSI: 8.1, CAUTI: 4.5 [12]. A 2017 study involving 80 patients identified several factors associated with increased mortality in severe sepsis cases. These factors included age over 60 years, tachycardia, hypotension, elevated levels of C-reactive protein and lactate, thrombocytopenia, the necessity for mechanical ventilation, and high scores on both the acute physiology and chronic health evaluation II and sequential organ failure assessment scales. The mortality rate was greater at 79.5% (35) among patients who were more than 60 years of age, whereas it was 52.5% (19) for patients who were less than 60 years of age. Males had a higher mortality rate (73.7%) as compared to females (52.2%) [6].

Outcome of sepsis

The present study highlights the severity of sepsis concerning sepsis without organ failure, severe sepsis with septic shock, and septic shock with MODS [3]. Septic shock with MODS showed the highest percentage (64.9%), followed by severe sepsis with septic shock (21.83%) and then sepsis without organ failure (13.21%) [13]. A study done to find out the determinants and outcome of sepsis in Indian hospitals reported that multi-organ failure (55.8%, p=0.04) and mortality rate (38.7%, p=0.04) was higher in the ICU setup [14]. Septic shock was seen in a large number of patients admitted to the ICU (51.6%, p<0.01) [7]. This study's findings favor the findings of the present study.

A study was carried out to explore the result of sepsis in ICUs of a higher care center in Pakistan from February 2014 to October 2015. The study's findings suggest that many of the patients were males 147 (54.9%). Their analysis indicated that the possibility of death was higher among those patients who had septic shock, 22.161 (10.055–48.840). They found that septic shock contributed to high mortality among 32.0% of the patients (Model 1: R^2=0.32, p=0.00), and when organ failure was present, the rate of mortality was even higher (42%). They concluded that the prognosis of patients who had septic shock was inferior [15]. In the present study, the sepsis outcome shows that 64.9% of the sepsis cases developed MODS. The recovery was higher in the non-sepsis group (83.6%) compared to the cases (31.3%). The highest mortality rate was observed among the cases (56.9%), whereas in the control group it was only 6%. However, the study has the limitation that it was conducted in a single center, and only a retrospective design was used by the investigators.

Relevance to clinical practice

Acquiring adequate information on the determinants and outcome of sepsis will help healthcare professionals recognize the risk factors of sepsis and implement that knowledge to prevent or reduce the burden of sepsis by being compliant with the sepsis bundle and other infection control measures, such as hand washing, barrier nursing, etc. [16].

What does this paper contribute to the wider global community?

The information on the determinants and outcome of sepsis will help healthcare professionals to recognize the risk factors of sepsis and implement this knowledge to prevent or reduce the burden of sepsis by being compliant to the sepsis bundle and adhering to infection control measures, such as handwashing, following aseptic techniques wherever indicated, barrier nursing, etc.

CONCLUSION

The most common organisms identified and isolated among patients admitted to the ICUs, responsible for ICU infections, were the Gram-negative organisms. Hospital-acquired infections pose a great deal of threat to the patients admitted in the ICUs, mainly due to the virulence of the various pathogenic micro-organisms. In the present study, both gram-positive and gram-negative organisms were grown in the cultures of ICU patients, with *E.coli* being the most common, followed by *K. Pneumoniae*. The higher number of microorganisms was grown in blood sample and the least number of organisms was grown in ascitic fluid sample.

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The author and co-authors state this article has not been submitted or published in any journals. Furthermore, it has not been considered for publication elsewhere. The ICJME form for conflict of interest has been attached for further reference. The authors state that the manuscript has been read and approved by all authors and that the requirements for authorship have been met. The authors state that this manuscript represents the honest work of all the authors. The authors hereby affirm that the materials in this article have not been plagiarized from other materials.

AUTHOR CONTRIBUTIONS

The authors confirm their contribution to the paper:

- Mrs.Drago Melba Bazel – Study concept and design, literature search, data acquisition, analysis, interpretation of results, and manuscript preparation.
- Dr. Latha T – Study concept and design, data acquisition, analysis, manuscript editing, and review, guidance through the entire study phase
- Mrs. Charlet Jasmine Vaz – Study concept and design, interpretation of results, guidance through the entire study phase
- Dr. Latha.S – Manuscript preparation, editing, and review

CONFLICT OF INTEREST

The authors have no conflicts of interest to declare.

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