

## Short Term Outcome Of Sepsis Patients Presented To The Emergency Department. Single Center Study. (Review Article)

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### Abstract:

**Background:** The sepsis which is defined as a systemic inflammatory response syndrome during or following an infectious event represents a common frequent entity in the emergency department. In this study was to find out the outcome of sepsis patients that presented to the emergency room and to explore the relationship between presentation and outcome.

**Patients and methods:** It is a prospective follow up study conducted in Emergency Room of Medical city, Baghdad through the period from 1<sup>st</sup> of January to 31<sup>st</sup> of October, 2019 on a sample of 100 sepsis patients. The study group were followed up for one month after their discharge and final outcomes of eligible patients were either alive or dead.

**Results:** The outcome was death in 89% of sepsis patients, and alive in 11% of them. Most (91%) of deaths occurred in high dependency unit, 4.5% of deaths occurred in intensive care unit and 4.5% of deaths occurred in the emergency department. Female gender, shortness of breath, diabetes history, cerebrovascular accident history, blood transfusion among patients with sepsis are significant risk factors of mortality. There was a significant association between longer high dependency unit stay duration and death outcome of patients with sepsis ( $p < 0.01$ ).

**Conclusions:** Although the death rate of sepsis patients admitted to Baghdad Teaching hospital is high, but it is within reported international range. We should develop and improve the services in high dependency unit.

**Key words:** cerebrovascular, blood transfusion and sepsis patients.

### Introduction:

Sepsis is defined as a whole-body inflammatory response to an infection; it is a systemic overreaction that is widespread & serious. The incidence of sepsis is higher than heart attack, and

results in more deaths than any cancer <sup>1</sup>. Sepsis is characterized by its ability to progress to a fundamental acute multi-organs dysfunction known as severe sepsis, and this result in activation of a cascade of mechanisms that can be resulted in septic shock, multi-organ failure, and death. Overwhelming infection might precipitate to septic shock, infection that are usually caused by gram-negative bacteria, or any other bacterial, viral, fungal or protozoal infection. The released endotoxins or other products of the microorganism are thought to be the main trigger for septic shock by their effect on the vascular system resulting in the sequestration of large volumes of blood in the capillary beds and veins; complement system and kinin systems activation and histamine, cytokines, prostaglandins and other chemical mediators release <sup>2</sup>.

Clinically sepsis is usually presented with chills and fever, warm and flushed skin, high cardiac output and low blood pressure, and specific inflammatory parameters; if the medical therapy is not effective, this might evolve to the clinical picture associated with septic shock <sup>2</sup>. This condition is associated with a higher risk of death and significant consequences, depending on early diagnosis, timely diagnosis, and early initiation of aggressive therapeutic measures. However, the early stages of sepsis are often presented in a nonspecific manner making it difficult to be recognized. Typical clinical manifestations of sepsis are not always clear, making it under recognition in most of the times recognized and with high mortality rates <sup>3</sup>.

### **Definition Of Sepsis, Severe Sepsis And Septic Shock**

Sepsis is defined by the presence of a systemic inflammatory response syndrome (SIRS) in the setting of an identified or presumed focus of infection <sup>4</sup>. A SIRS response might be resulted from many clinical seniors ranging that include major trauma, an ischemia (stroke, myocardial infarction, etc.), or an inflammatory response that involve an organ. The criteria for the diagnosis of (SIRS) include the following features (2 or more is diagnostic): (1) high core temperature  $>38^{\circ}\text{C}$  or low temperature  $<36^{\circ}\text{C}$ ; (2) respiratory rate  $>20$  breaths per minute pulse rate  $>90$  beats per minute; (3) pulse rate  $>90$  beats per minute; and (4) white blood cell count  $>$  than  $12,000/\text{mm}^3$  or  $<4,000/\text{mm}^3$  or the presence of more than 10% immature neutrophils <sup>5</sup>. Sepsis might evolve into a more dangerous clinical illness, called severe septicemia and septic shock.

The main difference between severe septicemia and sepsis, is that septicemia is associated with the of organ(s) malfunction <sup>4,5</sup>. Some clinical examples of organ dysfunction may include reduce the urine output with high renal indices (renal impairment), increase in liver enzymes (hepatic and GIT involvement) or disturbances of the consciousness level (CNS involvement) <sup>4</sup>. The most catastrophic end result of continuum of sepsis is septic shock.

Septic shock is defined as low blood pressure in the setting of a of end organ(s) dysfunction and abnormal tissue perfusion <sup>4,5</sup> that not respond to fluid resuscitation <sup>4,5</sup>.

## **Risk factors**

Risk factors for sepsis and death from septic shock include chronic debilitating conditions such as diabetes, treatment with immunosuppressant drugs, use of invasive procedures and devices, the presence of lines, catheters, intravascular or prosthetic devices, and genetic factors <sup>6</sup>. Factors associated with increased risk of developing sepsis also include complicated obstetric delivery, certain surgeries, and trauma to the gastrointestinal tract, such as perforation of the small intestine, infections such as urinary tract infection, pneumonia, cellulitis, meningitis, and many others <sup>7</sup>. Additional risk factors for progression to septic shock include prolonged time between onset of manifestations and initiation of treatment for sepsis, misdiagnosis of infection, and use of ineffective antibiotics. Extended hospitalization is associated with additional health complications, nosocomial infections, and increased costs. Elderly patients are more prone to prolonged length of hospital stay (LOS) <sup>6</sup>.

Survivors of sepsis are at increased risk of recurrent infections during the year following their septic episode. They are 2.83 times more likely to develop a subsequent infection, 3.78 times more likely to require re-hospitalization for infection, and 3.61 times more likely to die after hospital discharge <sup>8</sup>. Sepsis has been associated with the development of at least one new physical limitation for survivors and a 3-fold risk of developing moderate to severe cognitive impairment <sup>9</sup>. Sepsis survivors report deterioration in the quality of life related to poor physical function and overall declined health <sup>10</sup>. The aims to find out the outcome of patients with sepsis presented to emergency department in addition to explore the relationship between presentation and outcome of sepsis patients.

## **Patients and Method**

### **Selection of the sample**

A prospective study assumed in Emergency Department (ED) of Baghdad Teaching Hospital-Baghdad Medical city, follow up patients with sepsis, through the period from 1<sup>st</sup> of January to 31<sup>st</sup> of October, 2019. All those patients were admitted to the ED, HDU and ICU of Baghdad Teaching Hospital were the study population. The studied sample included 100 sepsis patients after eligibility to inclusion and exclusion criteria.

### **Inclusion criteria**

1. Adult age ( $\geq 18$  years).
2. Any patient with Systematic Inflammatory Response Syndrome (SIRS) by two or more of followings:
  - a) Temperature  $>38^{\circ}$  or  $<36^{\circ}$ .
  - b) Heart rate  $>90$  beats/minute.
  - c) Respiratory rate  $>20$  breaths/minute or  $\text{PaCO}_2 <32$  mmHg.
  - d) White blood cell count  $>12 \times 10^3/\text{mm}^3$ ,  $<4 \times 10^3/\text{mm}^3$  or  $>10\%$  band neutrophilia.

3. Any patient with Septic shock SIRS with suspected or confirmed infection with hypotension.

### **Exclusion criteria**

1. Sepsis patients in hospital ward.
2. Lost to follow up and incomplete data.
3. Recurrent admission of sepsis patient.

### **Data Collection**

The information was collected by the researcher through a direct questioning and encountering the patients and filling a prepared questionnaire. The questionnaire was designed by the supervisor and the researcher.

The followings data were included in the questionnaire:

1. Demographic specific features of patients with sepsis: Age and gender.
2. Symptoms of patients with sepsis.
3. Clinical parameters of patients with sepsis: BP, PR, RR, temperature, SPO<sub>2</sub> and Glasgow Coma Scale.
4. Past medical history of patients with sepsis: DM and its duration, CVA and its duration, renal diseases, liver diseases, IHD, bedridden and others.
5. Investigations parameters of patients with sepsis: RBS, Hb, WBC count, blood urea, serum creatinine and serum electrolytes.
6. Imaging findings of patients with sepsis: Chest x-ray and CT scan.
7. Treatment modules: IV fluids, blood transfusion, Dopamine, antibiotics, surgical interventions and others.
8. Stay duration of patients with sepsis in hospital units: ED, HDU and ICU.
9. Outcome of patients with sepsis: Alive or dead.

The researcher received sepsis patients in the ED resulted from different medical and surgical diseases. After taking history points from the patients with proper clinical examination in the ED, the eligible patients were interviewed by the researcher and diagnosis of sepsis was confirmed by the researcher and Specialist physician according to clinical and lab. Investigation. A blood sample of 5 ml of was taken from the patients and sent to the lab of ED to complete the investigations. The researcher helped in diagnosis and treatment of cancer patients in ED before referral to other units. The urgent management in ED included insurance of oxygenation, administration of crystalloid, antimicrobial therapy with surgical drainage and PRBC infusion if Hb <7 g/dl. After first aid treatment in ED, the sepsis patients were referred to High Dependency Unit (HDU) and Intensive Care Unit (ICU) of Baghdad Teaching hospital to complete the management and follow up.

## Follow up & Outcome

The studied sepsis patients were followed up for one month after their discharge from ED through checking them in HDU and ICU. The final outcomes of eligible patients were either alive or dead.

## Ethical considerations

1. Ethical approval was taken from Arab Board for Health Specialties and hospital authorities.
2. Confidentiality was taken in consideration.
3. The researcher managed the patients accordingly.
4. An oral informed consent was taken from sepsis patients or their relatives.

## Results:

In this study, the number of patients that included was 100 patients with sepsis and their mean age was  $65.2 \pm 18$  years; about 6% of patients were aged less than 30 years', about 3% of the patients aged between 30-39 years, about 5% of patient were aged between 40-49 years, about 14% of patients were aged between 50-59 years, about 29% of patients were aged between 60-69 years and 43% of patient were aged 70 years and more. The female to male ratio as 1.7:1. These findings are listed in table 1.

**Table 1: Demographic characteristics of patients with sepsis.**

Variable	No.	%
<b>Age mean<math>\pm</math>SD (65.2<math>\pm</math>18 years)</b>		
<30 years	6	6.0
30-39 years	3	3.0
40-49 years	5	5.0
50-59 years	14	14.0
60-69 years	29	29.0

≥70 years	43	43.0
Total	100	100.0
<b>Gender</b>		
Male	37	37.0
Female	63	63.0
Total	100	100.0

The most common symptom of sepsis was DLOC (33.7%), followed by; fever (19.2%), poor appetite (13.5%), SOB (10.6%), GIT symptoms (9%), wound infection (8.4%) and chest pain (5.6%). These findings are listed in table 2.

Table 2: Symptoms of patients with sepsis.

Variable	No.	%
<b>Symptoms</b>		
DLOC	60	33.7
Fever	34	19.2
Poor appetite	24	13.5
SOB	19	10.6
GIT symptoms	16	9.0
Wound infection	15	8.4

Chest pain	10	5.6
Total	178	100.0

Clinical parameters of sepsis were; BP mean (79.4/46.5±18/9.8), PR mean (118.9±14.5), RR mean (22.5±4.9), temperature mean (38.5±1.0) and SPO<sub>2</sub> mean (87.3±5.7). Mean Glasgow Coma Scale mean was 11.7±2.2; 42% of patients had mild GCS, 49% had moderate GCS and 9% of them had severe GCS. A These findings are listed in table 3.

**Table 3 Clinical parameters of patients with sepsis.**

Variable	Mean	SD
Blood pressure	79.4/46.5	18/9.8
Pulse rate	118.9	14.5
Respiratory rate	22.5	4.9
Temperature	38.5	1.0
SPO <sub>2</sub>	87.3	5.7
Total	100	100.0
<b>Glasgow Coma Scale</b> mean±SD (11.7±2.2)		
Minor	42	42.0
Moderate	49	49.0
Severe	9	9.0
Total	100	100.0

About (70%) of patients with sepsis had history of DM with mean duration of  $13.4 \pm 7.3$  years, while 33% of patients with sepsis had CVA history with mean duration of  $5.4 \pm 2.1$  years. Cancer was documented among 25% of patients with sepsis while renal CKD diseases were present among 3% of them. Liver diseases were found among 4% of patients with sepsis while IHD were detected among 16% of them. Bedridden was found among 52% of patients with sepsis while other diseases (like bed sores, diabetic foot, etc.) were found among 28% of them. These findings are listed in table 4.

**Table 4: Past medical history of patients with sepsis.**

Variable	No.	%
<b>DM</b>		
Yes	70	70.0
No	30	30.0
Total	100	100.0
<b>DM duration</b> mean $\pm$ SD ( $13.4 \pm 7.3$ years)		
<b>CVA</b>		
Yes	33	33.0
No	67	67.0
Total	100	100.0
<b>CVA duration</b> mean $\pm$ SD ( $5.4 \pm 2.1$ years)		
<b>CA</b>		
Yes	25	25.0
No	75	75.0
Total	100	100.0
<b>Renal diseases</b>		
Yes	3	3.0
No	97	97.0



Total	100	100.0
<b>Liver diseases</b>		
Yes	4	4.0
No	96	96.0
Total	100	100.0
<b>IHD</b>		
Yes	16	16.0
No	84	84.0
Total	100	100.0
<b>Bedridden</b>		
Yes	52	52.0
No	48	48.0
Total	100	100.0
<b>Others</b>		
Yes	28	28.0
No	72	72.0
Total	100	100.0

Mean RBS ( $\leq 200$ ) for 34 patients with sepsis was  $95.3 \pm 29.6$  while mean RBS ( $> 200$ ) for 66 patients with sepsis was  $329.2 \pm 79.6$ , mean Hb was  $8.9 \pm 1.7$ , mean WBC count was  $16.3 \pm 8.8 \times 10^3$ , mean blood urea was  $110.3 \pm 59.8$ , mean serum creatinine was  $3.0 \pm 1.9$ , mean serum  $K^+$  was  $4.5 \pm 1$ , mean serum  $Ca^+$  was  $8.9 \pm 1.6$  and mean serum  $Na^+$  was  $136.6 \pm 4.4$ . These findings are listed in table 5.

**Table 5: Investigations parameters of patients with sepsis.**

Variable	Mean	SD
RBS $\leq$ 200	95.3	29.6
RBS<200	329.2	79.6
Hb	8.9	1.7
WBC (x10 <sup>3</sup> )	16.3	8.8
Blood urea	110.3	59.8
Serum creatinine	3.0	1.9
Serum K <sup>+</sup>	4.5	1.0
Serum Ca <sup>+</sup>	8.9	1.6
Serum Na <sup>+</sup>	136.6	4.4
Total	100	100.0

All patients with sepsis received IV fluids at ED with mean amount of 1395 $\pm$ 667.8 cc. Blood transfusion was done for 14% of patients with sepsis while early vasopressin was given for 75% of the patients. The common antibiotic regimen given for patients with sepsis was Cefitrixone & meronidazole (61%) followed by Cefitrixone only (31%). The surgical interventions for sepsis were done only for 9 patients. Other interventions like peritoneal dialysis and endotracheal intubation were done for 12% of patients with dialysis. These findings are listed in table 6.

**Table 6: Treatment of patients with sepsis.**

Variable	No.	%
<b>IV fluids</b> mean±SD (1395±667.8 cc)		
<b>Blood transfusion</b>		
Yes	14	14.0
No	86	86.0
Total	100	100.0
<b>Dopamine</b>		
Yes	75	75.0
No	25	25.0
Total	100	100.0
<b>Antibiotics</b>		
Cefitrixone	31	31.0
Cefitrixone & meronidazole	61	61.0
Gentamycin	6	6.0
Meropenem	2	2.0
Total	100	100.0
<b>Surgical interventions</b>		
Yes	9	9.0
No	91	91.0
Total	100	100.0
<b>Others</b>		
Yes	12	12.0
No	88	88.0
Total	100	100.0

## Discussion:

Sepsis cases admitted in emergency care units all over the world is increased in incidence with different etiologies and clinical pattern. In Iraq, literatures tracking sepsis incidence among adults are scarce with focusing on pediatric sepsis<sup>11</sup>. However, health pattern changes in last two decades in Iraq was accompanied by many factors that increased incidence of sepsis cases admitted to emergency units of general hospitals<sup>12</sup>.

Present study showed that mortality rate of adult sepsis cases presented to the ED was 44%. This outcome is close to results of<sup>13</sup> study in Saudi Arabia which revealed that mortality outcome of 40.3%. Our study mortality rate is higher than mortality rate reported by<sup>14</sup> study in Iran of 32%. However<sup>15</sup> conducted a retrospective cohort study in Finland following sepsis cases in ED and found that mortality rate of these sepsis cases after 28 days was reaching about 95%. These differences in outcome of sepsis in the ED is attributed to many reasons like factors leading to sepsis, incidence of sepsis, difference in quality services in the ED and differences in methodology of these studies. Although higher advances in emergency care techniques and services, the sepsis is still associated with high mortality rate between 20-50% globally<sup>16, 17</sup>. Many authors found that sepsis and septic shock is accompanied by poor prognosis regarding life quality and mortality rate<sup>18</sup>. The priority of emergency care staff is to stop or delay the organs failure among sepsis patients as sepsis saving is time dependent and the outcome of sepsis is related directly to these immediate interventions<sup>19,20</sup> study in Germany included 54 of septicemia patients w presented to the emergency department and concluded that the recognition of sepsis earlier in the emergency department lead to better outcome and recommended the regular monitoring of vital signs that help in recognition of sepsis and saving the organs. In UK, Nafsi et al found that sepsis represented 12% of mortalities in emergency department and they considered this rate was underestimated because 26% of sepsis mortalities were accounted for respiratory diseases<sup>21,22</sup>. It was shown that admission of sepsis patients in UK and USA was increased to double in last decade<sup>23</sup>. Many strategies in management of patients with sepsis admitted to the emergency department were developed especially early goal-directed therapy (EGDT) which help the physicians in the emergency care in diagnosing and categorizing the sepsis cases and help in reducing the mortality rates<sup>24</sup>. Rivers study in USA revealed that EGDT is essential strategy applied in the ED for decreasing the mortality rate and increasing the life quality of sepsis patients admitted to the ED. Inversely,<sup>25</sup> study in Australia reported that EGDT role in the ED for sepsis patient's management was useless and mortality rate in absence of EGDT was lower than rates in application of EGDT criteria. However, other literatures urged on application of well-organized recognition and management systems in the ED for sepsis like EGDT to improve the outcome<sup>26,27</sup>.

Current study showed that 90.9% of sepsis mortalities occurred in HDU, while 4.5% in the ED and 4.5% in ICU. This finding is similar to the results of To<sup>28</sup> study in Norway which revealed that admission and mortality rates in high dependency unit are shown to be higher than

other hospital department. The explanation of this higher mortality rate in HDU is may be due to hospital organizational factors and fact that in our emergency center suspected patients with sepsis were commonly delivered to HDU for further monitoring and early management and to avoid high bed occupancy in the ED in Baghdad Teaching hospital which is a tertiary emergency care center received hundreds of emergent cases daily. The Royal College of Emergency Medicine in UK documented that the organization of emergent medical services in the ED for sepsis is vital in reducing the mortality rate and revealed also that risk stratification of sepsis patients could be started in ED and completed in HDU <sup>29</sup>. Also, we find an important relationship between longer stay in HDU and higher mortality rates ( $p=0.01$ ). This finding is consistent with results of <sup>30</sup> study in New Zealand which stated that longer hospital stays of patients with sepsis in HDU and ICU is commonly related with higher rates of severe sepsis and mortality. Longer hospital stay of sepsis patients in HDU is commonly related to deterioration of health status, difficulty in diagnosis and poor response of sepsis patients to treatment which are associated with higher mortality rates <sup>31</sup>.

**Conclusions:** Although the mortality rate of sepsis patients admitted to Baghdad Teaching hospital is high, but it is within reported international range. We should develop and improve the services in high dependency unit.

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