University of Karbala
College of Applied Medical Sciences

Study of Acute phase Reactant Proteins On Patients With Septicemia

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بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

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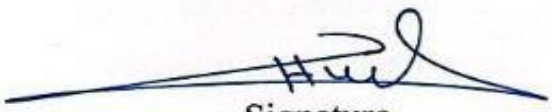

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Dedication

With my gratitude to God.

would like to dedicate my thesis to the Imam of the time, the Imam al-Mahdi (the guided one).

To the one I dreamed yesterday to get here and wished to be what I am today to the owner of the beautiful invitations to her and to the years of her life that she gave us. This is a little thing to return to you what you wished to be.

To my great father with your eyes I saw life and with your principles and morals and patience entrenched in my mentality and my belief asceticism of the world and my respect for myself and others.

and to my great self ,we have so many ambition to win.

azhar

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Abbreviations	Full nomenclature
APR	Acute Phase Reactants
HS. troponin	High sensitivity troponin
BNP	Brain Natriuretic Peptide
ICU	Intensive care units
EOS	early-onset sepsis
LOS	late-onset sepsis
NICU	Neonatal Intensive Care Unit
GBS	Group B streptococcus
VLBW	Low birth weight
GI	gastrointestinal
SIRS	Systemic inflammatory response syndrome
IL	Interleukin
CRP	C-reactive protein
SAA	Serum amyloid A
PCT	Procalcitonin
ALB	Albumen
HP	Haptoglobin
AAT	Alpha-1 antitypsin
CP	Ceruloplasmin
Ig	Immunoglobulins
WBC	White blood cell
NLR	Neutrophil to lymphocyte ratio
ETC	Electron transport chain
SPE	Serum protein electrophoresis
CZE	Capillary zone electrophoresis
ELFA	enzyme-linked fluorescence assay
SOFA	Sequential organ failure assessment
MODS	Multiple organ dysfunction syndrome
CVD	Cardiovascular dysfunction
CoNS	Coagulase negative staphylococci

Summary

Septicemia, or sepsis, is the clinical name for blood poisoning by bacteria. It is the body's most extreme response to an infection. Sepsis that progresses to septic shock has a death rate as high as 50%, depending on the type of organism involved. Sepsis is a medical emergency that needs urgent medical treatment. Without treatment, sepsis can quickly lead to tissue damage, organ failure, and death. There are Several causes of infection including parasites, bacteria, fungi.

In this study One hundred (100) participants were enrolled sub divided in to three groups involved in this case-control study according to clinical diagnosis ,Patients were suspected to have septicemia by sign & symptom taken by physician which noted the information of patients file in the center ,[50 patients(8 neonatal , 42 adult)] from both sex[(14 female) ,(36 male)] and divided two groups :first group A includes patients with positive blood culture [23 (6 neonatal , 17adult)], the second group B includes patients with negative blood culture [27(2 neonatal ,25 adult)] and the third group includes healthy control [50 (10 neonatal, 40 adult)] ,[(11 female),(39 male)] People were picked from the general public and appeared to be in good health,

(5-15 ml) of blood was aspirated from the veins of the patients. Blood sample of at least (9-10) milliliters (adults) and (5-8) milliliters (neonatal) was used for the blood culture ,taken (3 mL) of blood was deposited at room temperature in a gel tube for biochemical tests .The leftover blood sample (2ml) was placed in an EDTA tube and shaken for CBC , and (1.8 ml) blood sample was put in the sodium citrate tube for fibrinogen.

The purpose of the present study is to find the effect some biomarker on sepsis patients like acute phase reactant proteins and HS.troponin and Pro BNP, albumin,prealbumin,C-reactive protein,α_1-antitrypsin, haptoglobin and fibrinogen, also identification of the common type of bacteria that occur in septic patient.This atudy conducted at Imam Hussein hospital in Center ICU & Imam Zain Al-Abdeen hospital during the period from October 2022 to May 2023.

The results found that total WBC of the patient groups (A with bacterial growth B:without bacterial growth) for neonate and adult significant higher than control group (C) at level P value (< 0.05) while there are no significant differences between adult and neonate in different groups A,B,C,of other parameters (lymphocyte, neutrophil, platelets) at level P value (< 0.05).

Biochemical parameter (CRP,serum amyloid A,Alpha 1antitrbsin,fibrinogen ,gamma globulin , Haptoglobin) of the patient groups (A &B) for neonate and adult significant higher than control groups (C) at level P value (< 0.05). But in (Albumin ,ceruloplasmin ,Pro BNP) of the patient groups (A &B) for neonate and adult non-significant higher than control groups (C) at level P value (< 0.05), There is no significant differences between adult and neonate in different groups.

Found that type of bacteria of the sepsis patient groups for neonate and adult (21.75%) *staphylococcus aureus,* (17.40%) *staphylococcus epidermidis* (13.04%) *Enterobacter aerogenes*, significant higher than other type of bacteria *staphylococcus warner* (4.35%) respectively and there are no significant differences between adult and neonate in different groups.

Chapter One
Introduction

Chapter one : Introduction

1.1.Introduction

The Greek word "sepsis" means putrefaction which is the source of the English "sepsis." It describes the result of a process, not its origin. In the 19th century, when microorganisms were discovered to be the agents that spread infection, the term "sepsis" was used to represent the clinical condition brought on by a serious infection. The term "sepsis syndrome" was developed further to refer to the illness as a clinical syndrome (Kumar, 2018).

Sepsis is a life-threatening, dysregulated immune response that occurs, when the body's defensive reactions against infection damage its own tissues and organs (Singer *et al*., 2016). In 2017, an estimated 48.9 million cases of sepsis were recorded worldwide with 11.0 million sepsis-related deaths, representing 19.7% of all global deaths (Rudd *et al.*, 2020). Several types of organisms , such as bacteria, viruses, and fungi, are the cause for sepsis (Dolin *et al.*, 2019). Increased breathing rate, fever, elevated heart rate, and confusion occur because of common signs and symptoms. Early diagnosis of sepsis is critical to halt progression to septic shock. Blood cultures are the gold standard for detecting microbial species in the body, however approximately 30–40% of patients with severe sepsis or septic shock have positive test findings (Cohen *et al*., 2015).

Sepsis is a clinically common disease in neonates, and the incidence is higher in premature and low birth weight neonates. Most neo-nates develop the disease 1 week after birth. Premature babies are infected through the respiratory system and full-term babies are infected through the skin and navel (Zhang, 2020).

During systemic infections, the liver regulates immune defenses via bacterial clearance, production of acute-phase proteins and cytokines, and metabolic adaptation to inflammation (Sun *et a*l., 2020).

Inflammation markers acute phase reactants(APR)exhibit significant changes in serum concentration during inflammation. During acute and chronic inflammatory conditions, the liver produces these important mediators, (positive or negative) Acute phase reactants, depending on their serum concentrations during inflammation.Positive acute phase reactants are upregulated, and their concentrations increase during inflammation, Negative acute phase reactants are downregulated, and their concentrations decrease during inflammation. Positive acute phase reactants include ferritin, fibrinogen procalcitonin, C-reactive protein, hepcidin, and serum amyloid A. Negative acute phase reactants transferrin, albumin, prealbumin, retinol-binding protein, and antithrombin.

(Gulhar R *et al.*, 2022). C-reactive protein, originally described as a molecule that was present in the circulation of patients with infections and that was capable of recognizing the C-type polysaccharides of *Streptococcus pneumoniae* (Mantovani & Garlanda, 2023).

The appearance of higher acute-phase protein concentrations in bodily fluids like blood. is part of a more complex response to local or to systemic inflammation (sepsis) that has been referred to as the acute-phase response, which is characterized by decreased production of albumin by hepatocytes, reorientation of iron metabolism, and hormonal changes,These changes are also seen in the context of subclinical inflammation and chronic inflammatory diseases(Mantovani & Garlanda, 2023).

1.2. Aim of study:

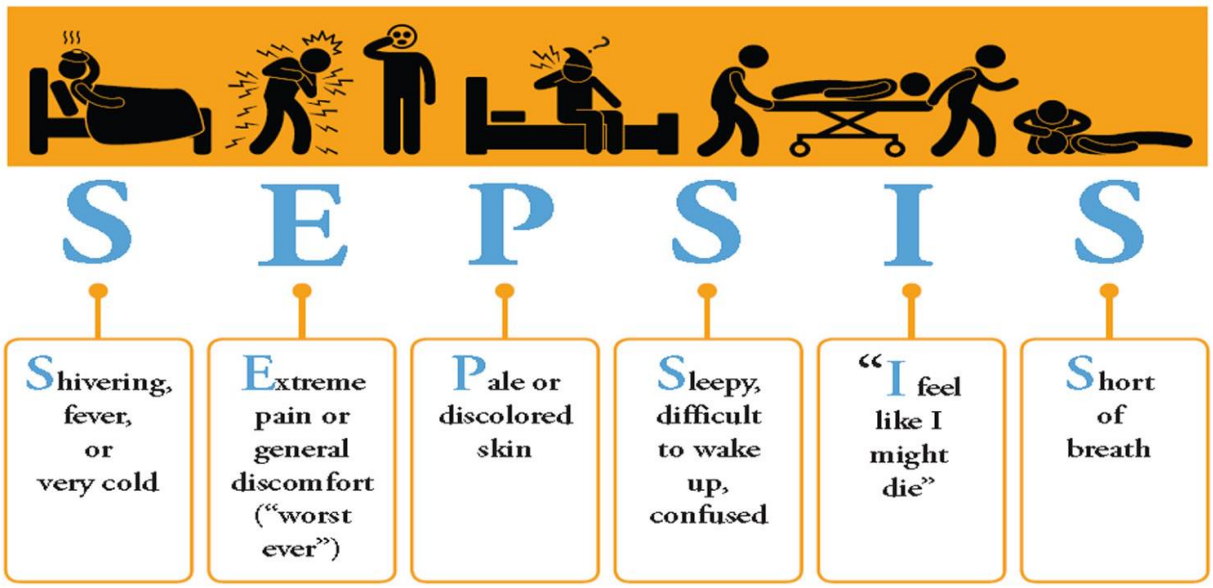
The purpose of the present study was to find the effect of bacterial infection on some biomarker like Acute phase reactant proteins and HS.troponin and Pro BNP, albumin, prealbumin , α_1-acid glycoprotein ,C-reactive protein, α_1-antitrypsin, haptoglobin and fibrinogen, in patients with sepsis.

Chapter Two
Literatures Review

2.1. Septicemia

2.1.1. An overview of septicemia

Sepsis is a serious medical condition that occurs in 30% of patients in intensive care units (ICUs). Early detection of sepsis is key to prevent its progression to severe sepsis and septic shock, which can cause organ failure and death (Markwart *et al*., 2020).



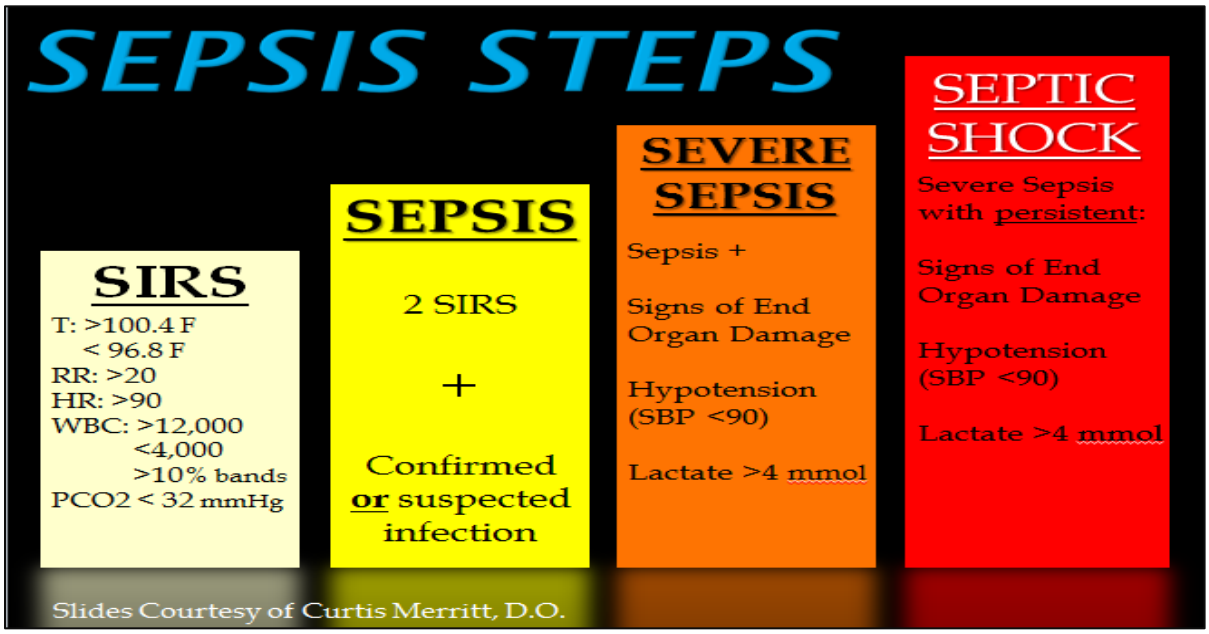
(Figer2-1) What Is Septicemia:(spectrum health Lakeland 2023)

Septicemia, or called blood poisoning, bacteremia, an infection brought on by the presence of bacteria in the blood ,Temperature High, weakness and chills, heavy sweating are the first symptoms of sepsis , which are then followed by a decrease in blood pressure. The typical microorganisms that cause septicemia, which are typically gram-negative bacteria, release toxic chemicals that cause immunological reactions and extensive blood clotting (coagulation) within the blood vessels, decreasing the flow of blood to tissues and organs (Bone *et al*., 1992). Numerous species, such as bacteria, viruses, and fungi, are responsible for sepsis(Dolin *et al.*, 2019). Lungs, the brain, the urinary system, the skin, and the

abdominal organs are common places for the main infection (Sganga, 2015). Recent infections, burns, injuries, surgery, diabetes, immune-suppressing medications, such as those used after organ donation or during cancer therapy, and being extremely old or very young are all common risk factors (Hunter, 2006).

Both the severity and the incidence of septicemia have increased, particularly in hospitalized patients, Due to both the increased use of intrusive technology and the rise in antibiotic-resistant microorganisms in hospitals, septicemia is frequently caused by multiple infections rather than just one microorganism, necessitating the use of broad-spectrum antibiotic therapy. Septicemia is followed by septic shock if not treated right away with the proper medications and surgical drainage of any visible foci of infection (Organization, 2020).

There are three stages of sepsis:

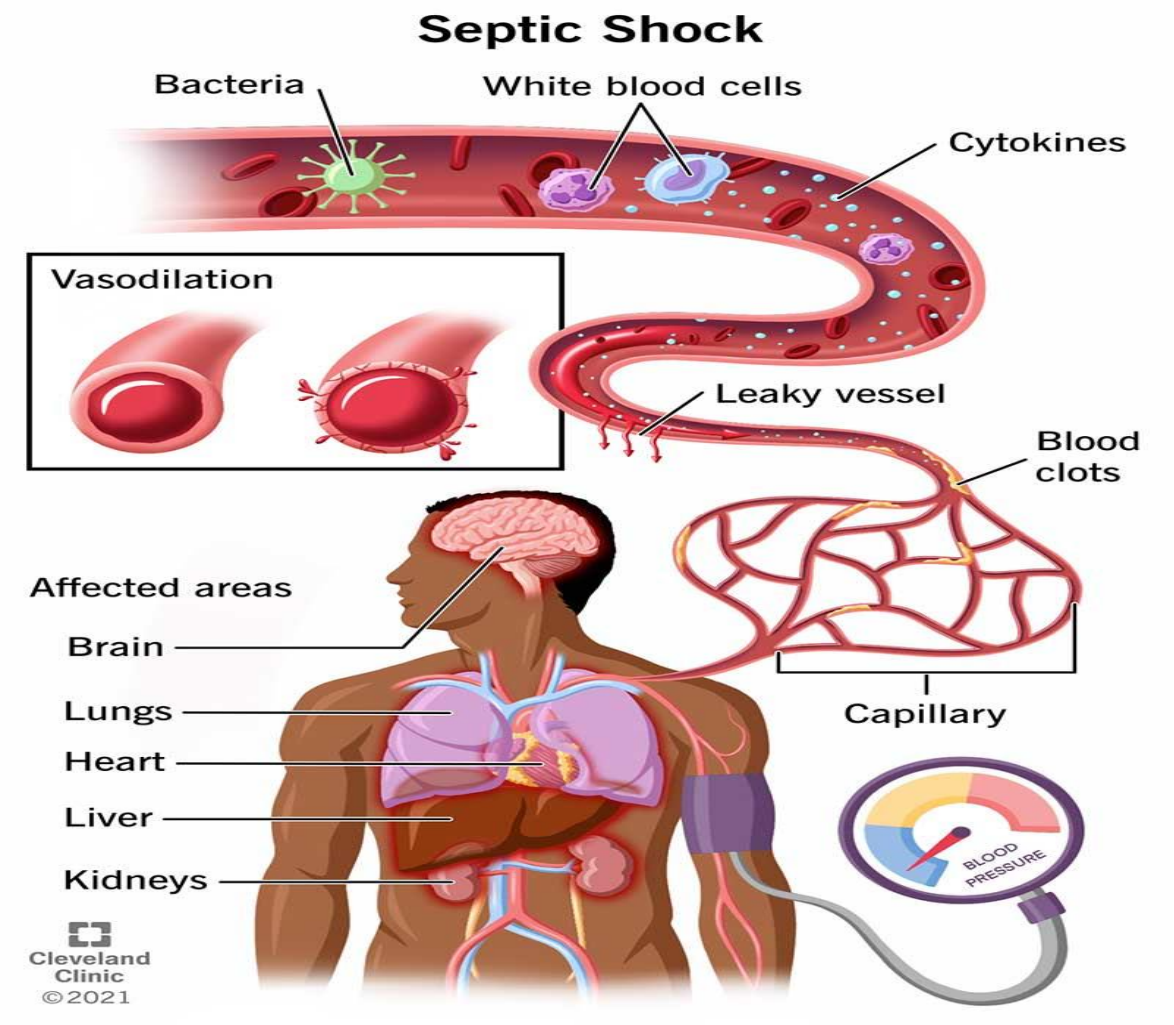


Figer (2-2) Sepsis Steps (hadron castle et *al*., 2015).

1. Sepsis:When an infection enters the bloodstream, causes inflammation throughout the body.

2-Severe sepsis:The infection and inflammation are severe that they begin to interfere with organ function.

3-Septic shock:A serious complication of sepsis, results in a sudden decrease in blood pressure. causes problems, such as organ dysfunction, respiratory or cardiac failure, stroke, and even death, can result from this(Dugar *et al*., 2020).



Figer(2-3) Septic shock occurs when a bacterial infection causes low blood pressure, widening of the blood vessels (vasodilation) and organ failure.(Cleveland Clinic logo 2022).

2.1.2 Neonatal sepsis

Neonatal sepsis includes bloodstream, cerebrospinal, urine, and peritoneal infections , infections starting from any other usually sterile sites, the causative agents of neonatal sepsis are bacterial, parasites, viruses, fungi and, though having a smaller role, must also be considered in the differential diagnosis of etiologies.(Satar & Özlü, 2012) Bacterial sepsis in the neonate is a clinical symptoms characterized by systemic signs of infection accompanied by bacteremia, sepsis Neonatal can be classified into two relatively distinct illnesses based on the postnatal age at onset: (Eichberger *et al*., 2022).

1-early-onset sepsis (EOS): starts within the (0-4)day of birth and is typically a fulminate multisystem infections that is contracted vertically from the mother (Bajaj *et al*., 2022).

2- (LOS): is usually more subtle yet can sometimes start off quickly. The distinction has clinical significance because EOS disease is primarily brought on by germs that are acquired before and during delivery. LOS is a frequent complication of prolonged hospitalization to the NICU after premature birth(Bajaj *et al*., 2022).

The most common cause of mortality is *Escherichia coli*, while Group B *streptococcus* (GBS) is the most common etiologic agent in early onset sepsis in neonates, particularly preterm newborns.Although current attempts to prevent maternal intrapartum infections have considerably decreased the rates of GBS disease, they have also been linked to higher incidence of Gram-negative infections, particularly in babies with extremely low birth weights. Blood cultures, nonspecific indicators including C-reactive protein and procalcitonin, and clinical presentation are used to make the diagnosis of newborn sepsis(Simonsen *et a*l., 2014). while LOS disease is due to bacteria acquired after delivery (nosocomial or community sources)

In the literature, however, there is little consensus as to what age limits apply, with EOS ranging from 48 hours to 6 days after deliver, Another type of sepsis has been recognized, very late-onset sepsis, which occurs after three months of life and affects premature infants who are of very low birth weight (VLBW) (Tao *et al*., 2020).

2.1.3. symptoms and signs

Table(2-1)The following symptoms that thought to make a doctor suspect sepsis:(Levy *et al.*, 2003).

Clinical signs:
· hypothermia, Fever
· Unexplained tachypnea
· Unexplained tachycardia
· Signs of peripheral vasodilation
· Unexplained shock
· Changes in mental status
· laboratory parameters
· Low systemic vascular resistance, Increased cardiac
Metabolic change:
· Increased oxygen consumption
· Leukocytosis/neutropenia
· Unexplained lactic acidosis
· Unexplained alteration in renal or liver function tests
· disseminated intravascular coagulation Thrombocytopenia
· Increased procalcitonin, C reactive protein Increased cytokines

2.1.4. Cause of sepsis

Severe sepsis is a leading cause of death in the United States and the most frequent causes of death among critically sick patients in non-coronary intensive care units (ICU), the most common site of infection are Respiratory tract infections, particularly pneumonia, and associated with the highest mortality, The type of

organism causing severe sepsis is an important determinant of outcome, and gram-positive organisms as a cause of sepsis have increased in frequency over time and are now more common than gram-negative infections(Angus *et al*., 2001). Sepsis-causing infections are typically bacterial, but they can also be viral, fungal, or parasitic (Munford RS *et al*.,2014). the most common causes of morbidity and mortality from infections worldwide *(Staphylococcus aureus*), This pathogen can cause a wide range of illnesses, including serious pneumonia and fatal sepsis, Sepsis is characterized by significant mortality rates, Even with proper treatment, its mortality reaches 50%, depending on the severity of the infection (Pleskova *et al.*, 2022).

In addition, sepsis is characterized by frequent relapses (5–10%) and various complications in more than one-third of its survivors, In recent years, the incidence of *S. aureus* bloodstream infections has been on the rise in developed countries ,The key *S.aureus* virulence strategies in their pathogenesis are the secretion of toxin (coagulases or TSS and other toxin), which bind and activate prothrombin, and the exposure of bacterial surface agglutinins, which bind polymerized fibrin (Pleskova *et al*., 2022).

The culmination of these processes is the formation of abscesses ,Thus, active immunosuppression, often combined with inflammation, can be a typical characteristic of sepsis, The endothelium of blood vessels is actively involved in the development of sepsis since proinflammatory and procoagulant factors are secreted on its surface, At the same time, uncontrolled active inflammation causes damage to the endothelium itself, leading to vascular destruction and an inability to maintain normal blood pressure (Pleskova *et al*., 2022). are believed More than 50% of cases of sepsis to be caused by bacteria, most frequently *staphylococcus*(Martin GS *et al.*, 2012). Other implicated bacteria include *Pseudomonas aeruginosa, Streptococcus*

pyogenes, Escherichia coli and *Klebsiella* species (Ramachandran G *et al*.,2014). About 5% of cases of severe sepsis and septic shock are due to fungal sepsis, which is typically brought on by an infection with the yeast species Candida (Delaloye J, Calandra T *et al*.,2014). A common infection picked up at a hospital. Plasmodium, Schistosoma, and Echinococcus are the most frequent causes of parasite sepsis. Lungs, abdomen, and urinary tract are the most typical places where severe sepsis is caused by infection. A lung infection typically causes 50% of all sepsis cases ,Unclear is the source of infection in between one-third and fifty percent of cases (Munford RS, Suffredini AF *et al*.,2014).

gram positive bacteria is a *Staphylococcus aureus* extracellular growing bacterium, It is a major source of mortality in medical facilities, It causes a wide range of infections from skin infection to life threatening diseases such as sepsis, abscesses of different organs, soft tissue and skin, infections in urinary tract, osteomyelitis, central nervous system infections,endocarditis,chronic lung infections associated with cystic fibrosis , arthritis and several syndromes caused by exotoxins and enterotoxins including food poisoning, scalded skin, and toxic shock syndromes(Tigabu & Getaneh, 2021).

The group A *streptococcus,* also known as ***Streptococcus pyogenes***, is the leading cause of infection-related death in pregnancy and the puerperium. (Sriskandan, 2011).

Streptococcus pyogenes is a species of Gram positive, aerotolerant bacteria in the genus *Streptococcus*. These bacteria are extracellular, and made up of non-motile and non sporing cocci (round cells) that tend to link in chains, They are clinically important for humans, as they are an infrequent, but usually pathogenic ,Infections with *Streptococcus pyogenes* in females after delivery cause significant morbidity worldwide and are due mostly to *S. pyogenes*, Although the rate of

nosocomial postpartum *S. pyogenes* infection has decreased tremendously within the past century owing to improved hygienic conditions during delivery, healthcare workers remain a potential source of infection(Cabal *et al.*, 2019).

Escherichia coli

is a Gram-negative, facultative anaerobic, rod-shaped, coliform bacterium of the genus *Escherichia* that is commonly found in the lower intestine of warm-blooded organisms(Okposhi *et al*., 2022). A common bacterial cause of sepsis is *Escherichia coli.*, It is found and widely distributed in the large intestine of humans, Virulence factors are encoded by genes restricted to pathogenic *E. coli*, being absent in commensal bacteria, making these microorganism etiologic agents of intestinal and extraintestinal infections, such as bacteremia and sepsis (Figueiredo *et al*., 2022).

Pseudomonas aeruginosa is a gram negative obligate aerobic encapsulated, rod-shaped bacterium that can cause disease in animals and, plants including humans, A species of considerable medical importance, *P. aeruginosa* is a widely spread and antibiotic resistant, its intrinsically advanced antibiotic resistance mechanisms, and its association with serious illnesses – hospital-acquired infections such as ventilator-associated pneumonia and various sepsis syndromes(Ramachandran G *et al*., 2014). *Pseudomonas aeruginosa* found as a part of normal intestinal flora and a significant pathogen responsible for wide range of ICU acquired infection in critically ill patients, Nosocomial infection associated with this organism including, blood stream infection ,urinary tract infections and gastrointestinal infection. Infection caused by this organism are difficult to treat because of the presence of its innate resistance to many antibiotics (β-lactam and penems group of antibiotics), and its ability to acquire further resistance mechanism to multiple class of antibiotics,

including fluoroquinolones and Beta-lactams, aminoglycosides (Pachori *et al*., 2019).

Klebsiella pneumoniae, a Gram-negative encapsulated aerobic bacillus in the Enterobacteriaceae family, is normal flora in the mouth, oropharynx, gastrointestinal (GI) tracts, skin, and intestines of the human hosts with high virulence and antibiotic resistance(Panpetch *et al*., 2022). One of the most common pathogens seen in intensive care units (ICUs) is *K. pneumoniae*, and causes infections such as bacteremia ,It is an opportunistic pathogen and causes both hospital-acquired and community-acquired infections , In hospitals, *K. pneumoniae* causes both endemic infections and outbreaks of epidemic strains; chances of acquisition of *K. pneumoniae* in nasopharynx, skin , and GI tract increases with longer hospital stays and use of invasive devices (mukherjee ,Subhankar, *et al*., 2021).

Candida is an increasing cause of bloodstream infection, with significant mortality and morbidity rates ,The overall incidence of invasive candidiasis has increased fivefold in the past 10 years, becoming the fourth leading cause of nosocomial bloodstream infection in the United States, accounting for 8% of all bloodstream infections acquired in hospitals, Despite the availability of effective antifungal therapy, crude mortality in the last decade has remained high, ranging from 36 to 90%(Patricio,*et al*., 2019). *Candida* bloodstream infection frequently arises from either gastrointestinal colonization and transmigration of the pathogen through the mucosal barrier, or from colonization of foreign material for example, intravenous (i.v.) catheters, Citation Colonized i.v. catheters may account for as much as 25–40% of cases of candidemia(Duggan, S. *et al.,* 2015). In addition to primary Candida sepsis, invasive Candida infection frequently occurs as a complication of bacterial sepsis due to concomitant immune paralysis,These

secondary *Candida* infections have been shown to prolong ICU stay, increase mortality and generate additional costs (Duggan, S. *et al.*, 2015).

Bacteria have been shown to be the predominant pathogens of sepsis, The reported proportions among adult septic patients were both around 40%, while the reported proportions of viruses were very low , However, the proportion of negative cultures was up to 42% among patient with sepsis, for whom the possible cause could be virus , Recent studies showed that respiratory viral infections were underdiagnosed in patients with sepsis or septic shock, The viruses, which can cause severe disease, included influenza A and B, respiratory syncytial virus, *coronavirus*, human *metapneumovirus*, *parainfluenza* virus types 1–3, *adenovirus*, *enteroviruses*, and *rhinovirus*, Viral sepsis has been defined as life-threatening organ dysfunction due to a dysregulated host response to viral infection(Gu *et al*., 2020).

2.1.5.Sepsis criteria

Sepsis had been defined using criteria. If the SIRS criteria are negative, it is extremely improbable that the individual has sepsis; if they are positive, there is only a slight chance that they do. There were various degrees of sepsis, sepsis, severe sepsis, and septic shock, according to SIRS(Kaukonen *et al.*, 2015).

Table (2-2) The definition of SIRS Diagnostic criteria of sepsis (Reinhart *et al., 2010).*

• SIRS occurs when two or more of the following are present: heart rate, respiratory rate, blood gas, abnormal body temperature and white blood cell count.
• The definition of sepsis is SIRS in response to an infecti0us process (Soong & Soni, 2012).

- The term "severe sepsis" refers to sepsis that has resulted in tissue hypoperfusion or organ dysfunction (expressed as hypotension, increased lactate, or decreased urine output) (Soong & Soni, 2012).

  An infectious disease condition is severe sepsis associated with multiple organ dysfunction syndrome (*MODS) (Dellinger et al., 2013).*

- Septic shock is severe sepsis plus persistently low blood pressure, even though intravenous fluids are being given(Dellinger *et al.*, 2013).

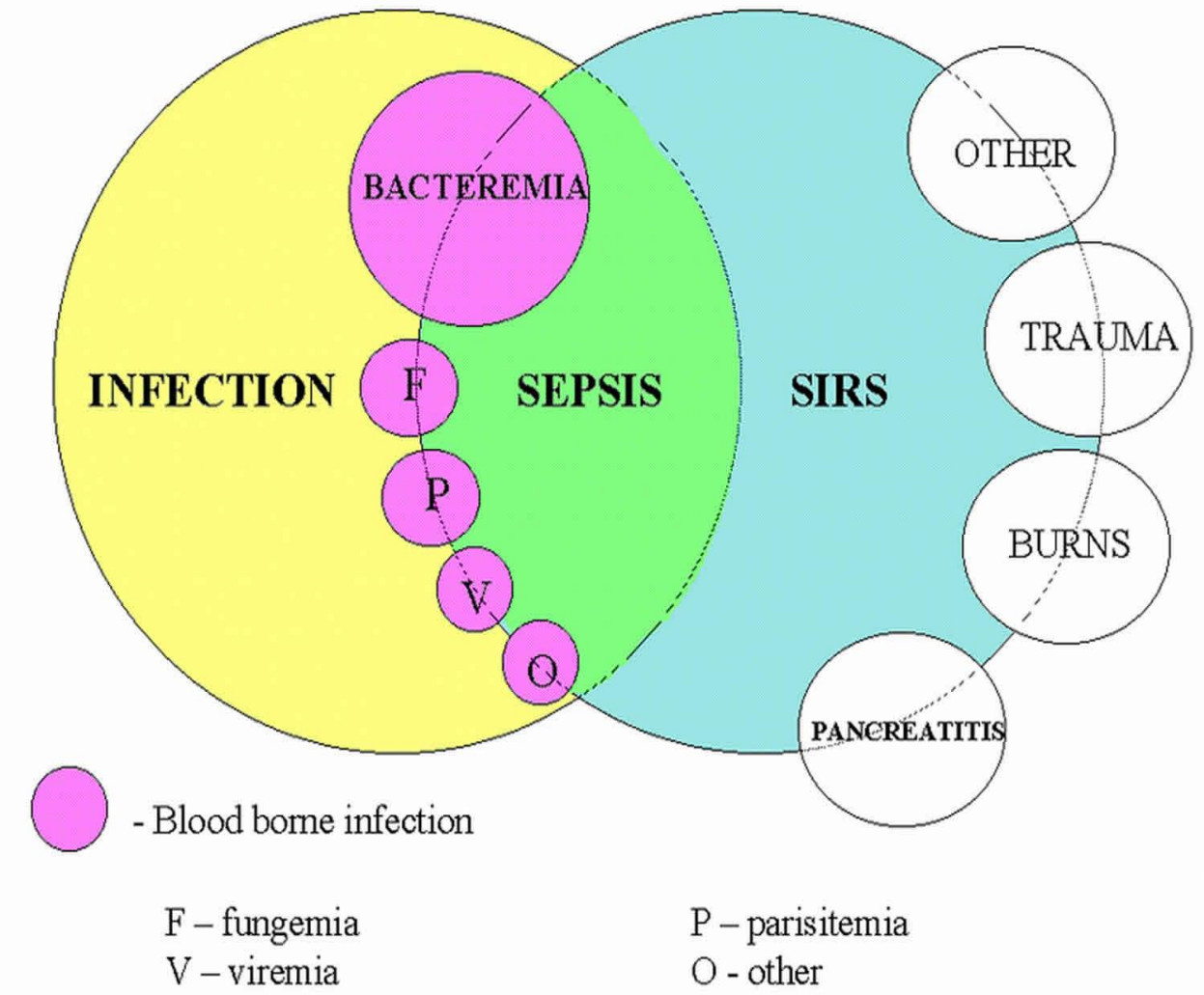


Figure (2 -4) Relationship between systemic inflammatory response and infection, where the overlap indicates sepsis, from (HEALTH JADE *et al*., 2019).

2.1.6. diagnosis of sepsis

The diagnosis of sepsis can be challenging as it has no pathognomonic clinical, hematological and biochemical signs, The diagnostic sepsis by blood cultures, are limited by variable sensitivity and specificity (Dembek *et al*., 2014).Blood cultures is gold stander are an essential part of sepsis management to optimize identification of causative organisms, recommend obtaining at least two sets of blood cultures (both aerobic and anaerobic bottles) before antimicrobial therapy, with at least one drawn percutaneously and one drawn through each

vascular access device, unless the device was recently (<48 h) inserted(Morgenthaler & Kostrzewa, 2015). in sepsis 30–60% of blood cultures become positive ,this method is one with the highest level of evidence in the diagnostic workup of a sepsis patient , The time to positivity of a blood culture varies and depends much on the pathogen load, the type of pathogen, and its growth capacity ,Other factors of influence include the volume of cultured blood taken, the presence of polymicrobial infection, the brand of blood culture bottles used, the time it takes for a culture bottle to reach an incubator, and the pretreatment of patients with antibiotics prior to sampling(Morgenthaler & Kostrzewa, 2015).With 48 hours are needed to get the final result of blood cultures and false negative results occur frequently(Dembek *et al.,* 2014*)*.Sepsis is a condition that requires immediate action and early treatment with antibiotics to improve outcome, and a method with good screening test characteristics (fast, convenient, high sensitivity) is therefore desirable(Levy *et al*., 2018).

2.2. Acute phase proteins

Acute phase proteins are plasma proteins synthesized in the liver whose concentrations increase (or decrease) by 25% or more during inflammation ,These proteins serve as inhibitors or mediators of the inflammatory processes and include α_1-acid glycoprotein ,C-reactive protein, mannose-binding protein, haptoglobin, , fibrinogen, complement components C3 and C4, and α_1-antitrypsin. The concentration of these acute phase proteins usually increases during inflammation, whereas the concentration of albumin and prealbumin (also acute phase proteins) decreases in inflammation (Ide *et al*., 2003).

Positive acute phase proteins are those which increases with inflammatory response and the Negative Positive acute phase proteins are those which shows a decrease in serum concentration with increase in inflammation(Ide *et al*., 2003).

Positive acute phase proteins include C-reactive protein, Serum amyloid A, Serum amyloid P component, Complement factors, Mannan-binding lectin, Fibrinogen, prothrombin, Alpha 2-macroglobulin, Ferritin, Ceruloplasmin, Haptoglobin, Alpha 1-antitrypsin and α1- antichymotrypsin. Their function includes Opsonisation of microbes, Recruitment of immune cells to inflammatory site, induces enzymes which degrade the extra cellular matrix. Chemotaxis, lysis and clumping of target cells. Complement activation, Degradation of blood clots, inhibits coagulation and fibrinolysis by inhibiting thrombin. Binds hemoglobin and inhibits microbe iron uptake, Serpin down regulates inflammation(Ebersole & Cappelli, 2000).

Negative acute phase proteins include Antithrombin, Albumin, Transferrin, prealbumin, and Retinol – binding protein. Their function includes increased coagulation, Increase free cortisol in blood, restoring homeostasis after stress(Ebersole & Cappelli, 2000).

Acute Phase Protein Synthesis In the event of inflammation or infection, a critical phase response is triggered by the main symptoms of inflammation The three most important proteins are CRP (C-reactive protein), SAA (serum amyloid A) and SAP (serum amyloid protein) (Gul *et al*., 2022). serum protein markers are the reflection of an acute phase response and do not accurately represent nutritional status in the ICU setting , These nutritional biomarkers are often low in the acute phase of sepsis because of decreased protein synthesis and dilution by the systemic inflammatory response(Takegawa *et al.*, 2019).

Biomarkers of sepsic patients on admission could reflect not only the severity but also the accumulated influences from the day of disease onset because the day of admission of patients with sepsis is not always the onset day of injury, such as that caused by trauma, burns, or cardiac arrest(Takegawa *et al*., 2019).

Biomarkers can have an important place in this process because they can indicate the presence or absence or severity of sepsis(Marshall & Reinhart, 2009).

CRP is an acute-phase protein produced by the liver in response to infection or tissue damage that is detectable in the blood and is frequently utilized as an effective diagnostic for the diagnosis of sepsis(Naher *et al*., 2011). C-reactive protein (CRP), an acute-phase protein, is closely associated with systemic inflammatory status , CRP (≥6 mg/dL) as a risk factor for developing sepsis in pediatric patients with burn injuries, However, some others hold the view that CRP is a confounding factor in identifying sepsis in burn patients because the chronic inflammatory response is part of the normal stress response in patients with burn injuries(Yu *et al*., 2021).

Serum amyloid A (SAA) proteins comprise a family of apolipoproteins synthesized in response to cytokines released by activated monocytes/macrophages. Acute-phase protein concentrations have been advocated as objective biochemical indices of disease activity in a number of different inflammatory processes.(Malle & De Beer, 1996) SAA proteins comprise a family of molecules, two members of which (SAA1 and SAA2) are (along with C-reactive protein, CRP) the most prominent members of the acute phase response (APR) during which their serum levels rise dramatically after trauma, infection and other stimuli(Sack Jr, 2020).Serum amyloid A (SAA), the precursor protein in inflammation-associated reactive amyloidosis, whose level in the blood increases up to 1000 fold in response to information, is synthesized in the liver. SAA is also an acute phase reactant like PCT and CRP, which has been proven to be a prognostic marker in late-onset sepsis in preterm infants , SAA had an overall better diagnostic accuracy than CRP for predicting early onset sepsis. Also, they showed that SAA was a useful inflammatory marker for sepsis(Elmashad *et al.*, 2019).

Pro Beta natriuretic peptide (BNP) is a hormone released in response to volume expansion and increased pressure. It is commonly used to assist in the diagnosis and management of heart failure. Pro BNP can also play an important role as a biomarker in septic shock; however, elevations of Pro BNP in conditions other than sepsis or cardiac dysfunction limits its use as the sole prognostic marker in patients hospitalized with sepsis(Bhandari & Cunningham, 2020). ProBNPis a commonly measures natriuretic peptides, It is released when the volume expands and the heart wall pressure rises, Vasomotor-tone relaxation, inhibition of sympathetic activities, a decrease in cardiac preload, increased renal blood flow, and the development of natriuresis and diuresis are all effects of The physiological functions of pro-BNP(Binita & Cunningham, 2020). In early stages of septic shock, impaired myocardial function plays an important prognostic role, In this context, B-type natriuretic peptide has been shown to be a humoral marker for left ventricular dysfunction, because myocardial strain and ischemia both increase BNP concentration plasma Pro BNP concentration represents a reliable marker for identification of patients developing sepsis-induced myocardial depression, In addition, Pro BNP concentration on day 5 may be used as a prognostic marker to identify patients with an elevated risk for an adverse outcome(Post *et al.*, 2008).

Troponin complex consists of three subunits that regulate the calcium-mediated contractile process of striated muscle. These include troponin C (TnC), which binds Ca2+, troponin I (TnI), which binds to actin and inhibits actin-myosin interactions, and troponin T (TnT), which binds to tropomyosin, thereby attaching the troponin complex to the thin filament(Jaffe & Van Eyk, 2006). Following myocyte injury, the initial release of cTnT and cTnI is from the cytosolic pool, followed subsequently by release from the structural (myofilament-bound) pool. Different genes encode TnT and TnI in cardiac and skeletal muscle, thus permitting

the production of specific antibodies for the cardiac form (cTnT and cTnI) that enable their quantitative assay(Marston & Zamora, 2020). The measurement of cTnT or cTnI is now at the center of the new diagnostic criteria for MI. When interpreting the results of assays for cTnT or cTnI, clinicians must be cognizant of several analytic issues.

Sepsis is a serious condition with high mortality, which is frequently encountered in neonatal calves,Cardiovascular abnormalities due to sepsis frequently occur, therefore early diagnosis and treatment of sepsis is of great importance in the survival of calves. Cardiac troponin I (cTnI) is considered to be an excellent biomarker in the diagnosis of cardiac damage due to its properties such as rapid release and high tissue specificity to the heart, The present study aims at evaluating the concentration of serum cTnI and cardiac enzyme activities (CK-MB, LDH and AST) in neonatal calves with sepsis.

Fibrinogen is a so called positive acute phase protein, i.e., its blood levels rise in response to systemic inflammation, tissue injury, and various types of cancer , Elevated levels of fibrinogen have been suggested to be the cause of thrombosis and vascular injury, i.e., complications that are sometimes associated with these conditions(Omiya *et al*., 2021).

Sepsis leads to coagulopathy by the activation of inflammatory mediators and vascular endothelial cell injury a number of biomarkers are used to evaluate coagulopathy on sepsis Fibrinogen and antithrombin activity have been reported as biomarkers of coagulopathy; however, the utility of these two markers has not been well established(Matsubara *et al*., 2019).

Fibrinogen (factor I) is a glycoprotein complex, made in the liver, that circulates in the blood of all vertebrates(Jiang & Doolittle, 2003). During tissue and vascular

injury, it is converted enzymatically by thrombin to fibrin and then to a fibrin-based blood clot .The main purpose of fibrin clots is to block blood arteries and stop bleeding, Fibrin also binds and reduces the activity of thrombin ,This activity, sometimes referred to as antithrombin I, limits clotting, Fibrin also mediates blood platelet and endothelial cell spreading, tissue fibroblast proliferation, capillary tube formation, and angiogenesis and thereby promotes revascularization and wound healing(Mosesson, 2008).

Albumin is the most abundant protein in human plasma with a normal plasma concentration of around 4.0 g dL^{-1}, while about 60% of the total albumin pool is located in the interstitial space, Albumin holds several important functions, both in health as well as in critically ill patients, It is the main preserver of colloid oncotic pressure (~75%), it functions as an anticoagulant and anti-oxidant and it is an important binding transporter of metabolites and drugs(Verbruggen *et al*., 2011). Critically ill patients are often hypoalbuminemia, primarily due to dilution and redistribution secondary to an altered vascular permeability, In critically ill patients hypoalbuminemia has been documented as a marker for disease severity, nutritional status, prolonged ventilator support and prolonged length of stay(Horowitz & Tai, 2007) .that decreased levels of albumin were significantly associated with poor prognosis in sepsis. Some potential mechanisms could explain this phenomenon. First, sepsis causes systemic inflammatory factors increasing significantly, which could impair the function of vascular endothelium and increase the permeability of capillary vessels. Then, albumin may leak into the outside of vessels, resulting in a decrease in the level of plasma albumin, which significantly increases the risk of poor outcomes(Cao *et al*., 2023). ore over, in sepsis, gastrointestinal function is usually injured partly, which affects the absorption of nutrients and causes malnutrition status, All in all, the level of serum albumin in sepsis might be an

indicator of inflammatory response, capillary leakage and organ dysfunction, which are associated with the prognostic role of plasma albumin in septic patients(Cao *et al., 2023)*.

alpha-1 antitrypsin AAT is a glycoprotein with a carbohydrate content of approximately 15% , AAT demonstrates Ans-linked glycosylation at three specific sites on its polypeptide backbone(Lechowicz *et al*., 2020).The acute phase protein alpha-1 antitrypsin (AAT) is a circulating protease inhibitor belonging to the serpin superfamily with divergent immunomodulatory functions, such as reduced production of proinflammatory cytokines , inhibition of neutrophil activation and chemotaxis, AAT analysis and its fragments revealed an increased proteolytic activity in patients with severe sepsis resulting in high peak intensities of AAT-fragments compared to severe SIRS of noninfectious origin(Blaurock *et al*., 2016).

Haptoglobin (Hp)is a positive acute phase protein, strongly binds hemoglobin, has anti-inflammatory capabilities and binds to CD11b/CD18 integrins representing major receptors on the cell membranes of leukocytes, Its quantity may decrease in massive erythrolysis and when blood is haemolytic. Determination by haemoglobin binding assays may give unreliable results, Haptoglobin binds and removes free haemoglobin released by intravascular haemolysis by forming a complex that is rapidly cleared by hepatocytes (Gruys *et al*., 2005). Following injury, infection or inflammation haptoglobin increases 2 to10 folds. Children and adults with sepsis have previously been shown to have higher plasma levels of haptoglobin,, Often regarded as an acute-phase reactant in response to physiologic stress, haptoglobin levels have been used in algorithms to help withe the diagnosis of sepsis(Janz *et al*., 2013).

Procalcitonin is a prohormone (peptide precursor) of calcitonin that is released by parenchymal cells, such as liver, kidney, adipocytes, and muscle cells in

response to bacterial toxins, leading to elevated serum levels (up to 5000-fold) within 2 to 4 hours; in contrast, procalcitonin is downregulated in patients with viral infections , The biological half-life of PCT is 22 to 26 hours, an advantageous time point compared with CRP and other acute-phase reactants, Although elevations of PCT can be observed in noninfectious disorders, especially following trauma , PCT levels have been used to guide empirical antibacterial therapy in patients with sepsis(Henriquez-Camacho & Losa, 2014).

Ceruloplasmin is a serum ferroxidase that contains greater than 95% of the copper found in plasma. This protein is a member of the multicopper oxidase family, an evolutionarily conserved group of proteins that utilize copper to couple substrate oxidation with the four-electron reduction of oxygen to water (Vasilyev, 2019). Despite the need for copper in ceruloplasmin function, this protein plays no essential role in the transport or metabolism of this metal. Aceruloplasminemia is a neurodegenerative disease resulting from inherited loss-of-function mutations in the ceruloplasmin gene Characterization of this disorder revealed a critical physiological role for ceruloplasmin in determining the rate of iron efflux from cells with mobilizable iron stores and has provided new insights into human iron metabolism and nutrition(Vasilyev, 2019). Cp levels increase during infection and inflammation, and pathogens can be exposed to high Cp at sites of infection.(Besold *et al.*, 2021).

Gamma globulin A group of proteins found in blood plasma. Injections of gamma globulin, which contain high levels of antibodies, can be given to boost a person’s immune system,gamma globulin a source of antibodies, and when viruses enter the body, the lymph nodes swell, and the reason for this is the production of antibodies, In a rare disease that may cause the loss of this source called agammaglobulinemia , which causes the body to lose the ability to produce antibodies (bigenc.ru *et al*., 2019).

low concentrations of gamma-globulins, especially IgG, are common in patients with community-acquired septic shock and persist over time even when sepsis resolves. Despite similar presentation, patients with hypo-IgG had greater vasopressor requirements, were more likely to develop acute lung injury/acute respiratory distress syndrome, and had higher mortality. Patients with low IgG concentrations may represent a logical target group to study the effects of Ig supplementation in septic shock (Taccone, F. *et al*.,2009).

White blood cells

leukocytes produce, transport, and distribute antibodies as a part of the immune system response. Normal values of white blood cells are 4500-10,000 in adults. In the elderly, total WBC will decrease slightly, In response to acute infection, trauma or inflammation, the number of WBCs increases and in some diseases, such as sepsis, the increase in WBC is so dramatic that resembles leukemia (leukemoid reaction)(Aminzadeh & Parsa, 2011). Leukocytes play a central role in the host response to infection. WBC count was incorporated into original consensus criteria for sepsis but was excluded from more recent sepsis definitions owing to its poor diagnostic accuracy when used in isolation (Malinovska *et al*., 2022).

The WBC is the most popular but least effective indicator used to assess infection. Septic shock may cause leukopenia or leukocytosis. Between these two extremes, there are many septic patients with normal WBCs (these patients frequently experience leukocytosis in a delayed manner). For instance, 50% of hospitalized patients with bacteremia might have a normal WBC. Therefore, the existence of an infection may be suggested by a significantly aberrant WBC(Seigel *et al*., 2012). Calculate the absolute neutrophil count (the total number of mature neutrophils plus any bands present) if the WBC is severely low. According to conventional definitions, neutropenia is characterized by a neutrophil count that is

either below 500/microliter in absolute terms or that is declining and falls between 500 and 1000-microliter. It is common for patients with neutropenia to miss certain infection-related symptoms. In patients with neutropenia, there needs to be a high index of suspicion for infection (for instance, the simple presence of a fever typically signals the need for broad-spectrum antibiotics) (Farkas, 2020).

Neutrophil to lymphocyte

neutrophil to lymphocyte ratio is the NLR. This can be determined with ease from any differential cell count (as either the ratio of absolute cell counts or the ratio of relative cell counts) Physiologic stress will typically result in an increase in neutrophils and a decrease in lymphocytes, which will raise the NLR. Although the exact cause of NLR elevation is unknown, it is likely caused by a combination of endogenous cortisol and catecholamines, both of which are known to raise neutrophil numbers while lowering lymphocyte levels) (Farkas, 2020). Septic shock may result in a particularly significant rise of NLR compared to other types of physiological stress because sepsis also induces lymphocyte apoptosis(Zhang *et al.*, 2011). often within 6 hours NLR increases rapidly following acute physiologic stress, This prompt rise can make NLR a superior reflection of acute illness, compared to other components of the complete blood count which usually take longer to increase (e.g., WBC) In many patients with early septic shock, the NLR may be the only parameter which accurately reflects the severity of illness(Farkas, 2020). NLR is less accurate at identification of septic shock within a population of critically ill patients, all of whom have been admitted to an intensive care unit. Patients with non-infectious critical illness tend to have moderately elevated NLR, so NLR is less adept at detecting sepsis within this context(Westerdijk et al., 2019).

Platelet

Infections may cause an increase or decrease in platelet count. Since platelet count is an acute phase reactant, it is common for persistent, smoldering infections to have elevated platelet counts. Because septic shock frequently results in platelet consumption, thrombocytopenia is more frequently seen platelet interaction with white cells through the formation of platelet-neutrophil aggregates and platelet-monocyte complexes in sepsis and other inflammatory conditions (in some cases, evolving into full-blown disseminated intravascular coagulation) (Thachil & Warkentin, 2017).

The presence of thrombocytopenia may help in making the sepsis diagnosis. About 40% of septic shock patients have it. Strong prognostic indicators for death include the degree of thrombocytopenia. However, given that thrombocytopenia is frequently observed in patients who are critically ill, this observation is somewhat general. Thrombocytopenia could therefore serve as a warning sign for the presence of a serious systemic illness without providing any specific information about its cause. Acute thrombocytopenia is more concerning than chronic thrombocytopenia since chronic thrombocytopenia is a typical characteristic of many disorders (cirrhosis) (Farkas, 2020).

2.3.treatment of sepsis

1-Antibiotics: Wide-ranging antibiotics (often two, a broad-spectrum -lactam antibiotic, or broad-spectrum carbapenem coupled with fluoroquinolones, macrolides, or aminoglycosides) are advised in cases of severe sepsis and septic shock. The choice of antibiotics has a significant impact on the likelihood that the patient will survive (Marik PE *et al*., 2014). Given that there is a 6% increase in mortality for every hour that antibiotics are delayed, some advise giving them within an hour of the diagnosis (Marik, 2014).All the suspected cases of sepsis are treated with ampicillin and gentamicin, or amikacin and cefotaxime, as first-line drugs for empiric treatment regimens (Guidelines from Myanmar Paediatric Society). Vancomycin, meropenem, and sulperazone are regarded as reserve or secondary groups. According to the data from the culture and drug susceptibility testing (CDST), antibiotic treatment was altered or modified in response to antimicrobial resistance patterns (Oo *et al*., 2021).

2-vitamin C: has emerged as a potential treatment to sepsis. The treatment has been shown to be deficient in septic patients and the administration of high dose intravenous as opposed to oral vitamin C leads to markedly improved and elevated serum levels. Its physiological effects on sepsis include attenuating oxidative stress and inflammation ,enhancing immune cell function, improving vasopressor synthesis, improving endovascular function, and epigenetic immunologic modifications (Kashiouris *et al*., 2020).

3-Melatonin: has been shown to enhance organ function and increase survival number of people's in a sepsis models, Melatonin's actions on many pathways in these sepsis models lead to its therapeutic benefits, There are few clinical trials, mainly on newborns and pediatric patients, that have shown promising results when melatonin is administered for the treatment of sepsis(Biancatelli et al.,

2020). Melatonin is a possible supplementary treatment for sepsis through its powerful anti-oxidative properties ,anti-inflammatory, antiapoptotic and. Several models of sepsis have demonstrated that melatonin can prevent multiorgan dysfunction and improve survival via restoring mitochondrial electron transport chain (ETC) function, inhibiting nitric oxide synthesis and decreasing cytokine production (Biancatelli *et al.*, 2020).

Chapter Three
Materials and Methods

3.1. Materials

3.1.1. Kits

The Kits that used in the current study are listed in table (3-1).

Table (3-1): Kits of the Study

NO	Kits	Campany	Country
1	S.P.E kit	Seleo	Italy
2	CRP Kit	MINDRAY	Chinese
3	SAA Kit	MINDRAY	Chinese
4	BNP kit	Biomerieux	France
5	Troponin kit	Biomerieux	France
6	Fibrinogen kit	HMG	Chinese
7	CBC	URIT	Chinese
8	ID (VITEK2) cards cassette	BioMerieux	France

3.1.2. Apparatuses

the tools that were utilized in this project. Table (3-2).

Table (3-2): Devices of the study

NO	Devices and Tools	Company	Origin
1.	Autoclave	Labtech	Korea
2.	Electrophoresis automated system	MINIPHOR 08	Italia
3.	URIT-3000plus	URIT	Chania
4.	Centr-ifuge	ROTOFIX 32A(Hettich)	GERMANY
5.	FUM HOOD	FASTER Bio4s	ITALY

6.	INCUBATER	Galenkamp	ENGLAND
7.	MINDRAY	BS-430	Chania
8.	REFRIGRATOR	LG	KOREA
9.	Deep-FREEZS	ALS	ITALY
10.	Vitek two- compact	BIONMERIEUX	France
11.	Mini-vidas	BIOMERIEUX	France
12.	Water Distling	GEL	Germany

3.1.3.Equipment

The equipment of current study are listed in table (3-3).

Table (3-3): The tools of the study

NO	Devices and Tools	Company	Origin
1.	Micro-pipettes	Slammed	Germany
2.	Gloves	Mumu plus +	Malaysia
3.	Mask	Disposable 3-layer Mask	China
4.	Watte-Cotton-Pleats	Alsalama	Iraq
5.	Diposable-syring 5 ml	EASYMED	China
6.	Disposable-syring 10 ml	ULTRA HEALTH	China
7.	Tourniquet	Voltaren	China
8.	Gel tube	Vaccum blood collection tubes	China
9.	EDTA-tube	Vaccum blood collection tubes	China

10.	*Sodium Citrate Tube*	Vaccum blood collection tubes	China
11.	Blood-culture-bottle	BACT\ALERT FA PLUS	USA

3.2.method

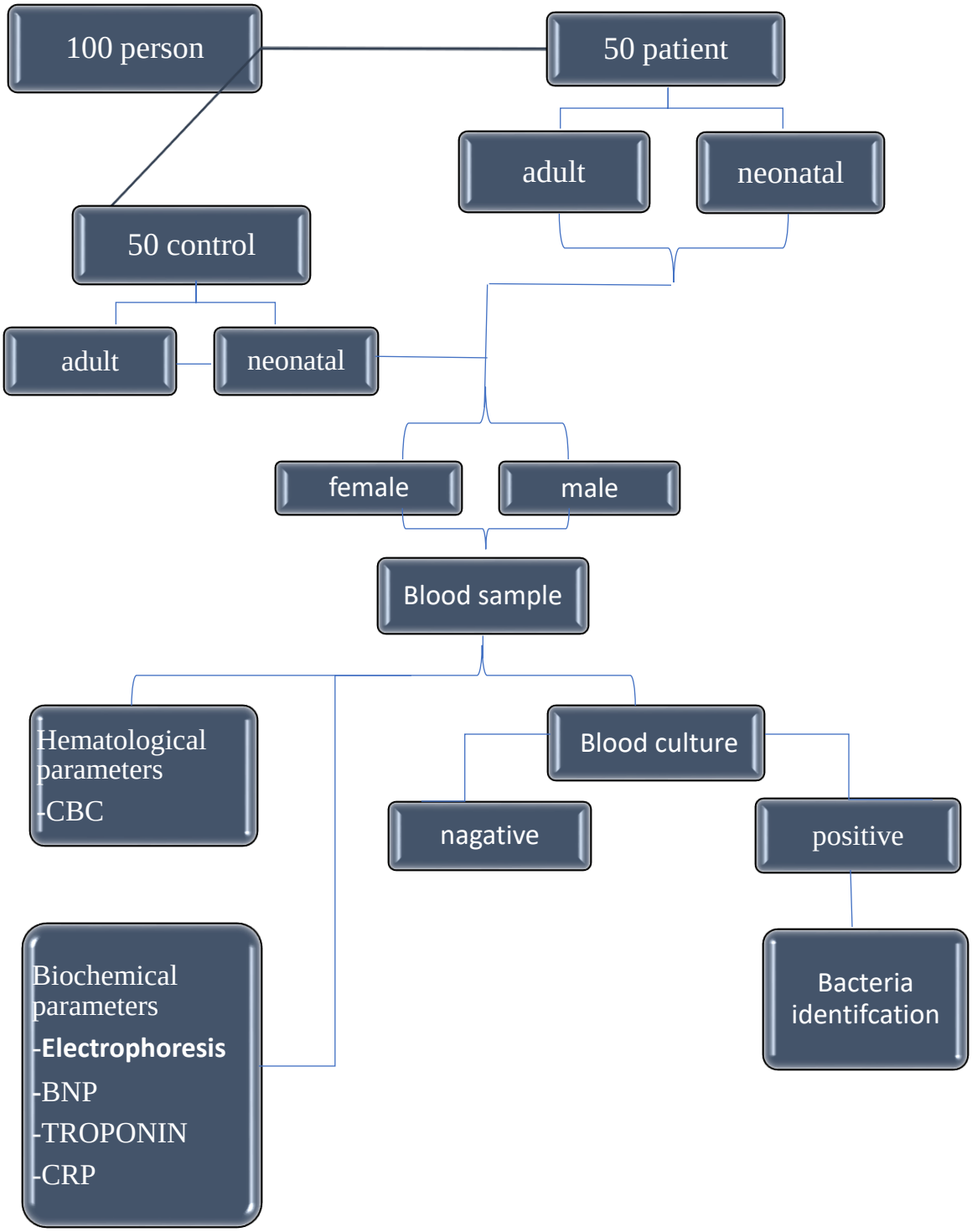
3.2.1. Study Design :

case-control study on patients with sing and symptom of septicemia was conducted. at Imam Hussein hospital in Center ICU/ Imam Zain Alabdeen hospital during the period from October 2022 to May 2023.

3. 2.2 Subjects Group:.

One hundred (100) participants were enrolled in this study classification three groups according to clinical diagnosis,patients were suspected to have septicemia by physician which noted the information of patients file in the center ,[50 patients(8 neonatal , 42 adult)] from both sex[(14 female) ,(36 male)] and divided to group :first group A includes patients with positive blood culture [23 (6 neonatal , 17adult)] the second group B includes patients with negative blood culture [27(2 neonatal ,25 adult)] and the third group includes healthy control [50 (10 neonatal, 40 adult)] ,[(11 female),(39 male)] People were taken from the general public and appeared to be in good health. in Medical staff and relatives free from sign and symptom.the neonates ages range(≤ 30 days), Adults (18_73 years). As show in the figure below **(**3.1).

On the weight and age of patient collected (5-15 ml) of blood sample was from patients and control and used for investigation (5-10 ml) was used blood culture and the remaining was used for hematological parameter including (WBC),biochemical parameters (SPE,BNP,Troponin,CRP).



Fieger (3-1) Study design Design

3.2.2.1. Questionnaire

The information demographic data and clinical data collected from each patients and was documented according to , names , age, sex chronic disease , pulse rate, fever, respiratory rate ,blood pressure and history of antibiotic.

3.2.2.2. Ethical management of studies

The research followed the guidelines set forth by the Department of Clinical Laboratories at the University of Karbala's College of Applied Medical Sciences for dealing with biological substances and dangerous microorganisms. After acquiring the necessary authorization from the hospital administration and patients, The samples for this investigation were taken from patients at the Karbala Health Directorate's Imam Hussein Center ICU,and imam zian alabden hosptal.

3. 3.1Inclusion criteria

All of the patients were admitted to ICU or medical word with history to be suspected to have septicemia such as high temperature . increase respiratory rate , tachy- or brady-cardia , hypotension.

3.4.Tests included in study.

1- CBC
2- C-reactive protein
3- Serum amyloid A
4- high-sensitivity troponin.
5- Pro- BNP
6- Fibrinogen
7- Blood culture
8- Serum protein electrophoresis which include the following protein

1- Albumin
2- Alpha-1-globulin
3- Alpha-2-globulin
4- beta-globulin
5- gamma -globulin

3.5. Collection of samples

A total of (5-15 ml) of blood aspirate from the veins of the patients were collected.

1. The patient's identity had been verified, and the patient's identity had been inquired about. Look on the wall above the bed or in the patient's records to double-check identify.
2. The method was explained to the patient, as well as the plans' details. Frequently, verbal approval was obtained .
3. Blood culture bottles, syringe (10 mL), sharps waste disposal container, as needed for a blood culture, sterile gloves, tourniquet, adhesive strip, povidone iodine or alcohol solution (or other acceptable skin disinfectant), and sterile pack with cotton/gauze swabs were collected.
4. A tourniquet was applied, and a suitable vein was selected. Hands were cleaned with soap and water or disinfected with alcohol. After that, the hands were cleaned or rubbed until fully dry. The gloves were put on with sterility in mind.
5. procedure, the puncture site was cleansed with povidone or an alcohol solution. For 1 to 2 minutes, the disinfectant was In an aseptic allowed to dry. The blood culture site was covered with a green sterile cover with an opening.
6. A needle was gently inserted into the patient's blood vein, resulting in a blood sample of at least (8-10) milliliters for two bottle aerobic and

anaerobic (adults) and (5-8) milliliters for aerobic only (neonatal). If the vacutainer equipment was employed, the blood culture would be the first blood specimen taken.

7. The tourniquet had been undone. From the puncture wound, the syringe and needle were withdrawn. A dry swab was used to clean the puncture site, and pressure was administered. If blood was not extracted directly into the culture bottle using the vacutainer method, inoculate blood into the culture bottle after cleaning the lid of the blood culture container with an alcohol swab. Before collecting blood for additional tests, inoculate the blood culture tube. There's a lot to do between obtaining blood samples and inoculating the blood culture container.

8. The blood culture container was gently turned to mix the blood and culture material (Avoided shake vigorously).

The blood culture vial was delivered to the laboratory as quickly as possible. At the same time, 3 mL of blood was deposited at room temperature in a gel tube (3 mL) and allowed to coagulate for at least fifteen minutes before centrifugation at 3000 rpm for biochemical tests S.P.E ,Troponin BNP,CRP,SAA. The leftover blood sample (2ml) was placed in an EDTA tube and shaken for at least fifteen minutes for CBC , and (1.8 ml) blood sample was put in the sodium citrate tube *for fibrinogen* and quickly centrifuged at 2500 rpm at least fifteen minutes to obtain of plasma)(Arif *et al*., 2021)(ARIF)

3.5.1 Electrophoresis

electrophoresis analyzer needs are small or large routines of protein analysis , have the automatic Serum proteins, hemoglobins, urinary proteins and immune fixations, choose the automatic or semi-automatic analyzer for the needs of clinical

analysis laboratory. smaller and automated electrophoresis analyzer MiniPhor 08 is the supported cellulose acetate. Suitable for medium-small daily routines, it offers simple and immediate use. The analyzer automatically processes up to 8 samples for each work cycle and is proposed, thanks to its simple and intuitive management software, as a valid analysis and reporting instrument. The possibility of being interfaced in a local network for data exchange with a remote station allows the speeding up of the master data management of the samples and reports to be produced. The use of an external PC with at least one USB port available for connection of the analyzer and installation of management software is required. The management software supports Microsoft operating systems from Windows XP to Windows 10. Supported tests: Serum proteins / Haemoglobins / Lipoproteins / Urinary Proteins.

Principle:

The separation of proteins by electrophoresis is based on the fact that charged molecules usually migrate through a matrix/medium upon application of an electrical field . Numerous aspects of the electrophoretic system and the nature of proteins themselves affect how quickly proteins move in an electric field. A few things to consider include the electric field's intensity, the system's temperature, the ions' pH, the buffer's concentration, etc.. (Ninfa *et al.*, 2009). The dissociation content of the amino acids in proteins determines their charges, which vary in size and form. Larger proteins often take longer to migrate, while smaller proteins do so more quickly. The electrophoretic method makes use of this protein's physical characteristic to separate it. Zone electrophoresis, in which the serum proteins are separated into zones or fractions and interpreted as such, is the most widely used type of electrophoresis for serum protein separation(Ramanathan & Srinivas, 2019). For the separation of serum proteins, a variety of support mediums are available,

such as agarose, cellulose acetate, capillary medium, etc. Capillary zone electrophoresis (CZE) is the term for the method when a capillary medium is employed. When compared to its rivals, such as agarose gel electrophoresis, capillary electrophoresis is the favored technique for the following reasons. CZE offers a better resolution as a result of the following:the "electroendosmosis" principle, which enhances separation resolution ,Employing a “high-voltage” electric current which aids in improving the throughput (the processing time) and the resolution of protein separation.

Capillary electrophoresis is seen below (Sebia Minicap Flex Piercing). Capillary electrophoresis with Sebia Minicap Flex Piercing operates on the idea of capillary electroendosmosis with high-voltage electric current. Human blood may be tested using sealed tubes thanks to Sebia CZE's Flex Piercing technology, which also eliminates the biohazard that comes with handling uncapped samples(Ramanathan & Srinivas, 2019).

3.5.2. MINI VIDAS

3.5.2.1. high-sensitivity Troponin

Principle:

Immunofluorescent assay.

Procedure:

The assay principle by (ELFA).The sample is transferred into the well containing the alkaline phosphatase-labeled **Hs-Troponin** antigen (conjugate). The antigen present in the serum and the labeled antigen compete for the specific **Hs-Troponin** sites coated to the inner surface of the SPR. During the final detection step, the substrate (4-Methyl-umbelliferyl phosphate) is cycled in and out of the SPR. The

conjugate enzyme catalyzes the hydrolysis of this substrate into a fluorescent product (4-Methyl-umbelliferone), whose 450 nm fluorescence is quantified. The amount of antigen present in the sample affects how intense the fluorescence is. At the end of the assay, results are automatically calculated by the instrument in relation to the calibration curve stored in memory, and then printed out [(Conseil) Biomerieux 2023].

3.5.2.2.Pro-BNP

Principle : Immunofluorescent assay

Procedure: The assay principle by (ELFA).The sample is transferred into the well containing the alkaline phosphatase-labeled **Pro-BNP** antigen (conjugate). The specific Pro-BNP sites coated to the inner surface of the SPR are contested by the labeled antigen and the antigen present in the blood. During the last detection stage, the substrate (4-Methyl-umbelliferyl phosphate) cycles in and out of the SPR. The fluorescence of the fluorescent product (4-Methyl-umbelliferone),whose wavelength is 450 nm, is produced by the conjugate enzyme's hydrolysis of this substrate. The intensity of the fluorescence is directly correlated with the amount of antigen present in the sample. At the conclusion of the assay, the gadget automatically calculates the results based on the calibration curve stored in memory, and then prints the results[(Conseil) Biomerieux 2023].

3.5.2.3:CRP & SAA

Principle:

Nephelometry

Procedure:

Instrument Operation see operator's manual for Mindray 430.

(1) Gently mix, uncap and load specimens into serum racks, with the barcode in the open slot. Make sure there are no bubbles. Load the racks in the specimen lanes.

(2) Uncap and load reagents in the reagent racks, with the barcode in the open slot. Load the rack in a reagent lane. (Note: reagents do not need to be at room temperature.)

(3) Select the CRP & SAA study test for all specimens. Testing is done in singlicate. The instrument will automatically rerun the specimen with a higher or lower dilution if the initial result is outside the range of the standard curve.

(4) The instrument automatically calculates all results. After testing is completed, results are printed and review by the technologist.

(5) Remove specimens, controls, and reagents. Return controls and reagents to the refrigerator

(6) Perform scheduled instrument maintenance (daily, weekly, monthly) as outlined on the maintenance log. See the operator's manual for specific instructions.

(7) Follow the on-screen instructions for shutting the instrument down (Wener *et al*., 2000).

3.5.3.Completes Blood Counts (CBC)

The procedure was followed by Blum in the swelab device

1. The samples were at room temperature in the first stage.
2. Once hanging, it was manually inverted ten times.
3. If the samples have barcodes, it was conducted as though the subject were a typical patient (Caps lock was turned off).
4. The sample was loaded onto the analyzer, and then the RUN button was pressed. The outcomes were printed following evaluation of all samples.
5. To print the information, "Stored Data" was selected.
6. A button was pressed for output.

7. To erase every mark, select "Mark," "All Clear," and then "Cancel" (Arif *et al*., 2021).

3.6. Diagnosis of Bacteria

3.6.1. Blood Culture Samples

Specimen Type

- Yellow paediatric bottle – Neonates and Infants (<3 Years), 0.5-4mL
- Green aerobic bottle – Children and Adults, 5-10mL
- Orange anaerobic bottle - Children and Adults, 5-10mL
- Mycoplasma Bottle (Silver cap) - Women (RWH), 3-5mL
- Mycobacterial bottle (Myco/F Lytic) (Red cap) 1-5 mL

Blood culture was performed by BacT/Alert automated blood culture system in all the cases. Approximately 0.5 ml of blood from neonetal and (8-10)ml from adult was inoculated aseptically into BacT/Alert paediatric blood culture bottle. Bottle was immediately transported to the microbiology laboratory. BacT/Alert bottles were incubated in BacT/Alert 3D microbial detection system (3D, BioMeriux Inc. Durham, NC) till it signals positive for growth (maximum incubation period was 7 days). Once the bottle was taken out, Gram's stain & subculture on BHIA agar/ blood agar/ MacConkey agar were performed, The microbes isolated were identified by standard microbiological techniques(Bala et al., 2018). Identification of the organisms was based on cultural characteristics,after that Aseptically transfer at least 3 mL of sterile saline into a clear polystyrene 12×75 mm test tube. Using sterile cotton swabs, prepare a homogenous organism suspension by transferring several isolated colonies from the plates to the saline tube. Adjust the suspension to the McFarland standard required by the ID reagent

using a calibrated V2C Denis check Plus Meter, Select the appropriate card based on the Gram stain reaction and the organism's microscopic appearance. Allow the card(s) to come to room temperature before opening the package liner(Jin et al., 2011).fill the VITEK®2 cassette with the inoculum at the smart carrier stationTM,a barcode connects the sample to the VITEK® 2 card ,The device will take care of the incubation and results reading once the cassette has been loaded. (Arif *et al*., 2021). (ARIF)

3.7. Statistical analysis:

The results were analyzed statistically by using the SPSS program version 27. the means of the study groups were compared by using the least significant difference (LSD) at the level of significance 0.05.

Chapter Four
Results and Discussion

4.1. distribution of studied groups according to sex:

This study revealed that, there as significant differences (P< 0.001) between male and female in septicemia patients, the higher level was in male patient in adults group and in neonate group as shown in table (4-1).

Table (4-1): Distribution of study groups by sex.

Characteristics		Groups						P value
		A (N= 23)		B (N=27)		C (N=50)		
Sex	**Age**	**No.**	**%**	**No.**	**%**	**No.**	**%**	
Female	**Neonates**	1	25.0	1	10.0	9	81.8	**0.0178** Sig.
	Adults	3	75.0	9	90.0	2	18.2	
	Total	**4**	**100**	**10**	**100**	**11**	**100**	
Male	**Neonates**	5	26.3	1	5.9	25	64.1	**0. 007*** Sig.
	Adults	14	73.7	16	94.1	14	35.9	
	Total	**19**	**100**	**17**	**100**	**39**	**100**	

Chi square used in comparison, sig: significant, NS; not significant P. value (≤ 0.05), (0.001).

A: patient group with bacteria growth, (B): patient group without bacteria growth ,(C): control group.

This study was agreed with other study by[(Naher & Khamael, 2013) and (Bala *et al.*, 2018)]whom founded that Males (70%) were more affected with septicemia than females (30%),The reason for male preponderance is not exactly known, but this could be because of sex-dependent factors ,The synthesis of gamma globulins is probably regulated by X-linked immunoregulatory genes and males have one X chromosome, are more prone to neonatal sepsis than females. However, reported an equal proportion of the males and females in study of neonatal sepsis, additionally other study found in a wide range of illnesses, including sepsis and septic shock, which affect men more often than women. The sex polarization of the intracellular pathways responding to encounters between pathogens and cell receptors helps to explain this discrepancy in part. Sex hormones appear to be the

cause of this polarization, although additional factors, such as chromosomal effects, remain unexplored (Lakbar I, 2023). In summary, men regularly have a higher frequency of sepsis, and some sources also claim higher mortality rates, whereas women are less sensitive to sepsis and appear to recover more quickly than men. However, variables other than hormonal differences complicate the interaction between sepsis and sex, including co-morbidities as well as social and cultural differences between men and women. Men are more likely to be exposed to risk factors connected to lifestyle (such as :physical activity, outdoors jobs) and greater exposure to violence among men, As for male children, infection and pollution are a cause of sepsis,Biological aspects relate to sex-related variations in hormonal and immunological characteristics (Lakbar I, 2023).

4.2. Comparison of hematological parameter in studied groups:

4.2.1. Comparison of hematological parameter in studied groups in neonates and adult

Hematology parameter levels was examined based on the three groups of neonate subjects (group A: sepsis patient with bacteria growth, group B: sepsis patient without bacteria C: control group) that compered with adults three groups subjects (group A: with bacteria growth, group B: without bacteria C: control group), the results show that in table(4-3).

Table (4-2): Comparison of hematological parameter study groups in neonates.

Groups	Num-ber	WBC Mean±SD	Neutrophils %	Lymphocytes %	platelets Mean±SD
A(with bacterial growth)	6	21.15±10.89	48.06±20.84	34.58±24.61	223.65±27.86
B(without bacterial growth)	2	23.17±11.89	37.55±36.69	48±27.56	298.15±38.11

C(Healthy group)	**10**	**12.58±6.95**	**58.57±23.76**	**27.68±18.8**	**253.62±154.33**
P value		**0.03**	**0.150**	**0.151**	**0.815**
LSD		***S***	***NS***	***NS***	***NS***

Comparisons by Post Hoc NS: no significance *significance

Table (4-3): Comparison of hematological parameter in studied groups in adult.

Groups	**Number**	**WBC Mean±SD**	**Neutrophils Mean±SD**	**Lymphocytes Mean±SD**	**platelets Mean±SD**
A(with bacterial growth)	**17**	**18.75±8.87**	**77.81±15.89**	**16.53±17.24**	**259.61±124.15**
B(without bacterial growth)	**25**	**15.12±8.64**	**77.08±23.74**	**9.31±5.64**	**242.31±122.59**
C(Healthy group)	**40**	**8.4±1.49**	**66.48±21.86**	**12.4±52.87**	**309.59±160.07**
P value		**0.042***	**0.225**	**0.230**	**0.294**
LSD		***S***	***NS***	***NS***	***NS***

Comparisons by Post Hoc NS: no significance *significance

In this study found that (total WBC) of the patient groups (A &B) for neonate and adult (21.15 ±10.89) (23.17 ±11.89) (18.75 ±8.87) (15.12 ±8.64) significant higher than control group (C) (12.85 ±6.95) (8.4 ±1.49), respectively at level *P value* (< 0.05), while there is no significant differences between adult and neonate in different groups A,B,C,of other parameters (lymphocyte, neutrophil, platelets) at level P value (> 0.05), as show in tables (4-2),(4-3)

The WBC is the most popular but least effective indicator used to assess infection. Either leukopenia or leukocytosis could result from septic shock. Between these two extremes, there are many septic patients with normal WBCs (these patients frequently experience leukocytosis in a delayed manner). For instance, 50% of individuals with bacteremia who present to the hospital might have a normal WBC. As a result, a normal WBC reveals little, but a significantly aberrant WBC may

indicate the presence of an illness (Agnello *et al*., 2021).white blood cell is typically associated with infection, and leucopenia can occur during severe infections. However, several studies found that WBC had low diagnostic performance for infection (Gurol *et al.,* 2015). Among ICU patients with suspected infection, leukopenia was associated with increased mortality risk compared with leukocytosis(Belok *et al.,* 2021).

Sepsis usually produces an elevated white blood cell count, with an increased number of neutrophils and an increased percentage of immature forms called bands (ie, a left shift, or *bandemia*) (Munford, 2008). Infection stimulates the production of cytokines which trigger the release of immature granulocytes from the bone marrow (e.g., granulocyte colony stimulating factor). This is reflected by the presence of immature cells in peripheral circulation. The least immature cells commonly seen in peripheral circulation are bands. An important drawback of left shift is that release of immature cells from the bone marrow is often delayed, emerging about one day after clinical infection. This can cause a left shift to be absent when a patient first presents with septic shock.(Farkas 2020) Measurement of bandemia has two unique drawbacks. First, a manual cell count is required, which introduces a considerable delay to the availability of these results (Martins *et al*., 2019). Given the urgency of reaching an accurate diagnosis of septic shock, a delay of even a few hours may be very problematic (Davis *et al*., 2019). Second, measurement of bands is subject to inter-observer and inter-hospital variability, due to confusion in the literature regarding exactly how to define bands , Bandemia has a low sensitivity for infection, but a reasonably high specificity (~85% using a cutoff of >10% bands) Other potential causes of bandemia may include surgery, hemorrhage, tissue necrosis, myeloproliferative disorders, and exogenous granulocyte cell stimulating factor. Thus, if a substantial bandemia is discovered, it

should be regarded as potential evidence of sepsis until demonstrated otherwise (Cornbleet, 2002).

In this study, neutrophils non-significant difference between patients groups and control , Neutrophil dysfunction is a result of sepsis, a severe dysregulation of the immunological response to infection. That causes organ failure and encourages sepsis(Stiel *et al*., 2018).In response to a range of inflammatory stimuli, neutrophils generate and release proteolytic enzymes and reactive oxygen species. Although crucial for host defense, these mediators can encourage tissue damage. The early stages of sepsis may be characterized by excessive neutrophil migration, which may result in an exacerbated inflammatory response, tissue damage, and ultimately organ dysfunction. On the other hand, the incapacity of neutrophils to confine and manage infection and delayed wound healing are caused by dysregulation of migration and insufficient migratory response that occur during the later stages of severe sepsis(V Lerman & Kim, 2015).During the course of sepsis, the number of neutrophils may vary, depending on the stage of sepsis, the patient's immunologic status, and the etiology of the infection (Dursun *et al.*, 2018).

many studies are not compatible with our current study, due to the type of study used in patients with sepsis retrospectively, but my study prospective design.

In this study, lymphocytes non-significant difference between patients groups and control .The lymphocyte count decreases in the early stages of sepsis and maintains this trend for the first 28 days (Hattori *et al*., 2017).
(Wyllie *et al*., 2004) studied the number of patients with bacteraemia number without bacteraemia. And suggests that lymphopenia independently predict bacteremia, found Lymphocyte counts less than 0.25 $*10^6$ /litre, referred to here as extreme lymphopenia, determined the group that was most at risk for bacteraemia.

lymphopenia was independently associated with higher 28-day mortality, lymphopenic patients were older than the control group, had a significantly higher need for ICU admission, higher likelihood of experiencing 28-day septic shock and readmission due to sepsis, and had a higher SOFA score(Sheikh Motahar Vahedi, 2019).

(Venet *et al*., 2010) It was proven that in patients who died of sepsis, B-and-T cell lymphocyte levels had considerably decreased during the first week post diagnosis. that the complex immunologic response brought on by sepsis disrupts the equilibrium between pro-and anti-inflammatory mechanisms. This causes an immune suppression phase that leads in developing primary and secondary infections, increased rates of morbidity and mortality, and other effects One of the immune cell suppression characteristics in sepsis is apoptosis of immunological including B lymphocytes ,T-helper , dendritic cells and cytotoxic lymphocytes, Many studies have shown in the early phase of sepsis that lymphocyte count decreases and follows the same pattern during the first 28 days (Sheikh Motahar Vahedi, 2019).

In this study platelets were decreased in patients groups, but non-significant difference between patients groups and control. with disease weak platelets may be due to a problem with the platelets themselves, or because an external factor alters the normal platelet function (Bianchi *et al*., 2022).

Activated platelets promote the development and progression of sepsis via their involvement in inflammation and thrombosis. Sepsis is characteristically accompanied by a drop in platelet count, reflecting their sequestration and their consumption in microthrombi although many other mechanisms contribute to the severity and persistence of thrombocytopenia. Severe thrombocytopenia is associated with a dysregulated host response leading to an increase in cytokine levels and endothelial dysfunction. Hence, sepsis is associated with increased systemic

thrombosis and coagulation as well as with elevated risk of hemorrhage due to the consumption of coagulation factors and platelets . Thrombocytopenia was found to correlate with sepsis disease severity and is associated with increased mortality risk (Assinger *et al*., 2019).

Another study found the exact opposite of our study Platelets play a significant role in the coordinated immune response to infection and therefore in the inflammation and coagulation dysfunction that contributes to organ damage in sepsis. Thrombocytopenia has a high incidence in sepsis, and it is a marker of poor prognosis. The genesis of thrombocytopenia is likely multifactorial, and unraveling the involved molecular mechanisms will allow development of biomarkers of platelet function in sepsis.Such platelet biomarkers can facilitate study of antiplatelet interventions as immunomodulatory treatment in sepsis(Shannon, 2021).

4.3.comparison between studied groups according to biochemicals parameters in neonate and adult:

4.3.1.C-reactive protein:

In this study found that (CRP) of the patient groups (A-Patient with growth bacteria & B-patient without growth bacteria) for neonate and adult (mean ±SD) (93.16±80.44) (88.7±74.54) (25.5±9.19) (52.7±26.59)significant higher than control groups (C) (mean ±SD)(4.1±1.2) (3.6±1.55) respectively at level P value (< 0.05),but there is no significant differences between adult and neonate in different groups Show table (4.4).

Table (4-4) comparison between studied groups according to biochemicals parameters(CRP) in neonatal and adult:

Groups	Neonates (Mean ± SD)	Adults (Mean ± SD)	*P value*
A(Patient-with growth bacteria)	93.16 ± 80.44	88.7 ± 74.54	**0.925 NS**
B(patient-without growth bacteria)	25.5 ± 9.19	52.7 ± 26.59	**0.169 NS**
C(control group)	4.1 ± 1.2	3.6 ± 1.55	**0.492 NS**
P value	**0.001***	**0.005***	Horizontal comparisons by t- test Vertical comparisons by Post Hoc NS: no significance * : significance
LSD	**S**	**S**	

This study found CRP is a sensitive marker of sepsis, but it is not specific. It is consistent with other studies(Rashwan *et al*., 2019) found CRP have higher diagnostic in sepsis comparison to other studied markers.

This means During the first 24-48 hours after infection, the increase in CRP serum concentration is rapid rather gradual, which may have a negative effect on the test's sensitivity(Kocabas *et al*., 2007).

(Hisamuddin et al., 2015) found The sensitivity and specificity of CRP in diagnosis of acute neonatal sepsis was 76.92% and 53.49% respectively while it had a positive predictive value of 80% and negative predictive value of 48.94%. Over all the diagnostic accuracy of CRP in diagnosis of neonatal sepsis was 70.07%.

The risk of sepsis related mortality appears to be increased when the 3rd day CRP value is greater than 100 mg/dL. Thus, CRP appears to be as valuable a predictor of mortality as the SOFA score (Özkan Devran & Medicine, 2012).

(Kingsley & Jones, 2008) tested whether CRP could be used to distinguish different types of infections, They discovered that mean CRP levels in a spreading infection were higher than those in other colonized, critically colonized, and locally infected groups, All cases of infection showed an increase in CRP levels compared

to non-infected controls, but CRP levels could not distinguish between the infection types, showing that it is infection in general that causes CRP levels to increase, rather than the type of infection.

This was also noted by (Healy & Freedman, 2006) who showed that CRP levels can be used only as a method of detecting infection, rather than distinguishing it.

(Patterson et al., 1968) found an association between CRP and *S. aureus* and showed that CRP was acting upon the polysaccharide bacterial cell wall. (Black *et al*., 2004) stated that CRP enhances the in vitro phagocytosis of many microorganisms (including *S. aureus*) by leukocytes. Their work confirmed this finding even in the absence of complement, suggesting that the enhancement of phagocytosis by CRP is due to the interactions with Fcγ receptors.

4.3.2. serum amyloid A:

This study found that serum amyloid A of the patient groups (A- Patient with growth bacteria &B-patient without growth bacteria) for neonate and adult(mean ±SD) (33.91±17) (28.35±23.97) (39.5± 27.76)(27.76±20.62), significant higher than control groups (C) (mean ±SD) (5.38±5.12) (5.9±6.48) respectively at level P value (< 0.05),and there is no significant differences between adult and neonate in different groups. Show table (4.5).

Table(4.5): comparison between studied groups according to biochemicals parameters(serum amyloid A) in neonatal and adult.

Groups	Neonates (Mean ± SD)	Adults (Mean ± SD)	*P value*
A(Patient-with growth bacteria)	33.91 ± 17.00	28.35 ± 23.97	**0.608 NS**
B(patient-without growth bacteria)	39.5 ± 27.76	27.76 ± 20.62	**0.488 NS**
C(control group)	5.38 ± 5.12	5.9 ± 6.48	**0.683 NS**

P value	**0.001***	**0.001 ***	Horizontal comparisons by t- test Vertical comparisons by Post Hoc NS: no significance * : significance
LSD	**S**	**S**	

In This study examined the Mean levels of Serum Amyloid A in all group septic patient neonate and adults were significantly higher than control because the body was infected with pathogen, the liver was stimulated to generate serum amyloid A into circulation ,Serum amyloid A is also an acute reaction protein similar with C-reaction protein, can increase and also inhibit the expression level of inflammatory factors in, the current study was similar to (Li *et al.*, 2020)suggests that SAA gradually rises and peaks 3–4 days after infection in patients with respiratory virus infections. Clinical symptoms typically appear 36–48 hours after infection.

And according to other studies, those who had severe acute respiratory syndrome had much higher levels of SAA, indicating that SAA could be utilized as a biomarker to track the development of respiratory disorders(Li *et al*., 2020).Even at very low concentrations, SAA can cause chemotaxis and activate chemokines to stimulate an inflammatory response(Sack Jr, 2018).

(Liu, 2020)found that SAA gradually increases after virus infection. It increases earlier than CRP, and the increase is obvious, reaching a peak on the 3–4 days after infection.

in other study potential role of SAA in host defense against virusfound SAA has been reported to directly activate neutrophils and to recruit them to the lung during infectious and inflammatory processes. Neutrophils are the most abundant cell recruited to the lung in the early phase of IAV infection. There are different forms and preparations of SAA1 that have found to have different effects on phagocyte responses, through various receptor, suggest that Serum amyloid A can be significantly increased in both bacterial and viral infections, Using serum amyloid

A combined with other indicators, bacterial and viral infections can be distinguished. (White, 2021)

Other study on Patients less than 28 weeks found The high sensitivity, specificity, positive predictive value and negative predictive value of SAA protein could help the clinicians for early diagnosis of neonatal sepsis (Abd Elkhalek *et al*., 2020).

4.3.3. Albumin:

This study found that Albumin of the patient groups (A- Patient with growth bacteria &B-patient without growth bacteria) for neonate and adult (mean ±SD) (3.78±0.7) (3.65±0.5) (3.2±0.28) (3.49±0.28) non-significant than control groups (C) (mean ±SD) (3.68±0.46) (3.43±0.35) respectively at level P value (> 0.05),and there is no significant differences between adult and neonate in different groups show table (4.9).

Table(4.6): comparison between studied groups according to biochemicals parameters(Albumin**) in neonatal and adult:**

Groups	Neonates (Mean ± SD)	Adults (Mean ± SD)	*P value*
A(Patient-with growth bacteria)	3.78 ± 0.7	3.65 ± 0.5	**0.642 NS**
B(patient-without growth bacteria)	3.2 ± 0.28	3.49± 0.28	**0.174 NS**
C(control group)	3.68 ± 0.46	3.43± 0.35	**0.786 NS**
P value	**0.360**	**0.213**	Horizontal comparisons by t- test Vertical comparisons by Post Hoc NS: no significance * : significance
LSD	**NS**	**NS**	

In this study found Albumin no significant than control group albumen is another protein produced by the liver. It can maintain the colloid-osmotic pressure, keep fluid from leaking out of blood vessels, nourishes tissues, and transports hormones, vitamins, drugs, and calcium throughout the body, hypoalbuminemia was frequent among neonates with sepsis, and that lower albumin levels might be

associated with a poorer prognosis. Lower serum albumin levels were also associated with more severe inflammation(Yang *et al*., 2016).

further reported that ALB was a predictor of severity in adult patients with abdominal sepsis. Besides, many studies demonstrated that there exists a close correlation between ALB and inflammation, Low ALB levels could widely be seen in patients with inflammatory diseases and were associated with more severe inflammation, Sepsis is often complicated with organ dysfunctions, Sepsis could damage the liver through hemodynamic alterations, assault on the hepatocytes, or both, which further reduced the liver's ability to synthesize with ALB (Li *et al.*, 2021).

These studies are not compatible with our current study, due to the type of study used in patients with sepsis retrospective, but my study design prospective.

4.3.4.Alpha 1antitrypsin:

this study found that (Alpha 1antitrypsin) of the patient groups (A- Patient with growth bacteria &B-patient without growth bacteria) for neonate and adult (mean ±SD) (7.6±3.73) (9.36±4.6) (6.45±2.05) (9.52±4.4) significant higher than control groups (C) (mean ±SD) (3.42±2.42) (3.6±3.28) respectively at level P value (< 0.05),and there is no significant differences between adult and neonate in different groups show Table(4.7).

Table(4.7):comparison between studied groups according to biochemicals parameters(Alpha 1antitrypsin) in neonatal and adult:

Groups	Neonates (Mean ± SD)	Adults (Mean ± SD)	*P value*
A(Patient-with growth bacteria)	7.60± 3.73	9.36 ± 4.6	**0.4209 NS**
B(patient-without growth bacteria)	6.45 ± 2.05	9.52± 4.4	**0.345 NS**
C(control group)	3.42 ± 2.42	3.6± 3.28	**0.998 NS**

P value	**0.020***	**0.017***	Horizontal comparisons by t- test Vertical comparisons by Post Hoc NS: no significance * : significance
LSD	**S**	**S**	

This study is consist with (Han et al., 2023)Alpha 1-antitrypsin levels was higher in-patient group, this marker may predict microbial (non-viral) infection and sepsis better than does clinical symptoms and may predict mortality, and other study propose that protein alpha-1 antitrypsin possesses increase their therapeutic efficacy, When the body is harmed or infected, the concentration of the acute-phase protein Alpha 1antitrypsin increases five-fold. In addition to reducing bacterial and viral burden, α1-antitrypsin has anti-inflammatory, anti-protease, pro-resolution, cytoprotective, and pro-angiogenic effects. It also protects cells from various stresses and encourages angiogenesis.

(Kaner, 2015) suggest α1-antitrypsin significantly reduced infection-induced leukopenia and liver, pancreatic, and lung damage, and it significantly improved 24-hour survival rates. Unexpectedly, bacterial load was decreased. Levels of early proinflammatory mediators and neutrophil influx were increased by Alpha 1 antitrypsin shortly after infection.

Levels of early proinflammatory mediators and neutrophil influx were increased by α1-antitrypsin soon after infection but not during sterile peritonitis(Kaner *et al*., 2015).

4.3.5. Haptoglobin:

In this study found that Haptoglobin of the patient groups (A- Patient with growth bacteria &B-patient without growth bacteria) for neonate and adult (mean ±SD) (445.83±132.97) (400.35±139.45) (298.5±282.13) (412±132.98) significant higher than control groups (C) (mean ±SD) (112.79±94.88) (119.87±101.82)

respectively at level *P value* (< 0.05) and there is no significant differences between adult and neonate in different groups as Show table(4.8).

Table(4.8):comparison between studied groups according to biochemicals parameters(haptoglobin) in neonatal and adult:

Groups	Neonates (Mean ± SD)	Adults (Mean ± SD)	*P value*
A(Patient-with growth bacteria)	445.83± 132.97[a]	400.35 ± 139.45[a]	**0.495 NS**
B(patient-without growth bacteria)	298.5 ± 282.13[a]	412± 132.98[b]	**0.287 NS**
C(control group)	112.79 ± 94.88[b]	119.87± 101.82[b]	**0.946 NS**
P value	**0.001***	**0.001***	Horizontal comparisons by t-test Vertical comparisons by Post Hoc NS: no significance * : significance
LSD	**S**	**S**	

The current study suggests a found individuals with septic shock had haptoglobin levels that were much greater than those of individuals without sepsis, although they fell as the severity of the illness increased. a result of several physiological abnormalities in septic shock(Lan *et al*., 2022). Independent of sickness severity, chronic liver disease (which may decrease the generation of haptoglobin), and cell-free hemoglobin level, higher plasma haptoglobin levels were linked to a lower risk of mortality (Janz, 2013). Patients with detectable plasma cell-free hemoglobin showed a stronger correlation between haptoglobin levels and decreased mortality than patients without detectable cell-free hemoglobin. suggest that haptoglobin as an endogenous scavenger of cell-free hemoglobin may play a protective role in patients with sepsis rather than just being an acute-phase reactant (Janz, 2013).

(Emami et al., 2016) Studied on Total of 84 neonates, which was suggested Serum plasma haptoglobin can be a specific diagnostic factor in diagnosing early neonatal sepsis in keeping with other diagnostic tests for sepsis.

4.3.6.ceruloplasmin:

This study found that ceruloplasmin of the patient groups(A- Patient with growth bacteria &B-patient without growth bacteria)for neonate and adult(mean ±SD) (20.33±8.61) (15.88±7.3) (12.45±12.09) (17.82±7.3) was nonsignificant at level P value (> 0.05), in comparison with control groups (C) (mean ±SD) (16.55±6.5) (20.43±8.01) respectively, in spite of the results approved lower level in ceruloplasmin in patients groups with comparison with control group as show table(4-9).

Table(4-9):comparison between studied groups according to biochemicals parameters(ceruloplasmin) in neonatal and adult:

Groups	Neonates (Mean ± SD)	Adults (Mean ± SD)	*P value*
A (patient with growth bacteria)	20.33 ± 8.61	15.88 ± 7.3	**0.233 NS**
B (patient without growth bacteria)	12.45 ± 12.09	17.82 ± 7.3	**0.342 NS**
C (control group)	16.55 ± 6.50	20.43 ± 8.01	**0.120 NS**
P value	**0.323**	**0.226**	Horizontal comparisons by t- test Vertical comparisons by Post Hoc NS: no significance * : significance
LSD	**NS**	**NS**	

The current study was similar to other study by (Abuduxikuer *et a*l., 2015). Who found that serum ceruloplasmin is not suitable for newborn screening in sepsis patients.other study by found no difference in serum ceruloplasmin and transferrin levels before and after therapy in patients with sepsis. Additional study was approved that serum ceruloplasmin and transferrin decrease but rise to normal levels after recovery25 (KALAYCI et al., 2000).

4.3.7. Pro BNP:

This study found that (Pro BNP) of the patient groups (A- Patient with growth bacteria &B-patient without growth bacteria) for neonate and adult (mean ±SD) (287.66±107.94) (250.35±235.86) (261.5±51.61) (294.52±215.03) non-significant higher than control groups (C) (mean ±SD) (283.79±181.47) (196.68±127.85) respectively at level P value (> 0.05),and there is no significant differences between adult and neonate in different groups show table(4-10).

Table (4-10): comparison between studied groups according to biochemicals parameters(pro BNP) in neonatal and adult:

Groups	Neonates (Mean ± SD)	Adults (Mean ± SD)	*P value*
A (patient with growth bacteria)	287.66±107.94	250.35 ± 235.86	**0.541 NS**
B (patient without growth bacteria)	261.5 ± 51.61	294.52 ± 215.03	**0.399 NS**
C (control group)	203.79±181.47	196.68 ± 127.85	**0.107 NS**
P value	**0.319**	**0.324**	Horizontal comparisons by t- test Vertical comparisons by Post Hoc NS: no significance * : significance
LSD	**NS**	**NS**	

The present study shows non significant higher BNP late in complication sepsis (septic shock) this our study consists with, increased pro BNP levels are related to dysfunction of the cardiovascular system and systemic inflammation, Pro BNP can be used as a predictor of cardiac insufficiency secondary to sepsis, as well as a poor prognostic indicator of sepsis(Li *et al*., 2013).and other study suggest Pro-BNP levels can be used as a marker of early cardiovascular dysfunction (CVD), which when combined with bedside echocardiography, may be used in the early diagnosis of CVD in children with sepsis(Yang *et al*., 2022). The (Khoury *et al*., 2017) shows that higher pro BNP levels on admission are associated with increased in hospital 90 days and longer all-cause mortality.

4.3.8. HS-Troponin:

This study found that HS-Troponin of the patient groups (A- Patient with growth bacteria &B-patient without growth bacteria) for neonate and adult(mean ±SD)(4.9±1.3) (6.11±42.26) (7.6±1.4) (5.20±38.67) significant higher than control groups (C) (mean ±SD) (0.95±0.3) (1.1±0.08) respectively at level P value (< 0.05),and there is no significant differences between adult and neonate in different groups Show table(4-11).

Table(4-11):comparison between studied groups according to biochemicals parameters(HS-Troponin) in neonatal and adult:

Groups	Neonates (Mean ± SD)	Adults (Mean ± SD)	*P value*
A (patient with growth bacteria)	4.9±1.3	6.11±42.26	**0.445 NS**
B (patient with growth bacteria)	7.6±1.4	5.20±38.67	**0.094 NS**
C (control group)	0.95±0.3	1.1±0.08	**0.671 NS**
P value	**0.007**	**0.003**	Horizontal comparisons by t- test Vertical comparisons by Post Hoc NS: no significance * : significance
LSD	**S**	**S**	

HS. Troponin may be released during sepsis because of direct myocardial injury from inflammation or infection. a higher serum troponin level is a prognostic indicator of high mortality in sepsis cases (Garcia *et al*., 2021). Its impact has had inconsistent reports because of differences in troponin types (troponin I or troponin T) disease severity, cutoff values, and the time to measurement (Vallabhajosyula *et al., 2017)*.

Wilhelm *et al*.2014 reported that non-survivors of septic patients had higher sensitivity troponin on admission compared with survivors.

(Bessière et al., 2013)suggest Elevated troponin identifies a subset of patients with sepsis at higher risk of death.

troponin elevation is probably multifactorial and a common finding among critically ill patients with sepsis, It might be that myocardial dysfunction accounts for troponin elevation and could potentially explain the troponin's association with mortality, Alternatively, raised troponin may indicate a more fulminant disease process. There is no guideline on the appropriate approach and management of septic critically ill patients with elevated troponin (Zochios & Valchanov, 2015). However, vigilance for objective evidence of acute coronary syndrome, prompt management of sepsis and optimisation of myocardial oxygen demand/supply balance are of paramount importance. of cardiac troponins as a sepsis screening tool and addition of troponin to sepsis bundles could be helpful in prognostically stratifying critically ill patients with sepsis, so that early evaluation (by echocardiography or angiography) and management is appropriately initiated. It would stand to reason that septic patients with high pre-test probability of coronary artery disease and very high troponin levels (above 10% of the co-efficient variance) undergo cardiac investigations during their ICU stay. However, believe that cardiac troponins form one part of a much larger diagnostic, prognostic and therapeutic puzzle(Zochios & Valchanov, 2015).

4.3.9.Gamma globulin:

This study found that Gamma globulin of the patient groups (A- Patient with growth bacteria &B-patient without growth bacteria)for neonate and adult (mean ±SD) (29.65±3.09) (28.57±2.34) (25.30±4.80) (29.45±3.45) significant higher than control groups (C) (mean ±SD) (17.14±2.09) (17.71±4.42) respectively at level P value (< 0.05),and there is no significant differences between adult and neonate in different groups show table(4-12).

Table(4-12):comparison between studied groups according to biochemicals parameters(gamma globulin) in neonatal and adult:

Groups	Neonates (Mean ± SD)	Adults (Mean ± SD)	*P value*
A (patient with growth bacteria	29.65 ± 3.09 [a]	28.57 ± 2.34 [b]	**0.385 NS**
B (patient without growth bacteria	25.30 ± 4.80 [b]	29.45 ± 3.45 [b]	**0.121 NS**
C (control group)	17.14 ± 2.09 [b]	17.71 ± 4.42 [a]	**0.71**
P value	**0.032 ***	**0.002 ***	Horizontal comparisons by t- test Vertical comparisons by Post Hoc NS: no significance * : significance
LSD	**S**	**S**	

immunoglobulins could be a useful tool to identify septic patients at high risk of mortality this consistent with other studies of patients with severe sepsis or septic shock, we found that high levels of IgA and IgG on the first day of diagnosis were associated with a decreased 90-day survival. No association was found between IgM levels and survival (Alagna, 2021).and (Andaluz-Ojeda *et al*., 2011)showed in 172 adult patients with severe sepsis or septic shock that low plasma concentrations of IgA, IgG and IgM were associated with reduced survival. there are several possible explanations for the lower levels of immunoglobulins found in some patients with severe sepsis or septic shock. First, the production of immunoglobulins may be decreased. Whilst this mechanism could affect the levels of IgM and IgA, it is unlikely to contribute to the low levels of IgG1 observed in no survivors, given the long half-life of this immunoglobulin (several weeks). Secondly, hemodilution due to liquid replacement or capillary leak may provide an explanation. Thirdly, other factors potentially affecting immunoglobulin levels in sepsis include increased catabolism, redistribution/sequestration in inflamed tissues, previous immune defficiency or immunodeficiency due to sepsis or the critical illness . Finally, immunoglobulin levels could also be affected by consumption in the context of the antimicrobial response(Bermejo-Martín *et al*., 2014).

4.3.10. Fibrinogen:

This study found that Fibrinogen of the patient groups (A- Patient with growth bacteria &B-patient without growth bacteria) for neonate and adult (mean ±SD) (413.5±98.42) (434.35±168.11) (489.00±76.36) (440.76±154.95) significant higher than control groups (C) (mean ±SD) (334.97±102.38) (306.31±136.99) respectively at level P value (< 0.05),and there is no significant differences between adult and neonate in different groups show table(4-14).

Table(4-13):comparison between studied groups according to biochemicals parameters(fibrinogen) in neonatal and adult:

Groups	Neonates (Mean ± SD)	Adults (Mean ± SD)	*P value*
A (patient with growth bacteria	413.50 ± 98.42 [ab]	434.35 ± 168.11[a]	**0.779 NS**
B(patient without growth bacteria)	489.00 ± 76.36 [a]	440.76 ± 154.95[a]	**0.671 NS**
C(control group)	334.97 ± 102.38[b]	306.31 ± 136.99[b]	**0.203 NS**
P value	**0.043 ***	**0.015**	Horizontal comparisons by t-test Vertical comparisons by Post Hoc NS: no significance * : significance
LSD	**S**	**S**	

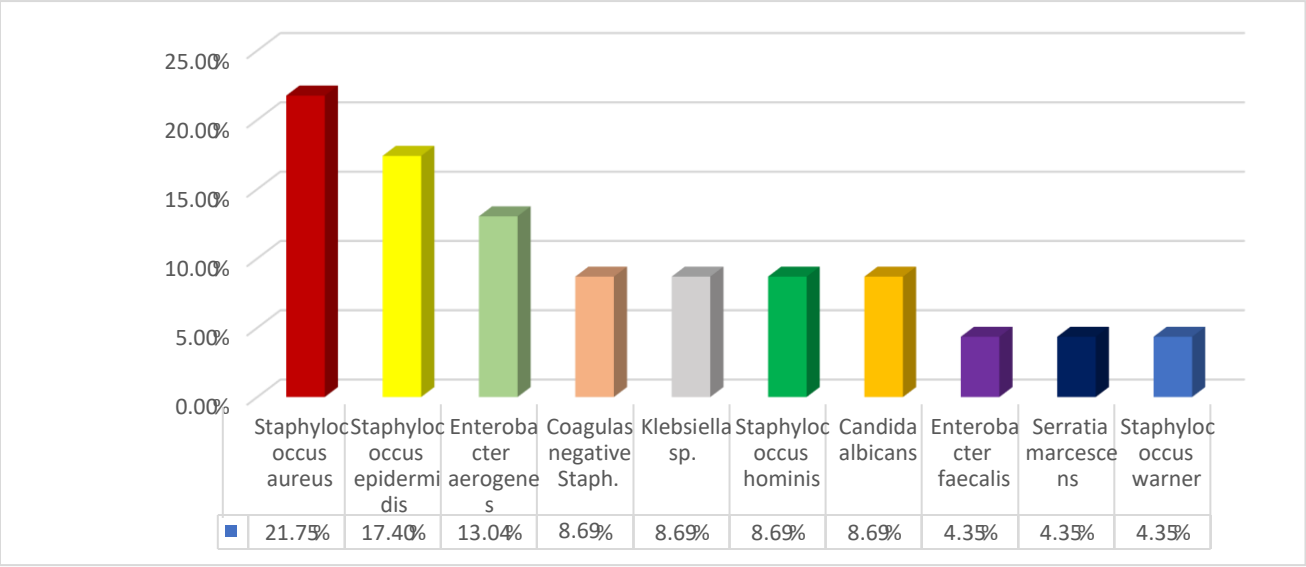
A useful predictive biomarker for pediatric sepsis is fibrinogen. This is consistent with earlier research, which found that neonates and adult who died had lower plasma fibrinogen levels. Plasma fibrinogen was also found to be a useful tool for evaluating neonatal outcomes, showing that inflammation-induced increased coagulant activity and decreased fibrinolysis result in fibrin deposition in the microcirculation, which causes organ dysfunction(Tang *et al*., 2020) .

Iskandar *et al* 2013 reported that adult patients with sepsis had decreased plasma fibrinogen in 23.5% of cases and elevated plasma fibrinogen in 43.5% of patients Acute phase reactant fibrinogen may be increased in the initial stages of

sepsis(Iskander *et al*., 2013). Another study The reduced fibrinogen in patients with acute infection may possibly indicate activation of coagulation leading to its consumption(Sharma *et al.*, 2018).

4.4. bacterial types in septicemia patients:

This study found that type of bacteria of the sepsis patient groups for neonate and adult (21.75%) *staphylococcus aureus*, (17.40%) *staphylococcus epidermidis* (13.04%) *Enterobacter aerogenes*, significant higher than other type of bacteria *staphylococcus warner* (4.35%) respectively and there is no significant differences between adult and neonate in different groups.



Figer:(4.1) Percentage of bacterial types in septicemia patients

This study approved that gram positive bacteria were more commonly found to cause septicemia than gram negative bacteria. which is similar to the results of previous studies by (Llewelyn & Cohen, 2007) there was a widespread shift from gram-positive bacteria to gram-negative bacteria among the microbes causing sepsis, and in most reports since the 1990, gram-positive organisms have caused the largest proportion of sepsis infections.

(Mahallei et al., 2018) suggested *S. aureus, Streptococcus pneumoniae, Klebsiella, and Escherichia coli (E. coli*) were described as the most prevalent pathogenic microorganisms of sepsis in developed nations, whereas negative-gram bacteria were the major pathogens of neonatal sepsis in poor countries, *S.aureus* bacteremia is associated with higher mortalities than bacteremia jcaused by most other microbes and can develop to severe sepsis and death(Jin *et al., 2021)*. another study found the most predominant reported Gram positives and Gram negatives isolates was *S. aureus* (47.9%),*Klebsiella* spps(29.8%) and *E. coli* (23.1%). The predominance of the above isolates as common causes of septicemia was also reported in many previous study (Abayneh *et al*., 2021). Bacterial profile of septicemia is constantly changing thus, current knowledge on the patterns of bacterial isolates, its antibiotic resistance profile, and associated factors, are essential to design and implement appropriate interventions(Abayneh *et al., 2021)*. Additionally, a previous study reported that *S.epidermidis* stimulates the release of an antimicrobial peptide, increasing the ability of cell lysates to inhibit the growth of group *A Streptococcus* and *S.aureus*. However, the usage of indwelling or implanted medical equipment is rising due to infections caused by S. epidermidis biofilm. Nosocomial sepsis can frequently be brought on by them spreading into the circulation(Farajzadeh Sheikh *et al.*, 2019). Other study found Out of 132 blood culture isolates in study, 81 were Gram positive, 50 were Gram negative, and one was *Candida albicans*. Among Gram positives, *Staphylococcus aureus, Enterococcus* species(Sah *et a*l., 2021).

(Rallis *et al*., 2023) found Other *streptococci, enterococci* (*Enterococcus* spp.), Gram-negative Enterobacteriaceae (*Enterobacte*r spp.) and fungal infections, particularly *Candid*a spp., are implicated in neonates with very low birth weights and may manifest with a clinical picture of EOS, typically in the first 24 h of life. Microorganisms present in the hospital setting, particularly in the NICU, are among

the pathogens responsible for LOS. *Staphylococcus aureus, coagulase-negative* s*taphylococci* (CoNS), which account for 53–78% of episodes, and Gram-negative bacteria, primarily *Escherichia coli*, *Klebsiella spp.*, and *Enterobacter* spp., are the pathogens most frequently implicated in cases. In newborns with a very low birth weight, *Candida* spp. fungal infection is common and severe(Rallis *et al.*, 2023).

Other study that didn't agree with this study present gram negative organisms (68%) were more common than gram positive organisms (32%) as isolated pathogens (Bala *et al.*, 2018).

Conclusions and Recommendations

Conclusions

- it was found that the percentage of white blood cells in newborns is higher than that of adults, and that the percentage of group without bacterial growth is higher in children than in adults ,The WBC is the most popular effective indicator used to assess infection , while lymphocyte, neutrophil, platelets there is no good indicator differences between adult and neonate in different groups sepsis ,neutrophil is decrease in neonatal with bacterial growth and non-bacterial growth than control
- and some of biomarker as (CRP) in all group septic patient neonate and adults were significantly higher than control group and serum amyloid A found increase higher in patient with sepsis(neonatal-adult)with and without growth bacterial than control this markers is good indicator routinely to diagnosis of sepsis.
- the biomarker such as troponin and pro BNP could use to assess the severity of disease.
- Found other marker(Alpha 1 antitrypsin-haptoglobin) higher in patient with bacterial growth in neonatal than without bacterial growth and control this markers is good for predict microbial in frication.
- most of negative acute phase reactant protein (ceruloplasmin- Albumin) found non-significant between group with and without bacterial growth in neonatal and adult than control ,count not useful for diagnosis and assess of sepsis**.**
- fibrinogen useful predictive biomarker for pediatric sepsis.
- gold stander for diagnosis is blood culture.

Recommendations

- Increase the sample size for future study and studies in different center for more reliable con and convincing result
- Used of viral marker INF-y, in future study
- Used different acute phase reactant such as PCT, LBP.
- We recommended to used prospected study about the patient with chronic disease DM, CRE(chronic respiratory disease)and stander the biochemical marker**.**

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Appendices

Appendices

Appendix 1: Fieger electrophoresi

Appendix 2: Fieger Mindray

Appendix 3:URIT Apparatus

Appendix 4:mini vides Apparat

الخلاصة

تسمم الدم ، أو تعفن الدم ، هو الاسم السريري لتسمم الدم بالبكتيريا. إنها استجابة الجسم القصوى للعدوى. الإنتان الذي يتطور إلى صدمة إنتانية لديه معدل وفيات يصل إلى 50٪، اعتمادًا على نوع الكائن الحي المصاب. الإنتان هو حالة طبية طارئة ويحتاج إلى علاج طبي عاجل . بدون علاج، يمكن أن يؤدي الإنتان بسرعة إلى تلف الأنسجة وفشل الأعضاء والموت. عدة أسباب للعدوى منها الطفيليات والبكتيريا والفطريات.

تم تسجيل مائة (100) مشارك في هذه الدراسة بما في ذلك ثلاث مجموعات مشاركة في دراسة الحالة والشواهد هذه وفقًا للتشخيص السريري ، وكان يُشتبه في إصابة المرضى بتسمم الدم عن طريق العلامات والأعراض التي أخذها الطبيب الذي لاحظ معلومات المرضى تم أخذ[50 مريضًا (8 حديثي الولادة ، 42 بالغًا) [من كلا الجنسين] (14 أنثى) ، (36 ذكرًا)]ومجموعتين مقسمتين: المجموعة الأولى تشمل المرضى الذين لديهم ثقافة دم إيجابية[23 (6 حديثي الولادة ، 17 بالغًا)] المجموعة الثانية تشمل المرضى الذين يعانون من ثقافة دم سلبية[27 (2 حديثي الولادة ، 25 بالغًا)] وتشمل المجموعة الثالثة الاصحاء [50 (10 حديثي الولادة ، 40 بالغًا)] ،[(11 أنثى) ، (39 من الذكور)] تم اختيار الأشخاص من عامة الناس وبدا أنهم بصحة جيدة ، وتم جمع جميع المرضى (5-15 مل) من الدم من أوردة المرضى. عينة دم لا تقل عن (9-10) مليلتر (بالغين) و (5-8) مليلتر (حديثي الولادة) ستكون مزرعة الدم هي أول عينة دم تؤخذ، 3 مل من الدم يتم ترسيبها في درجة حرارة الغرفة في أنبوب جل (3) مليلتر للاختبارات البيوكيميائية ، تم وضع عينة الدم المتبقية (2 مل) في أنبوب مانع للتخثر ورجها من أجل عمل صوره دم ووضعت عينة دم (1.8 مل) في أنبوب سترات الصوديوم للفايبرنوجين.

كان الغرض من هذه الدراسة هو معرفة تأثير بعض العلامات الحيوية على مرضى الإنتان مثل البروتينات المتفاعلة في المرحلة الحادة و. للتعرف على النوع الشائع من البكتيريا التي تصيب مرضى الإنتان، وقد أجريت هذه الدراسة في مستشفى الإمام الحسين بمركز العناية المركزة ومستشفى الإمام زين العابدين خلال الفترة من أكتوبر 2022 إلى مايو 2023.

وجدت النتائج في هذه الدراسة أن كريات الدم البيضاء في إجمالي المرضى مع نمو البكتيري ولمجموعه بدون نمو بكتيري لحديثي الولادة والبالغين أعلى معنويًا من المجموعة الضابطة عند المستوى (<0.05) ،

بينما لا توجد فروق ذات دلالة إحصائية بين البالغين وحديثي الولادة في مجموعات المختلفة مجموعه (أ-ب)مع المجموعة الضابطة عند المستوى (<0.05)في الصفيحات الدموية- العدلات-الخلايا اللمفاوية.

تم العثور على معامل كيميائي حيوي لمجموعة المرضى (أ-ب) في (البروتين المتفاعل-الفيبرونوجين- مصل اميلويد أ- غاما الغلوبولين -هبتوغلوبين-الفا1انتي تربسين)لمجموعه المرضى (أ-ب)في حديثي الولادة والبالغين حيث وجد فروقات معنويه اعلى بكثير من المجموعة الضابطة عند مستوى(<0.05)ولاتوجد فروقات ذات دلائل إحصائية بين البالغين وحديثي الولادة

اما مختلفة. ولكن في (الألبومين ، السيرولوبلازمين ،انزيم القلب) لمجموعات المرضى(أ-ب) لحديثي الولادة والبالغين وجد فروقات غير معنوي أعلى من المجموعات الضابطة عند المستوى بقيمة (<0.05) ، ولا توجد فروق ذات دلالة إحصائية بين البالغين و حديثي الولادة في المجموعات مختلفة.

أيضا وجدت في هذه الدراسة ان نوع البكتريا لمجموعات مرضى الإنتان لحديثي الولادة والبالغين (21.75٪) المكورات العنقودية الذهبية ، (17.40٪) المكورات العنقودية البَشْرَوية (13.04٪) المعوية الهوائية ، أعلى بكثير من الأنواع الأخرى من بكتيريا المكورات العنقودية المنذر (4.35٪) على التوالي و لا توجد فروق ذات دلالة إحصائية بين البالغين وحديثي الولادة في مجموعات مختلفة.

جامعه كربلاء

كلية العلوم الطبية التطبيقية

قسم التحليلات المرضية

دراسة البروتينات المتفاعلة في المرحلة الحادة في مريض الإنتان

رسالة مقدمة

الى مجلس كلية العلوم الطبية التطبيقية-جامعة كربلاء

وهي جزء من متطلبات نيل شهادة الماجستير في التحليلات المرضية

كتبت بواسطة

ازهار مهدي عبد الأمير

بكالوريوس تقني طبي تحليلات مرضيه/كليه اليرموك الجامعة

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