"TO STUDY THE SERUM LACTATE ALBUMIN RATIO IN THE PATIENTS WITH SEPSIS A ONE YEAR CROSS SECTIONAL STUDY IN KLES DR. PRABHAKAR KORE HOSPITAL AND MRC, BELGAVI."

BY

REG NO: BG0118006

Dissertation

Submitted to the
KAHER, Belagavi, Karnataka
In partial fulfillment
of the requirements for the degree of

DOCTOR OF MEDICINE (M.D)
IN
GENERAL MEDICINE

DEPARTMENT OF GENERAL MEDICINE
J. N. MEDICAL COLLEGE, NEHRU NAGAR
BELAGAVI-590010

APRIL-2021

KLE ACADEMY OF HIGHER EDUCATION AND RESEARCH, BELAGAVI, KARNATAKA

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LIST OF ABBREVIATIONS USED

SIRS	Systemic Inflammatory Response Syndrome
L/A ratio	Serum lactate albumin ratio
APACHE 2	Acute Physiology and Chronic Health Evaluation II
SOFA	Sequential Organ Failure Assessment
TLRs	Toll-like receptors
CLRs	C-type lectin receptors
RLRs	Retinoic acid inducible gene 1–like receptors
NLRs	Nucleotide-binding oligomerization domain–like receptors
PAMPs	Pathogen-associated molecular patterns
NOD1 & 2	Nucleotide oligomerization domain proteins 1 and 2
TNF	Tumor necrosis factor
IFN	Interferons
IL	Interleukins
PAF	Platelets activating factors
PARs	Protease-activated receptors
ARDS	Acute Respiratory Distress Syndrome
AKI	Acute kidney injury
MODS	Multiple Organ Dysfunction Syndrome

ABSTRACT

Background and objectives: Severe sepsis and septic shock, are the major cause of emergency room admission and are associated with high morbidity and mortality worldwide. It is known that increased serum lactate is prognostic marker of generalized tissue hypoxia in distributive shock. Serum albumin is a negative acute phase protein and marker of outcome of sepsis which decreases during the response of active phase of infections. As each of the two parameters independently predicts mortality, a combination of both was meant to further increase the predictive value. Hence this study aims to evaluate L/A ratio to predict mortality in sepsis.

Materials and Methods: This was hospital based cross sectional study carried out over a period of one year with sepsis patients. Clinical and demographic characteristics were noted and at admission serum lactate, albumin, L/A ratio and APACHE 2 score were calculated and follow up was done on day seven and the association of outcome with L/A ratio and APACHE 2 score were derived.

Results: Out of 100 hospitalized patients, the mortality was higher in sepsis patients with respiratory infections and abdominal infections, and with diabetes mellitus as compared with patients with other comorbidities or without comorbidities. The mortality was higher in patients with septic shock than patients without shock. There was positive correlation between the L/A ratio and mortality in sepsis patients with a cut off value of 0.76. The non-survivor group had higher serum lactate (high **6.05 +/- 4.12** vs low 2.54 +/-1.53 mmol/L, **p= 0.0001**), low serum albumin (low **2.64 +/- 0.71** vs high 2.90 **+/-** 0.65 g/dL, p =0.087) and higher L/A ratio levels (high **2.64 +/- 2.45** vs low 0.88 +/- 0.88, **p= 0.0001**) as compared to survivor groups. There was positive

correlation between serum lactate and APACHE 2 score in predicting the mortality in sepsis.

Conclusion: Based on this study it is concluded that, serum lactate albumin ratio can be used as the simple tool as predictor for poor prognosis in the patients with sepsis.

In our study there was no correlation observed between the serum lactate albumin ratio and APACHE 2 score in predicting the mortality in sepsis.

Keywords- L/A ratio- serum lactate albumin ratio, APACHE 2- Acute Physiology and Chronic Health Evaluation.

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INTRODUCTION

"Sepsis is defined as the dysregulated host response to infection resulting in life-threatening organ dysfunction."[1]

When this process is accompanied by persistent hypotension requiring vasopressor support, it is classified as septic shock.[1] These are conditions caused by tissue hypoperfusion and hypoxia leading to organ dysfunction.

Severe sepsis and septic shock, are the major cause of emergency room admission and are associated with high morbidity and mortality worldwide.[2] Similarly, hospital mortality and 28-day mortality of severe sepsis in India were 65.2% and 64.6%, respectively.[3]

Furthermore, most of the patients recovering after sepsis have low quality of life who commonly develop cognitive and functional disability need substantial continuing immediate and chronic care. [4-6]

Late diagnosis and inadequate resuscitation in sepsis and septic shock causes increase in mortality.[7] As the incidences of sepsis and septic shock are rising more things have to be done in reducing the mortality rate.[8]

There are various data regarding the incidence, prevalence, predicting factors and mortality from sepsis and septic shock alone with bacteriological profiles, antibiotic sensitivity patterns isolated from blood cultures in India. The pivotal factor in declining mortality among sepsis and septic shock patients, is the application of care bundle approaches of the Surviving Sepsis Campaign.[9]

If one can predict the risk of poor outcome in patients with sepsis and septic shock in the emergency services and aggressively resuscitate them, the improving rate can be expected to rise. Definitely, the gravity of organ dysfunction is a crucial factor for prognosis in sepsis.[10]

Therefore, predictive biomarkers of mortality in septic shock patients are important for early detection and timely care.

Due to low oxygen saturation and reduced oxygen supply to tissue requirement anaerobic metabolism commences, and followed by hike in lactate production. It is well demonstrated that the raised lactate is prognostic marker of global tissue hypoxia in distributive shock.[11]

Previous observations have shown that a lactate concentration more than 4 mmol/L in association with systemic inflammatory response syndrome (SIRS) criteria substantially accelerate the mortality in normotensive patients.[12]

Serum albumin constitutes 75-80% of normal plasma colloid oncotic pressure and the extent of decreased serum albumin in critically ill sepsis patients is directly correlated with the intensity of infection.[13] It is a negative acute phase protein and marker of mortality of sepsis and septic shock which is reduced due to consequence of active phase of infections.[14]

As each of the two parameters independently predicts mortality, a combination of both was intend to further accentuate the predictive value. Hence, these both serum lactate and serum albumin levels which go in different directions in sepsis and septic shock are clubbed together, and this serum lactate albumin ratio is expected to provide

a prognostic index that correlate positively with infection, that are inexpensive and easily accessible in nearly all emergency room, with and without scoring systems.

Various ICU scoring systems predicting mortality are in current use like the APACHE II and SOFA score.[15] These scoring systems are cumbersome and are done at24 hours of admission during which precious time is lost in administering therapy.

AIMS AND OBJECTIVES

1. To study the serum lactate albumin ratio in the patients with sepsis.
2. To study correlation between serum lactate albumin ratio and APACHE 2 scoring system**.**

REVIEW OF LITERATURE

HISTORY

"The word sepsis is derived from the Greek word for "decomposition" or "decay," and its first documented use was about 2700 years ago in Homer's poems."[62]

Almost two millennia ago, Hippocrates said that sepsis was characterized by rotting flesh and festering wounds.[16,62] Many centuries later, Galen thought sepsis a laudable event, needed for wound healing.[17,62]

Later as the germ theory was suggested by Semmelweis, Pasteur, and others in the nineteenth century, sepsis was revised as a systemic infection referred to as "blood poisoning" and believed because of pathogen invasion and extend in the bloodstream of the host.[1]

However, after the discovery of modern antibiotics, germ theory could not completely explain the pathogenesis of sepsis: sepsis mortality was increasing even with successful clearance of the causative pathogen.

Finally, then the researchers considered the host, not the germ, that drove the pathogenesis of sepsis.[18]

Bone and colleagues in 1992 thought it was the host, not the germ, was accountable for the sepsis pathogenesis. Precisely, their definition was "sepsis as a systemic inflammatory response to infection." Nevertheless, sepsis occurred consequent to numerous distinct pathogens, and septicemia was neither a required situation nor a helpful word.[19]

A second consensus panel in 2003 validated many of these ideas, with the provision that signs of a systemic inflammatory response, like tachycardia or an increased white-cell count, is seen in most infectious and noninfectious situation and hence not useful to differentiate between sepsis and other conditions.[20]

Therefore, they coined the term *severe sepsis* in cases where sepsis is associated with acute organ impairment and the term *septic shock* for a subunit of sepsis which are complicated by hypotension even after adequate fluid resuscitation with perfusion irregularity or hyperlactatemia.

Previous studies almost in last 20 years have revealed that in response to infection numerous patients have developed organ dysfunction before they develop the signs of systemic inflammatory response syndrome. It was seen that, both pro- and anti-inflammatory variations were associated with notable changes in other pathways.

To reflect terminology and the present perception of the pathobiology of sepsis, the Sepsis Definitions Task Force in 2016 suggested the Third International Consensus Definitions- "*sepsis* is a dysregulated host response to infection that leads to acute organ dysfunction."[61]

By this definition infection leading to uncomplicated sepsis were distinguished from sepsis due to organ dysfunction, poor outcome.

Due to the wide variation by which septic shock was detected in research, clinical, or surveillance conditions, the Third International Consensus Definitions specifically defined "*septic shock* as a subset of sepsis cases in which underlying circulatory and cellular/metabolic abnormalities are profound enough to substantially increase mortality risk."

Table 1 -Definition

YEAR	DEFINITION NAME OR IDENTIFIER	DEFINING ELEMENTS
1987	Bone, from methylprednisolone trial	• Inflammatory criteria, ≥1 organ dysfunction (AMS, hypoxemia, elevated lactate, oliguria)
1991	ACCP, SCCM Definitions Conference	• Septicemia abandoned • SIRS concept proposed but not defined • Categories of sepsis, severe sepsis, and septic shock established • MODS terminology
2001	ACCP, SCCM, ATS, ESIM, SIS	• Expanded SIRS criteria, PIRO stratification: predisposition, insult, response, organ dysfunction
2015	Centers for Medicare and Medicaid Services	• Severe sepsis: Infection* and SIRS and organ dysfunction including elevated lactate (>2 mmol/dL) • Septic shock: Severe sepsis with persistent hypotension OR lactate >4 mmol/dL
2016	Third International Consensus Definitions for Sepsis and Septic Shock (Sepsis-3)	• Severe sepsis abandoned • Focus on organ failure/dysfunction • Sepsis: organ failure focus including vasopressor-dependent hypotension • Septic shock: vasopressor-dependent hypotension with elevated lactate
2016	Surviving Sepsis Campaign	• Severe sepsis: abandoned • Sepsis: previous severe sepsis (lactate qualifies, no vasopressor-dependent hypotension) • Septic shock: previous septic shock, includes all vasopressor-dependent hypotension ± lactate

ETIOLOGY

Severe sepsis results due to both community acquired and health care facility associated infections. Pneumonia is most frequent infection accounting about half of all cases (57.45%), next common are intraabdominal and urinary tract infections.

From various studies Culture positivity was found in 61.6%. Gram-negative organisms most commonly *Escherichia coli*, klebsiella species, and *Pseudomonas*

Aeruginosa were found in 72.45% of cases and Gram-positive most commonly *Staphylococcus aureus* and *Streptococcus pneumoniae* in 13.13%. The rest were parasitic, viral and fungal infection.[3,21]

There are several predisposing factors for sepsis and are associated to both patient's susceptibility for infection and to the possibility of acute organ impairment if infection commences. Chronic diseases (e.g., the acquired immunodeficiency syndrome, chronic obstructive pulmonary disease, and many cancers) and the use of immunosuppressive agents are among the most familiar risk factors that trigger severe sepsis and septic shock from infections.[22]

Factors like age, sex, and race or ethnic group also have impact on the incidence of severe sepsis, infants and elderly persons are at risk than the other age groups, higher in males than in females, and blacks more than whites.[22,23]

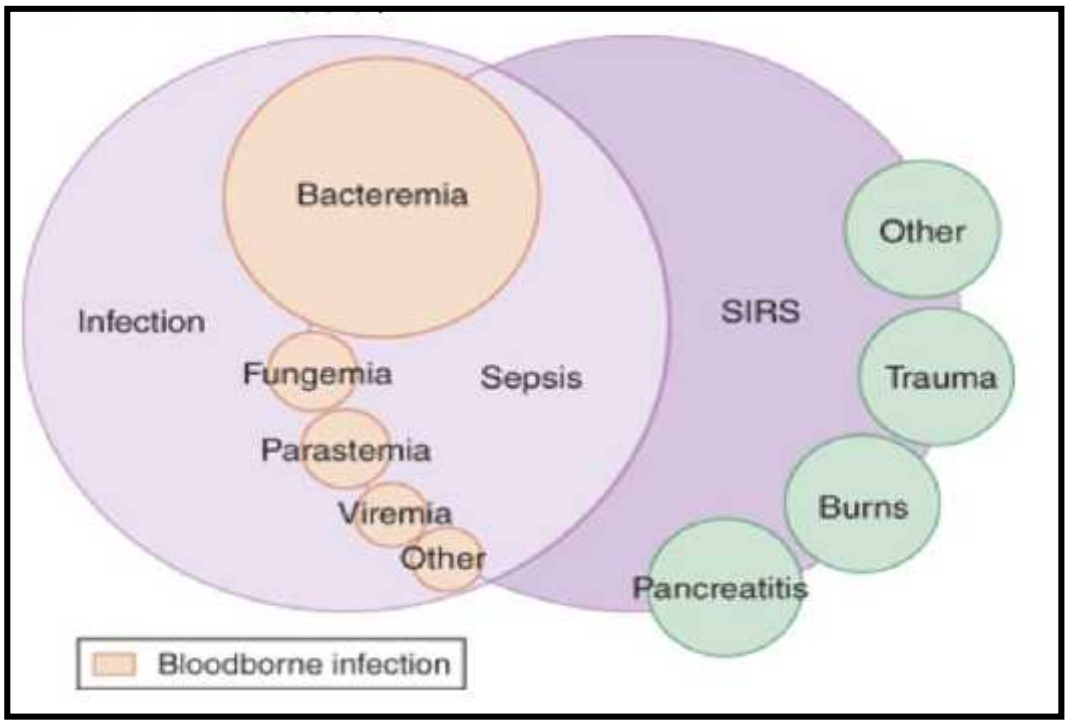


Figure 1: Etiology of SIRS and Sepsis

Few molecules like alarmins are secreted due to sterile injury example like trauma, lead to the thought of pathogenesis of multiorgan dysfunction in sepsis is not dissimilar which is seen in noninfectious critical illness.[27]

PATHOPHYSIOLOGY OF SEPSIS

HOST RESPONSE

Initially after the postulation of the host theory, it was thought that the clinical features of sepsis were because of overly exuberant inflammation.

Then few years later Bone et al. proposed the idea that the initial inflammatory response lead to a subsequent "compensatory anti-inflammatory response syndrome".[24]

Later, it was clear that infection stimulates a much more complex, variable, and extended host reaction, leading to both proinflammatory and anti-inflammatory mechanisms that can contribute to eliminate infection and tissue recovery on the one side and organ damage and secondary infections on the other.[25]

The appropriate response in any patient mainly is influenced by the causative pathogen factors (load and virulence) and the host factors (genetic and previous and coexisting illnesses), with variable responses at local, regional, and systemic levels.

The host response advances with time with the patient's clinical process. In common, proinflammatory responses (directed at clearance of pathogens) cause "collateral" tissue injury in sepsis, whereas anti-inflammatory responses are responsible for the enhanced susceptibility to secondary infections that tend to occurs later in the course.[63]

The host's ability to fight and to tolerate both direct and immunopathologic injury will specify if uncomplicated infection turns in to sepsis.[1]

INFLAMMATORY AND COUNTER-INFLAMMATORY RESPONSES.

In sepsis, many microbial cell wall constituents attach to receptors on cells of the innate immune system of them are four main classes — toll-like receptors (TLRs), C-type lectin receptors (CLRs), retinoic acid inducible gene 1–like receptors (RLRs), and nucleotide-binding oligomerization domain–like receptors (NLRs) — have been found, of which the last group partially acting in protein complexes known as inflammasomes.[26,64,65]

This mechanism induces the pro inflammatory response.

Likely initiators of inflammation in sepsis are signaling pathways that lie downstream of TLRs, that recall and identify a host of microbe derive substances containing so-called pathogen-associated molecular patterns (PAMPs), as well as G-protein coupled receptors that recognize bacterial peptides, and nucleotide oligomerization domain proteins 1 and 2 [NOD1, NOD2].[64]

A common PAMP is a lipid A moiety of lipopolysaccharide (LPS or endotoxin), which binds to the LPS-binding protein on the surface of monocytes, macrophages, and neutrophils.

LPS is transferred to and signals via TLR4 to produce and secrete cytokines such as tumor necrosis factor that process the signal and change other cells and tissues. 10 TLRs have been found in humans.[1]

These same receptors identify endogenous molecules secreted from damaged cells, called damage-associated molecular patterns, or alarmins like high-mobility group protein B1, S100 proteins, and extracellular RNA, DNA, and histones.[27]

Alarmins are secreted even due to sterile injury example like trauma, lead to the thought of pathogenesis of multiorgan dysfunction in sepsis is not dissimilar which is seen in noninfectious critical illness.[27]

Once activated, innate immune cell secretes TNF, IL-1, IFN-γ, IL-12, and IL-18, and also various other inflammatory mediators like high mobility group box 1 protein (HMGB1).

Reactive oxygen species and lipid mediators like prostaglandins and platelet activating factor (PAF) are also elaborated. These effector molecules induce endothelial cells (also different cell types) to upregulate adhesion molecule expression and further stimulate cytokine and chemokine secretion.[64]

The *complement system* is also triggered by microbial components, either directly or by the proteolytic activity of plasmin or through both mechanisms, leads to the production of anaphylotoxins (C3a, C5a), chemotactic fragments (C5a), and opsonins (C3b), these all impart to the proinflammatory state.[66]

Sepsis triggers the hyperinflammatory state which in turn also triggers counter-regulatory immunosuppressive phenomenon, which can include both innate and adaptive immune cells. As a consequence, septic patients may fluctuate among hyperinflammatory and immunosuppressed states along their clinical process. Suggested mechanisms for the immune suppression need a switch from pro-inflammatory (TH1) to anti-inflammatory (TH2) cytokines, synthesis of anti-

inflammatory mediators (e.g., soluble TNF receptor, IL-1 receptor antagonist, and IL-10), lymphocyte apoptosis, the immunosuppressive effects of apoptotic cells, and the induction of cellular anergy. [28]

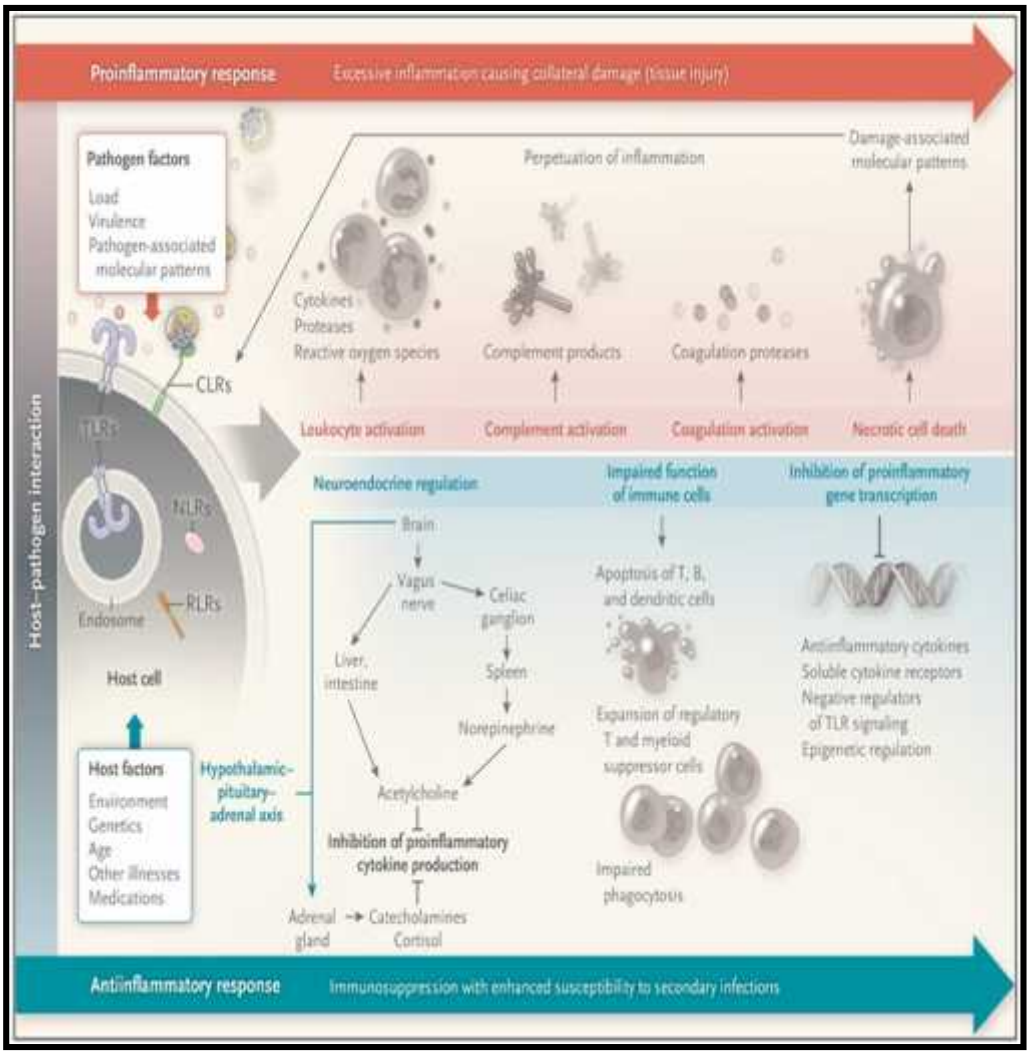


Figure 2: Host Response to Severe Sepsis:[9]

ENDOTHELIAL ACTIVATION AND INJURY:

The pro-inflammatory state and endothelial cells trigger seen in sepsis causes diffuse vascular leakage and tissue edema, they have detrimental effects on nutrient transportation and waste disposal. One consequence of inflammatory cytokines is to weaken endothelial cell tight junctions, resulting in leaky vessels and leads to

collection of protein-rich edema all over the body. This change impedes tissue perfusion and sometimes can be exacerbated by efforts to support the patient with intravenous fluids. Activated endothelium also increases secretion of nitric oxide (NO) and also added vasoactive inflammatory mediators (e.g., C3a, C5a, and PAF), which will lead to vascular smooth muscle relaxation and systemic hypotension.[28]

ABNORMALITIES OF COAGULATION:

Sepsis is usually correlated with changes in coagulation, most commonly resulting in disseminated intravascular coagulation.[29] Abnormalities in coagulation are believed to segregate the invading microorganisms and/or to stop the spread of infection and inflammation to various different tissues and organs.

Increased fibrin deposition is driven by coagulation due to tissue factor, a transmembrane glycoprotein expressed by varied cell categories; by dysfunction anticoagulant process, together with the protein C system and antithrombin; and due to altered fibrin disposal because of suppression of the fibrinolytic system.[29,63]

Protease-activated receptors (PARs) act as the molecular link among coagulation and inflammation. Four varieties of these are identified and PAR1 specifically is connected with sepsis.[29] Activated protein C or low-dose thrombin activates PAR1 which has cytoprotective actions but when stimulated by high-dose thrombin it causes deranged effects on endothelial-cell barrier function.[30,63] The protective actions of activated protein C with sepsis is related to its ability to trigger PAR1 and no relation with anticoagulant properties was seen when studied in animals.[30] In infections with endothelial predominance (e.g., meningococcemia), these mechanisms may be common and fatal.

ORGAN DYSFUNCTION:

The processes causing organ failure in sepsis patients are partly understood and it is thought that interrupted tissue oxygenation plays a pivotal role. Various factors lead to decreased oxygen delivery in sepsis and septic shock, and includes hypotension, decreased red-cell deformability, and microvascular thrombosis.[1]

Inflammation can give rise to damaged vascular endothelium, along with cell death and loss of barrier integrity, causing subcutaneous and body-cavity fluid collection.[31] Pro-inflammatory cytokines, like interleukin-1β (IL-1β) and interleukin-6 (IL-6), suppress cardiomyocyte contractility and induces expression of vascular cell adhesion molecule-1 (VCAM-1) in the coronary endothelium, thus mediating infiltration of neutrophils to the myocardium.[67,68]

An excessive and unlimited secretion of nitric oxide leads to vasomotor collapse, opening of arteriovenous shunts, and pathologic shunting of oxygenated blood from susceptible tissues.[68]

Additionally, mitochondrial damage due to oxidative stress and various mechanisms impairs cellular oxygen utilization.[32] The slowing of oxidative metabolism, along with disrupted oxygen delivery, lowers cellular O2 extraction. Yet energy (i.e., ATP) is still required to maintain basal, vital cellular function, which is driven from glycolysis and fermentation and so producing H+ and lactate.[33] Due to severe or prolonged injury, ATP levels go below critical threshold, causing bioenergetic failure, leading to release of toxic reactive oxygen species, and at last apoptosis inducing irreversible cell death hence organ failure.

Kupffer cells accelerate the release of IL-1β, IL-6, and TNF-α when these cells are exposed to lipopolysaccharides.[69,70] As a result of exposure to the proinflammatory cytokines, hepatocytes release acute-phase proteins (APPs) into circulation, with extensive proinflammatory and anti-inflammatory reactions.[71]

Thus, it was hypothesized that hepatocytes, via APPs, play a critical role in maintaining balance between the immune response in sepsis, and hence avoiding an excessive inflammatory or immunosuppressed state.

The definite morphologic alterations in sepsis-induced organ failure are also complex. Over all, organs like the lungs encounter extensive microscopic changes, but other organs will undergo rather lesser histologic variations. As a matter of fact, few organs (e. g., the kidney) may not have any significant structural injury while they may have remarkable tubular-cell changes leading to impaired function.

Besides, damaged mitochondria secrete alarmins in the extracellular environment together with mitochondrial DNA and formyl peptides, that triggers neutrophils and resulting in enhanced tissue damage.[34]

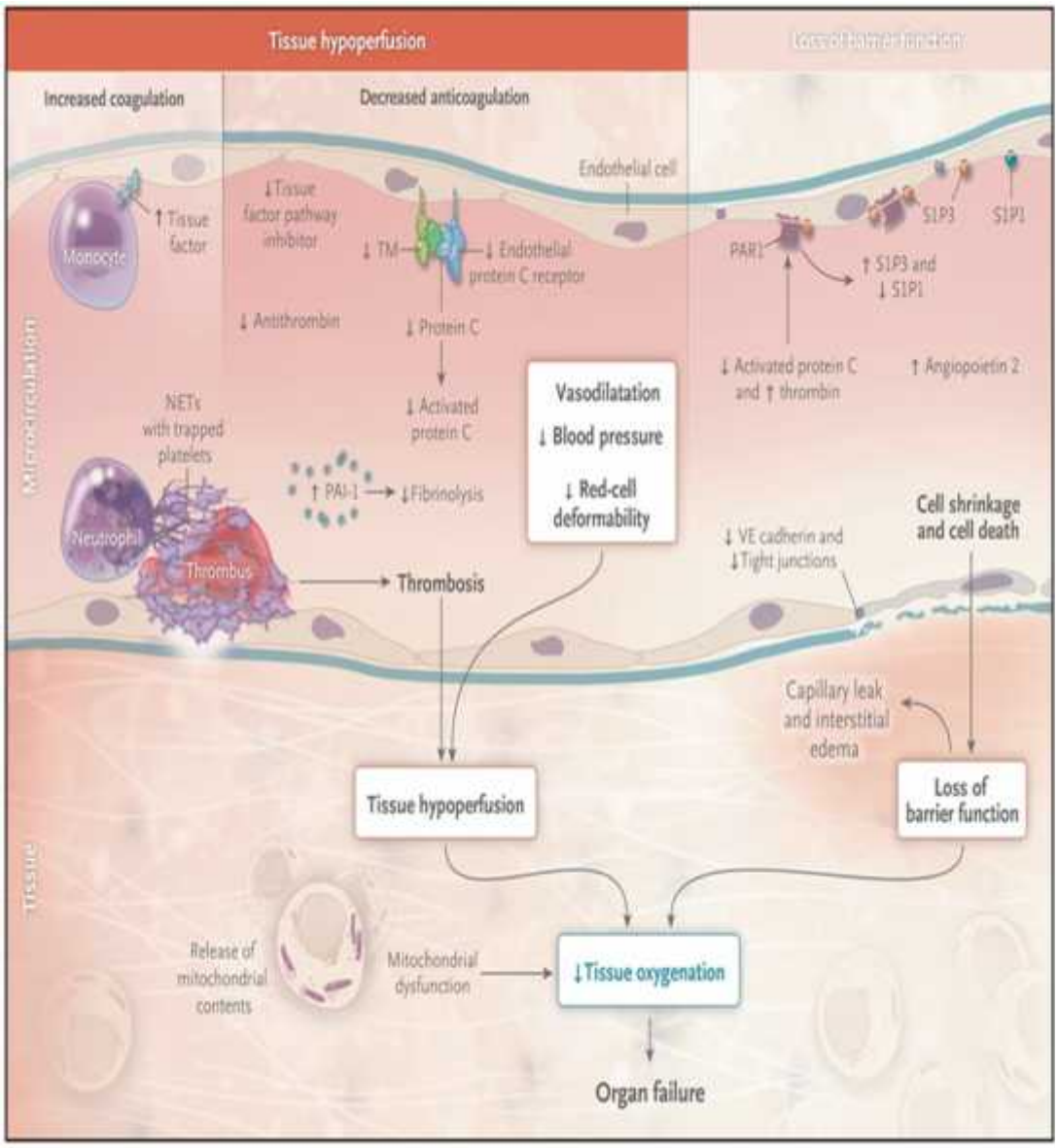


Figure 3: Dysfunction of the vascular endothelium and mitochondria and organ failure in sepsis[9]:

ANTI-INFLAMMATORY MECHANISM AND IMMUNOSUPPRESSION

The immune system harbors humoral, cellular, and neural processes that enervate the dangerous consequences of the proinflammatory effects.[25] Phagocytes will transform to an anti-inflammatory phenotype facilitating tissue recovery, and regulatory T cells and myeloid derived suppressor cells also decrease inflammation.

Additionally, neural processes may reduce inflammation.[35] This neuroinflammatory reflex includes, sensory input which is passed on via the afferent vagus nerve to the brain stem, from where the efferent vagus nerve stimulates the splenic nerve in the celiac plexus, hence norepinephrine is secreted from the spleen and acetylcholine release by a subset of CD4+ T cells. The acetylcholine released choose α7 cholinergic receptors on macrophages, suppressing the secretion of proinflammatory cytokines.[36]

Patients those who pull through early sepsis but needing intensive care have illustrated immunosuppression, partly indicated by lesser expression of HLA-DR on myeloid cells.[37]

Infectious foci is thought to be persistent these patients, even with antimicrobial treatment, or reawaken of latent infectious agents like virus.[38,39] It was demonstrated in few studies that there was decreased effectiveness of blood leukocytes to pathogens in sepsis.[25] Along with the spleen, the lungs also illustrated confirmation of immunosuppression; these organs showed amplified expression of ligands for T-cell inhibitory receptors on parenchymal cells.[37]

Accelerated apoptosis, particularly of B cells, CD4+ T cells, and follicular dendritic cells, was suggested in sepsis-related immunosuppression and poor outcome.[40,41] Epigenetic control of gene expression can impart to sepsis-associated immunosuppression.[42]

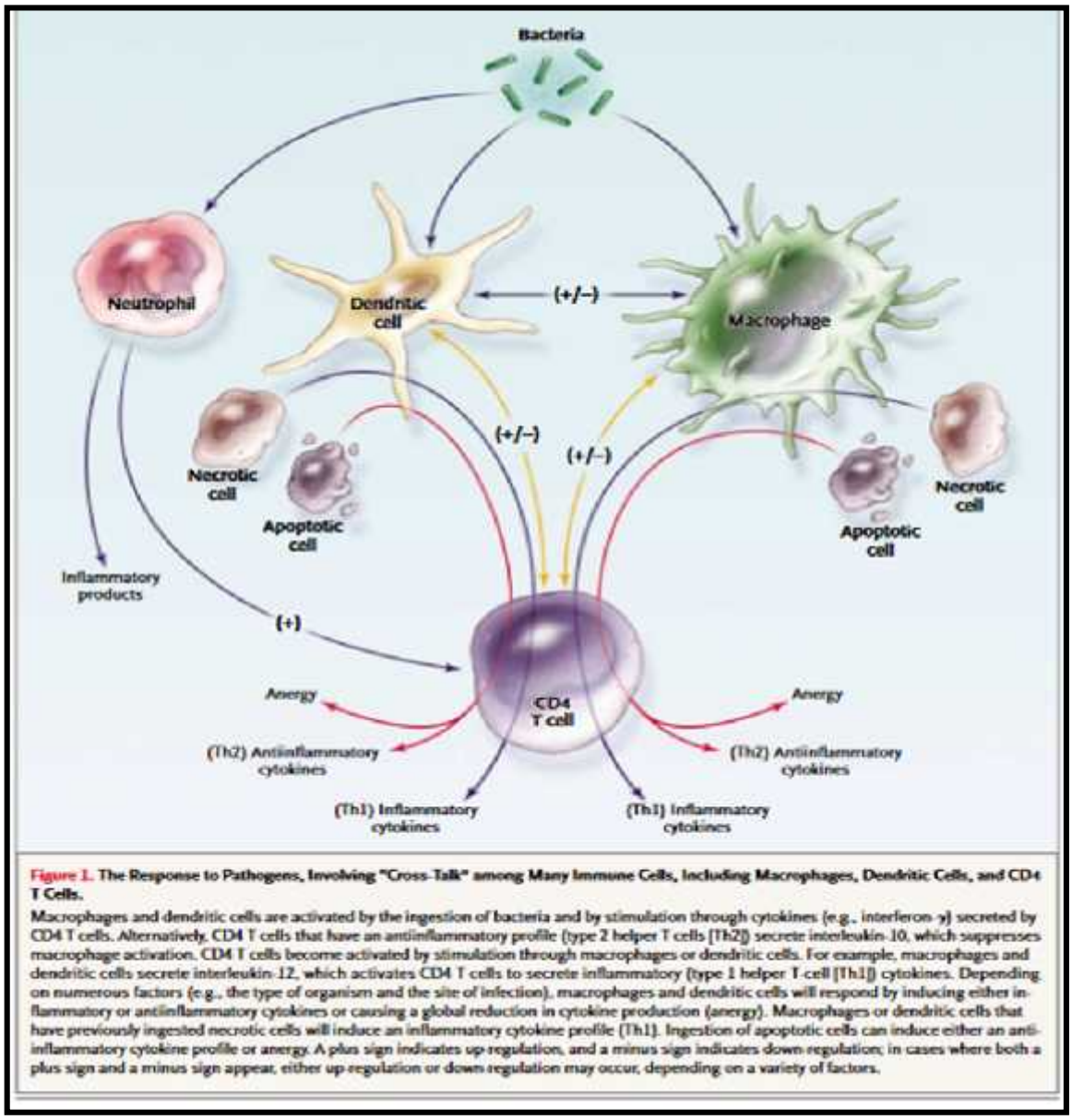


Figure 1. The Response to Pathogens, Involving "Cross-Talk" among Many Immune Cells, Including Macrophages, Dendritic Cells, and CD4 T Cells.

Macrophages and dendritic cells are activated by the ingestion of bacteria and by stimulation through cytokines (e.g., interferon-γ) secreted by CD4 T cells. Alternatively, CD4 T cells that have an antiinflammatory profile (type 2 helper T cells [Th2]) secrete interleukin-10, which suppresses macrophage activation. CD4 T cells become activated by stimulation through macrophages or dendritic cells. For example, macrophages and dendritic cells secrete interleukin-12, which activates CD4 T cells to secrete inflammatory (type 1 helper T-cell [Th1]) cytokines. Depending on numerous factors (e.g., the type of organism and the site of infection), macrophages and dendritic cells will respond by inducing either inflammatory or antiinflammatory cytokines or causing a global reduction in cytokine production (anergy). Macrophages or dendritic cells that have previously ingested necrotic cells will induce an inflammatory cytokine profile (Th1). Ingestion of apoptotic cells can induce either an antiinflammatory cytokine profile or anergy. A plus sign indicates up-regulation, and a minus sign indicates down-regulation; in cases where both a plus sign and a minus sign appear, either up-regulation or down-regulation may occur, depending on a variety of factors.

Figure 4: Immune Response to Pathogens

SEPSIS AND LACTATE:

Hyperlactatemia results as the lactate accumulation surpasses lactate utilization. It also indicates the increase in number of protons equivalent to the number of unwanted lactate ions, irrespective of the prevailing acid–base status. Demonstrating the pathogenesis of hyperlactatemia may pivotal to guide to therapy.[53]

Lactate is excessively produced globally or localized due to tissue hypoxia, and less utilized due to damaged mitochondrial oxidation.[47] Aerobic glycolysis representing stimulated glycolysis which is not only due to tissue hypoxia but can depend on other factors, this also leads to hyperlactatemia. Aerobic glycolysis stimulated in stress is effective although an insufficient process for rapid production of ATP.

In inflammatory states, aerobic glycolysis may be stimulated by cytokine dependent increased cellular glucose uptake. Tissue hypoxia and aerobic glycolysis are not mutually exclusive; in certain situations, they lead to hyper-lactatemia.[47,48] Cardiogenic or hypovolemic shock, severe heart failure, severe trauma, and sepsis are usual etiologies of lactic acidosis, contributing to most of cases.[49]

The lower value of the normal limit of the blood lactate assay, 0.5 mmol/liter, is constant in most laboratories, although the upper value may differ considerably, from as low as 1.0 mmol/liter to as high as 2.2 mmol/liter.[50-52]

Hence, the cutoff for abnormal levels mostly vary in various laboratories. Values at the upper tier of normal levels are related to hike in mortality in critically ill cases.[51,52]

Therefore, serum lactate values at the upper tier of normal levels or mildly raised as compared to previous base-line levels, whilst within the normal range, may predict poor results and need supervising of those patient.[53]

SEPSIS AND ALBUMIN

Albumin is the basic protein needed to maintain plasma colloid osmotic pressure. Albumin is carrier for most endogenous and exogenous compounds and acts as a buffer particle for acid and base balance; and possesses anti-inflammatory and antioxidative properties.[54-56] Hypoalbuminemia is related to predict por outcome in various chronic and acute diseases.[57,58]

Hypoalbuminemia is noted very frequently in critically ill cases and related directly to prognostications in them. The relation was greater detailed in severe sepsis and septic shock as in sepsis alone. Later it was concluded that serum albumin monitoring had significant clinical prognostic value in prognosticating the severe sepsis/septic shock cases.[13]

CLINICAL MANIFESTATIONS

The clinical presentation of sepsis is very inconsistent, depends on the first site of infection, the organism causing, the variations of acute organ impairment, the intrinsic and previous health condition of the patient, lastly the time of commencement of treatment. Infection and organ derangement pointers can be indefinite, and so the recent international consensus guidelines provide the warning signs of emerging sepsis[43.]

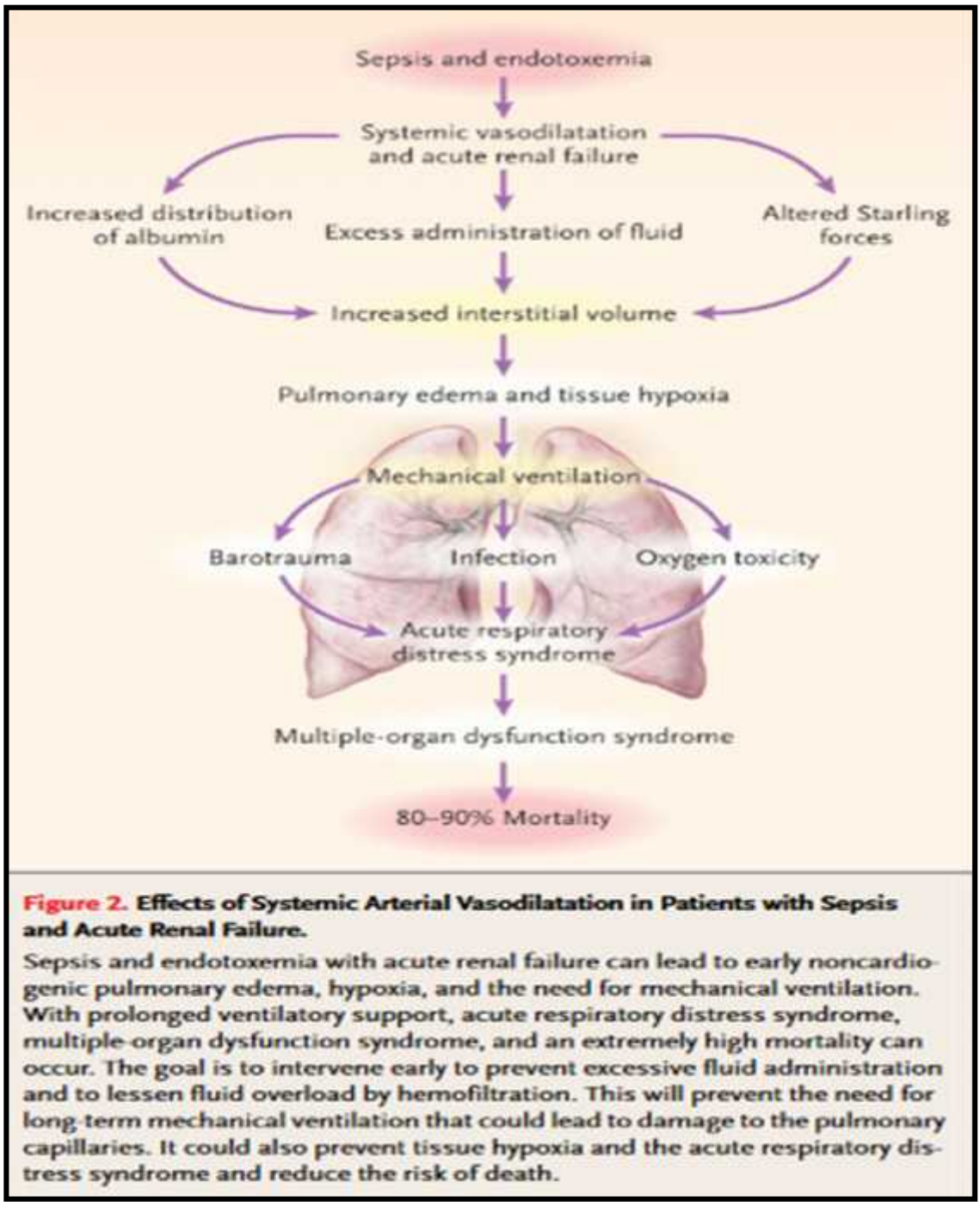


Figure 2. Effects of Systemic Arterial Vasodilatation in Patients with Sepsis and Acute Renal Failure.

Sepsis and endotoxemia with acute renal failure can lead to early noncardiogenic pulmonary edema, hypoxia, and the need for mechanical ventilation. With prolonged ventilatory support, acute respiratory distress syndrome, multiple-organ dysfunction syndrome, and an extremely high mortality can occur. The goal is to intervene early to prevent excessive fluid administration and to lessen fluid overload by hemofiltration. This will prevent the need for long-term mechanical ventilation that could lead to damage to the pulmonary capillaries. It could also prevent tissue hypoxia and the acute respiratory distress syndrome and reduce the risk of death.

Figure 5: effects of systemic vasodilatation

Cardiorespiratory Failure

Two of the most frequently damaged organ systems in sepsis are cardiovascular and the respiratory systems.

"Respiratory compromise specifically presents as acute respiratory distress syndrome (ARDS), defined as hypoxemia and bilateral infiltrates of noncardiac origin that begin within a week of the suspected infection. ARDS can be graded by Berlin criteria as mild (PaO2/FiO2, 201–300 mmHg), moderate (101–200 mmHg), or severe (≤100 mmHg)."[44] A usual competing alternative is hydrostatic edema caused due to cardiac failure or volume overload. Although traditionally diagnosed by raised pulmonary capillary wedge measurements from a pulmonary artery catheter (>18 mmHg), cardiac failure can be objectively identified on the basis of clinical judgment or echocardiography.

Hypotension is the typical manifestation of cardiovascular involvement. The causes may be straight forward hypovolemia, maldistribution of blood flow and intravascular volume because of disseminated capillary leakage, decreased systemic vascular resistance, or suppressed myocardial function. Hypotension usually doesn't resolve even after appropriate volume expansion, necessitating the need of vasopressors.[45] During early stages of shock, when volume status is depleted, systemic vascular resistance can be quite high along with low cardiac output; however, after volume repletion, this scenario may rapidly convert to low systemic vascular resistance and high cardiac output.

Kidney Injury

Acute kidney injury (AKI) is illustrated in >50% of septic patients, which increases the risk of in-hospital mortality by six- to eightfold. AKI presents as oliguria, azotemia, and rising serum creatinine values and mostly needing dialysis. The mechanisms of sepsis-induced AKI are not understood clearly. AKI can be present in up to 25% of patients without overt hypotension.[1]

Present mechanistic work proposes that a combination of diffuse microcirculatory blood-flow irregularity, inflammation, and cellular bioenergetic responses to damage all promote sepsis-induced AKI beyond mere organ ischemia.

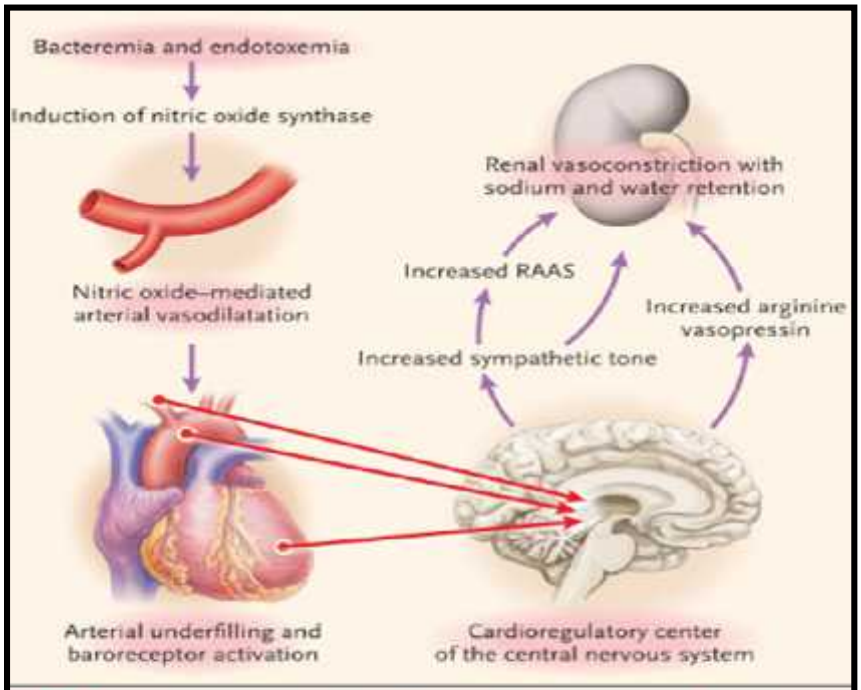


Figure 1. Arterial Vasodilatation and Renal Vasoconstriction in Patients with Sepsis.

Endotoxemia stimulates the induction of nitric oxide synthase, which leads to nitric oxide–mediated arterial vasodilatation. The resultant arterial underfilling is sensed by the baroreceptors and results in an increase in sympathetic outflow and the release of arginine vasopressin from the central nervous system, with activation of the renin–angiotensin–aldosterone system (RAAS). These increases in renal sympathetic and angiotensin activities lead to vasoconstriction with sodium and water retention and a predisposition to acute renal failure.

Figure 6: Arterial vasodilation and renal vasoconstriction

Neurologic Complications

With classic central nervous system compromise, coma or delirium are the usual manifestation. Imaging studies specifically do not indicate any focal damage, and electroencephalographic findings are mostly indicating non-focal encephalopathy.[1] Sepsis-associated delirium is usually due to a global cerebral dysfunction caused by the inflammatory response to infection without any confirmed primary central nervous system infection. Critical-illness polyneuropathy and myopathy are seen commonly, specifically in patients with a longer course.[46]

"Paralytic ileus, elevated aminotransferase levels, altered glycemic control, thrombocytopenia and disseminated intravascular coagulation, adrenal dysfunction, and the euthyroid sick syndrome are also seen commonly in patients with severe sepsis."[43]

Sepsis with adrenal insufficiency is frequently studied and is ideated to be related mostly to reversible dysfunction of the hypothalamic–pituitary axis or tissue glucocorticoid resistance than to direct damage to the adrenal gland.[1]

DIAGNOSIS

There appear no specific tests for sepsis, nor is there a gold-standard process for determining whether a patient is septic.

LABORATORY AND PHYSIOLOGIC FINDINGS

The patients with sepsis usually have tachycardia (heart rate, >90 beats per min); the most common accompanying abnormalities were tachypnea (respiratory

rate, >20 breaths per min), hypotension (systolic blood pressure, ≤100 mmHg), and hypoxia (SaO2, ≤90%).

Leukocytosis (WBC count, >12,000/μL) and leukopenia (WBC count, <4000/μL).[1]

Notably, many features that may identify acute organ dysfunction, such as platelet count, total bilirubin, or serum lactate level are also measured. If measured, metabolic acidosis with anion gap may be detected, as respiratory muscle fatigue occurs in sepsis-associated respiratory failure. Other, less common findings include serum hypoalbuminemia, troponin elevation, hypoglycemia, and hypofibrinogenemia.[1]

ROUTINE BLOOD INVESTIGATIONS [1]:

1. Complete blood count –

   Platelets are raised in inflammation and reduced in DIC

   Leukocytes are usually elevated but sometimes suppressed.

2. Renal function tests -Abnormal either in hypoperfusion or renal failure.

3. Liver function tests -specific in localizing sepsis; probable biliary sepsis, especially in elderly patients with no obvious localizing signs

4. Blood cultures: Three sets of cultures are collected in all patients before administration of Antibiotics.

5. Urine cultures for diagnostic workup for sepsis

6. Bacterial cultures – Admission blood cultures; culture of the catheter tip (to rule out sepsis from central IV line); nasal cultures (potential marker of MRSA risk)

7. Stained buffy coat smear examination or peripheral blood gram staining.

8. Urine studies (Gram stain, urinalysis)

9. Procalcitonin levels

10. Arterial blood gas

11. Arterial lactate is a long-studied marker of tissue hypoperfusion, and hyperlactatemia and a greater incidence of organ failure and death in sepsis are associated with delayed lactate clearance.

Imaging modalities include the following:

- Chest radiography (to look for pneumonia and also to diagnose etiology of pulmonary infiltrates like ARDS)

- Abdominal ultrasonography (to look for biliary tract obstruction or any other cause)

- Abdominal CT or MRI

12. Cardiac studies if acute myocardial infarction (MI) is likely:

- Electrocardiography (ECG)

- Cardiac enzymes

Table 2: Diagnostic Criteria for Sepsis

Sepsis (documented or suspected infection plus ≥1 of the following)†
General variables
Fever (core temperature, >38.3°C)
Hypothermia (core temperature, <36°C)
Elevated heart rate (>90 beats per min or >2 SD above the upper limit of the normal range for age)
Tachypnea
Altered mental status
Substantial edema or positive fluid balance (>20 ml/kg of body weight over a 24-hr period)
Hyperglycemia (plasma glucose, >120 mg/dl [6.7 mmol/liter]) in the absence of diabetes
Inflammatory variables
Leukocytosis (white-cell count, >12,000/mm^3)
Leukopenia (white-cell count, <4000/mm^3)
Normal white-cell count with >10% immature forms
Elevated plasma C-reactive protein (>2 SD above the upper limit of the normal range)
Elevated plasma procalcitonin (>2 SD above the upper limit of the normal range)
Hemodynamic variables
Arterial hypotension (systolic pressure, <90 mm Hg; mean arterial pressure, <70 mm Hg; or decrease in systolic pressure of >40 mm Hg in adults or to >2 SD below the lower limit of the normal range for age)
Elevated mixed venous oxygen saturation (>70%)‡
Elevated cardiac index (>3.5 liters/min/square meter of body-surface area)§
Organ-dysfunction variables
Arterial hypoxemia (ratio of the partial pressure of arterial oxygen to the fraction of inspired oxygen, <300)
Acute oliguria (urine output, <0.5 ml/kg/hr or 45 ml/hr for at least 2 hr)
Increase in creatinine level of >0.5 mg/dl (>44 μmol/liter)
Coagulation abnormalities (international normalized ratio, >1.5; or activated partial-thromboplastin time, >60 sec)
Paralytic ileus (absence of bowel sounds)
Thrombocytopenia (platelet count, <100,000/mm^3)
Hyperbilirubinemia (plasma total bilirubin, >4 mg/dl [68 μmol/liter])
Tissue-perfusion variables
Hyperlactatemia (lactate, >1 mmol/liter)
Decreased capillary refill or mottling
Severe sepsis (sepsis plus organ dysfunction)
Septic shock (sepsis plus either hypotension [refractory to intravenous fluids] or hyperlactatemia)¶

Data are adapted from Levy et al.[3]
In children, diagnostic criteria for sepsis are signs and symptoms of inflammation plus infection with hyperthermia or hypothermia (rectal temperature, >38.5°C or <35°C, respectively), tachycardia (may be absent with hypothermia), and at least one of the following indications of altered organ function: altered mental status, hypoxemia, increased serum lactate level, or bounding pulses.
A mixed venous oxygen saturation level of more than 70% is normal in newborns and children (pediatric range, 75 to 80%).
A cardiac index ranging from 3.5 to 5.5 liters per minute per square meter is normal in children.
Refractory hypotension is defined as either persistent hypotension or a requirement for vasopressors after the administration of an intravenous fluid bolus.

THE APACHE II SCORING SYSTEM

"Abbreviation - Acute Physiology and Chronic Health Evaluation (APACHE II)".

The APACHE II system is one of the scoring systems for severity of illness most commonly used worldwide.

The score includes 2 parts – one is the physiological score which represents the degree of the acute illness and the second is the preadmission health status before the acute illness.[59]

APACHE II score use in ICU patients dying within 24 hours of admission can be variable.

Prognosis augury dependent on the reason for ICU admission and the APACHE II score.

Indications to admission may be not precisely delineated and mostly one can be chosen to get the required coefficient. Distinct indications may invariably influence mortality prediction.[60]

Table 3: Acute Physiology and Chronic Health Evaluation (APACHE II)

Physiologic Variable	+4	+3	+2	+1	0	+1	+2	+3	+4
Temperature - rectal (°C)	≥41	39-40.9		38.5-38.9	36-38.4	34-35.9	32-33.9	30-31.9	≤29.9
Mean Arterial Pressure (mm Hg)	≥160	130-159	110-129		70-109		50-69		≤49
Heart Rate	≥180	140-179	110-139		70-109		55-69	40-54	≤39
Respiratory Rate (nonventilated or ventilated)	≥50	35-49		25-34	12-24	10-11	6-9		≤5
Oxygenation (mmHg) a. $FiO_2 > 0,5$ use A-aDO_2 b. $FiO_2 < 0,5$ use PaO_2	a ≥500	350-499	200-349		<200				
	b				> 70	61-70		55-60	<55
Arterial pH	≥7.7	7.6-7.69		7.5-7.59	7.33-7.49		7.25-7.32	7.15-7.24	<7.15
Serum Sodium (mmol/l)	≥180	160-179	155-159	150-154	130-149		120-129	111-119	≤110
Serum Potassium (mmol/l)	≥7	6-6.9		5.5-5.9	3.5-5.4	3-3.4	2.5-2.9		<2.5
Serum Creatinine (mg/dl, Double point score for acute renal failure)	≥3.5	2-3.4	1.5-1.9		0.6-1.4		<0.6		
Hematocrit (%)	≥60		50-59.9	46-49.9	30-45.9		20-29.9		<20
White Blood Count (in 1000/mm³)	≥40		20-39.9	15-19.9	3-14.9		1-2.9		<1
Glasgow-Coma-Scale (GCS)	Score = 15 minus actual GCS								
Serum HCO_3 (venous, mmol/l, use if no ABGs)	≥52	41-51.9		32-40.9	22-31.9		18-21.9	15-17.9	<15
A = Total Acute Physiology Score APS	Sum of the 12 individual variable points								

B = Age Points	
≤44 years	0 points
45-54 years	2 points
55-64 years	3 points
65-74 years	5 points
≥75 years	6 points

C = Chronic Health Points

If the patient has a history of severe organ system insufficiency or is immunocompromised assign points as follows:

a. For nonoperative or emergency postoperative patients – 5 points

b. For elective postoperative patients – 2 points

APACHE II Score = Sum of A (APS points) + B (Age points) + C (Chronic Health points)

(From: Knaus WA, Draper EA, Wagner DP, Zimmerman JE. APACHE II: a severity of disease classification system. Crit Care Med 1985;13(10):818-29)

Table 4: Mortality evaluation by APACHE 2

Mortality evaluated by acute physiology and chronic health evaluation (APACHE) II score	
APACHE II score	Mortality
0–4	~4% death rate
5–9	~8% death rate
10–14	~15% death rate
15–19	~25% death rate
20–24	~40% death rate
25–29	~55% death rate
30–34	~75% death rate
>34	~85% death rate

This score considers the important risk factors that affect the consequence involve the acute physiological disturbance and also the ability of the patient get better which can be reduced by aging or chronic disease.

The APACHE II score range is vast, giving a good extent among the mild and severe invasion because different weights are provided to raising abnormal calibers, instead to all or no judgements.

Score of ≥ 2 suggests presence of organ failure. Scores were calculated within 72 hours of hospitalization. The organ failure was classified as:

Transient (less than 48 hrs.)

Persistent (more than 48 hrs.)

Various studies were conducted to study serum lactate albumin level as a prognostic marker in the patients with sepsis.

In **Thapa S et al study**[72], "there were total 240 patients diagnosed with severe sepsis and septic shock. Out of 240 patients 57 (23.75%) were having severe sepsis and 183 (76.25%) had septic shock. Follow up was done on 28th day and the mortality outcome were calculated.

28day mortality was 143 (59.6 %) Correlation between APACHE II score and serum lactate albumin ratio showed positive deflection with correlation coefficient of 0.637 and P value <0.01 confirmed that serum lactate albumin ratio shows strong correlation with APACHE II score in predicting mortality in patients with severe sepsis and septic shock."[72]

In study by **Lichtenauer M et al**[73], "conducted in Germany with 348 patients and concluded that patients with an increased serum lactate/albumin ratio were of similar age but appeared to be clinically more ill as expressed by both higher SAPS2 and APACHE2 scores.

Patients with raised lactate/albumin ratio had more pronounced laboratory signs of multiorgan damage. The serum lactate/albumin ratio was robustly correlated with both in-hospital and post-discharge mortality in their study cohort."[73]

In **Shin J et al** study[74] "done in Korea, 946 patients with septic shock were analyzed. When the L/A ratio was above the cut-off point regardless of lactate level, the 28th day outcome included non survivors mostly and statistically significant. A significant trend in higher mortality was also seen in hypoalbuminemia patients compared with normal albumin."[74]

Wang B et al study[75] done in "china with 54 patients with sepsis also concluded that the analysis supported that the lactate clearance and fluid balance were

not the main reason for the high L/A ratio in patients with sepsis. That L/A ratio is an independent factor in predicting the development of MODS and outcome i.e mortality in patients with early severe sepsis and septic shock."[75]

In **Trujillo RN et al** study[76], "found that lactate/albumin index was a good prognostic marker for the determination of mortality in sepsis and in septic shock with statistical significance."

In study by **Dr. L S Mishra et al** in Uttar Pradesh[77] also "found that L /A ratio was an independent predictor for the development of MODS and mortality in patient with early severe sepsis and septic shock. Also concluded that morbidity and mortality was significantly decreased by using predictive measures and treatment protocol as per Survival Sepsis Campaign (2012)".

Study from **Noer. A et al**[78] "concluded from their results that the serial L/A ratio associated with the SOFA score can be used as a marker for predictors of mortality in septic patients admitted to the ICU."

The research done with 6414 patients by **Gharipour. A et al**[79], concluded that the performance of L/A ratio at admission can independently predict mortality in ICU and can be used as early prognostic markers for patients with sepsis and septic shock.

In study by **Choi et al**[80], "conducted in Korea with 90 cohorts also concluded that serum lactate/albumin ratio is a useful predictor of mortality in septic shock patients. The 28-day hospital mortality was 26.7% (24/90). The lactate/albumin ratio was 0.9 ± 0.8 in survivors and 3.2 ± 2.4 in non-survivors ($p<0.001$)."

The main limitation of our study is that there are many confounding factors which could lead to hypoalbuminemia, including undiagnosed comorbid conditions and long standing illness. The other important limitation is inclusion of the hypotensive patients as serum lactate is raised in these situations. Limited sample size is one more limitation as large population would have given us a better correlation.

MATERIAL AND METHODS

STUDY SITE - This study was carried in the Department of General Medicine, KLE's Dr. Prabhakar Kore Hospital and MRC, Belgaum.

STUDY DESIGN AND DURATION - The current study was cross sectional study for one year.

STUDY PERIOD - The study was conducted from January 2019 to December 2019.

STUDY POPULATION - Study population consisted of 100 patients and included all admissions of age > 18 years with SIRS or sepsis or septic shock in MICU of KLES Dr. Prabhakar Kore Hospital and MRC, Belgavi.

The diagnosis in each case was established with appropriate history, clinical signs and symptoms, with leukocytes count or relevant investigations suggesting organ dysfunction**.**

SAMPLE SIZE - The sample size was calculated by the following formula:

Sample size (n) = **$4PQ/D^2$**

P = Prevalence of the disease

Q= 100- P

D = Absolute error taken as 10%

(P = 50; Q = 50; D=10)

$n = 4 \times 50 \times 50 / 10^2$

n = 100

SAMPLING METHOD - All the qualified patients were included in the study by convenient sampling till the sample size was reached.

INCLUSION CRITERIA - Patients of age > 18 years admitted in KLE Hospital fulfilling the criteria for SIRS/ sepsis / septic shock

SIRS – Two or more of the following

1. Fever >38 degree C or hypothermia <36 degree C
2. Tachypnea >24 breaths /min
3. Tachycardia - heart rate >90 beats /min
4. Leukocytosis >12000/micro L or Leucopenia <4000/micro L

SEPSIS: any one of the following

1. Cardiovascular – arterial BP <= 90mmhg or mean arterial pressure <=70 mm hg that responds to IV fluid.
2. Renal –urine output <0.5 mL/kg per hour for 1 hour despite adequate fluid resuscitation.
3. Respiratory- PaO2/FiO2 <=250 or if lung the only dysfunction organ, <=200.
4. Hematologic- platelet count <80000/micro L or decrease by 50% from highest value recorded over previous 3 days.
5. Unexplained metabolic acidosis-pH <=7.30 or base deficit >=5.0mEq/L and plasma lactate level >1.5 times upper limit of normal for reporting lab.

SEPTIC SHOCK – suspected or documented infection plus vasopressor therapy needed to maintain mean arterial pressure at >= 65 mmHg and serum lactate level >2mmol/L despite adequate fluid resuscitation.

EXCLUSION CRITERIA - Known case of hypoalbuminemia of any etiology.

ETHICAL CLEARANCE: Institutional Ethics Committee Jawaharlal Nehru Medical College, Belagavi approved the study before to the commencement. (Annexure-III).

INFORMED CONSENT: The patients qualifying the selection criteria were informed about the study and the participants were included after they agreed and a written informed consent was taken (Annexure-I).

DATA COLLECTION: Study population of 100 inpatients fulfilling the Inclusion & Exclusion criteria are taken in to study after obtaining written informed consent in their own vernacular language.

Demographic data, History, Clinical examination and details of investigations (routine blood investigations, serum albumin and serum lactate) were compiled. On admission, the serum lactate albumin ratio (L/A ratio) and APACHE II Score were calculated. Patients were followed up till day of discharge or death, to study the outcome.

STATISTICAL METHODS:. The categorical data was expressed in terms of rates, ratio and percentage and the continuous data was expressed in terms of mean ± standard deviation. The association between the outcome, clinical and demographic characteristics was tested using chi-square test or Fisher's exact test. Continuous data was compared using independent sample 't' test. Correlation between serum lactate, serum albumin and LA ratio with APACHE 2 scores by Karl Pearson's correlation coefficient method A probability (p) value of ≤ 0.05 was considered as statistically significant. Multiple logistic regression analysis of outcome by other variables is calculated.

RESULTS

A one-year cross sectional study was conducted in the Department of General Medicine, KLE's DrPrabhakarKore Hospital and Medical Research Centre, Belagavi.

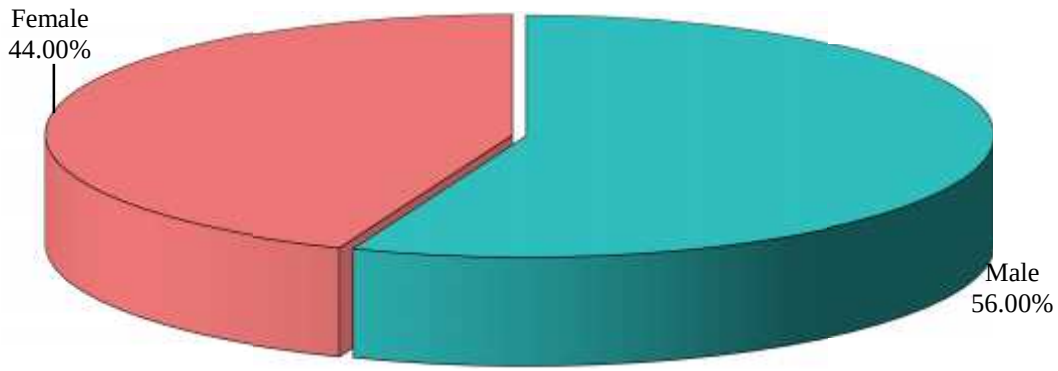
A total of 100 adult patients with the diagnosis of Sepsis who fulfilled the inclusion and exclusion criteria were included in the study after taking informed consent.

The data obtained was analyzed and the final results were tabulated and interpreted as below.

Table 5.1: Gender distribution in the sepsis patients:

Gender	No of patients	% of patients
Male	56	56.00
Female	44	44.00
Total	100	100.00

Graph 5.1: Gender wise distribution of patients

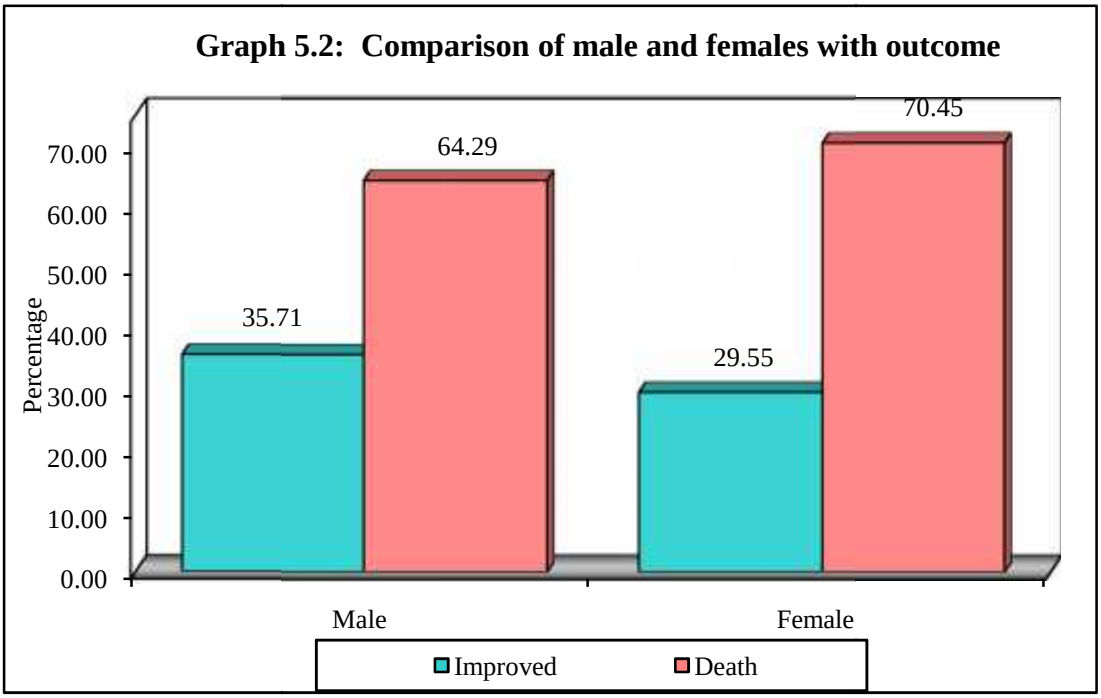


Out of total study subjects, **56%** were male and **44%** were female patients, with male to female ratio **1.27:1.**

Table 5.2 Association between outcome and Gender of patients

Gender	Improved	%	Death	%	Total	χ^2	p-value
Male	20	35.71	36	64.29	56	7.9640	0.1582, NS
Female	13	29.55	31	70.45	44		
Total	33	33.00	67	67.00	100		

Graph 5.2: Comparison of male and females with outcome

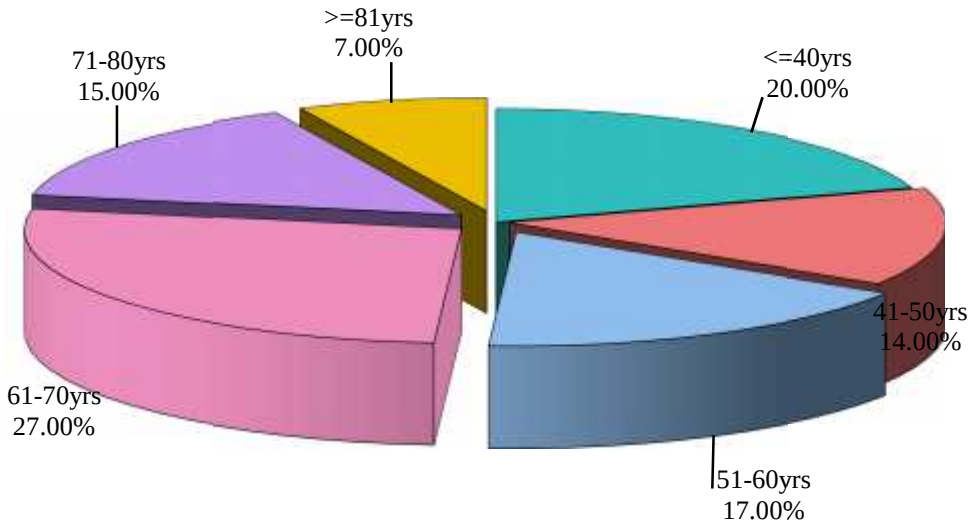


According to our data, mortality was observed in **64.29%** of the male and **70.45 %** of the female patients. However, the association between the gender and mortality in the sepsis patients was not statistically significant.

Table 5.3: Age distribution of sepsis patients:

Age groups	No of patients	% of patients
<=40yrs	20	20.00
41-50yrs	14	14.00
51-60yrs	17	17.00
61-70yrs	**27**	**27.00**
71-80yrs	15	15.00
>=81yrs	7	7.00
Mean age	**56.24**	
SD age	18.18	
Total	100	100.00

Graph 5.3: Age distribution of patients

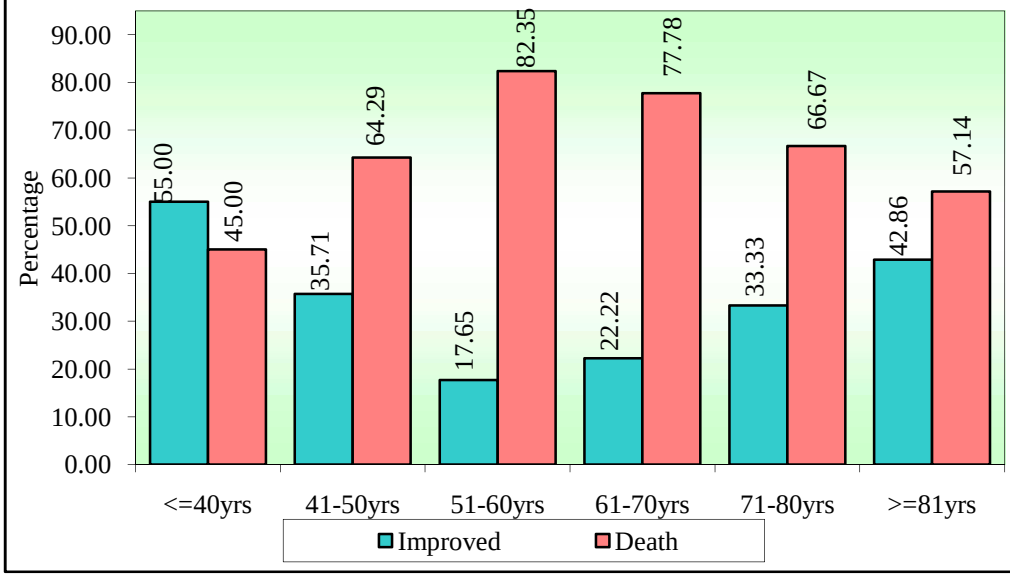


In our study the age range was from 19-90 years with the mean age of **56.24 +/- 18.18** years. The majority of the patients belonged the age group of **61-70** years **(27%)**.

Table 5.4: Association between outcome and Age groups of patients

Age groups	Improved	%	Death	%	Total	χ^2	p-value
<=40yrs	11	55.00	9	45.00	20	0.4240	0.5145, NS
41-50yrs	5	35.71	9	64.29	14		
51-60yrs	3	17.65	14	82.35	17		
61-70yrs	6	22.22	21	77.78	27		
71-80yrs	5	33.33	10	66.67	15		
>=81yrs	3	42.86	4	57.14	7		
Total	33	33.00	67	67.00	100		

Graph 5.4: Comparison of age groups with outcome

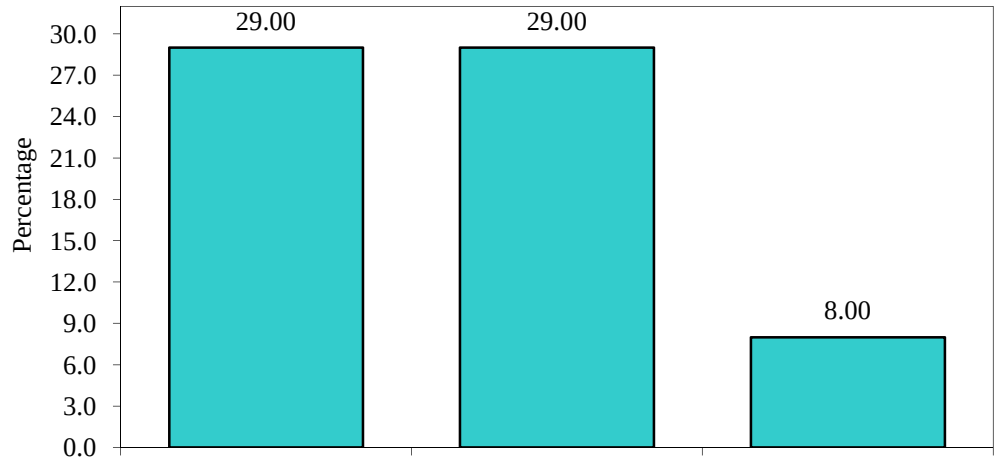


It was observed that highest mortality was seen in age group between 51-60 years with **82.35%,** followed by 77.78% mortality seen in age group between 61-70 years and lowest mortality **45.00%** was seen in age <40 years. However, statistically the association between the outcome and the age in sepsis was not significant.

Table 5.5: Co-morbidities wise distribution of patients

Co-morbidities	No of patients	% of patients
Hypertension		
No	71	71.00
Yes	29	29.00
Type 2 Diabetes		
No	71	71.00
Yes	29	29.00
IHD		
No	92	92.00
Yes	8	8.00
Total	100	100.00

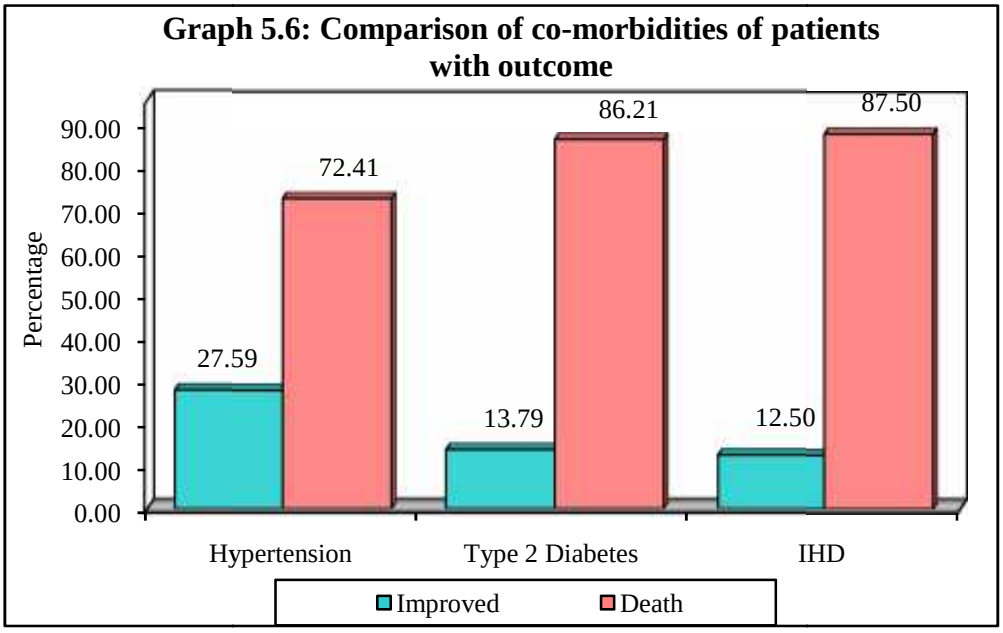
Graph 5.5: Co-morbidities wise distribution of patients



In our study most frequently found comorbidities were diabetes mellitus, hypertension and ischemic heart disease accounting for 29%, 29% and 8% respectively.

Table 5.6: Association between outcome and Co-morbidities of patients

Co-morbidities	Improved	%	Death	%	Total	χ^2	p-value
Hypertension							
No	25	35.21	46	64.79	71	0.5410	0.4618, NS
Yes	8	27.59	21	72.41	29		
Type 2 Diabetes							
No	29	40.85	42	59.15	71	6.8150	**0.0090, S**
Yes	4	13.79	25	86.21	29		
IHD							
No	32	34.78	60	65.22	92	1.6530	0.1986, NS
Yes	1	12.50	7	87.50	8		
Total	33	33.00	67	67.00	100		



In our study mortality was seen in **86.21%** of the patients with diabetes, **72.41%** of the patients with hypertension and **87.50%** of the patients with ischemic heart disease. However, the correlation between comorbidities with mortality was statistically significant only in diabetes mellitus patients with **p value=0.0090**.

Table 5.7: Diagnosis – septicemia- causes wise distribution of patients

Diagnosis - septicemia causes	No of patients	% of patients
Abdominal infection	15	15.00
Abscess	3	3.00
Bed sore	2	2.00
Cellulitis	6	6.00
Gangrene	2	2.00
Leptospirosis	1	1.00
Pneumonia	46	46.00
Rickettsia	1	1.00
Right upper limb necrotizing fasciitis	1	1.00
Urosepsis	10	10.00
Viral infection	13	13.00
Total	100	100.00

Graph 5.7: Diagnosis - septicemia cause wise distribution of patients

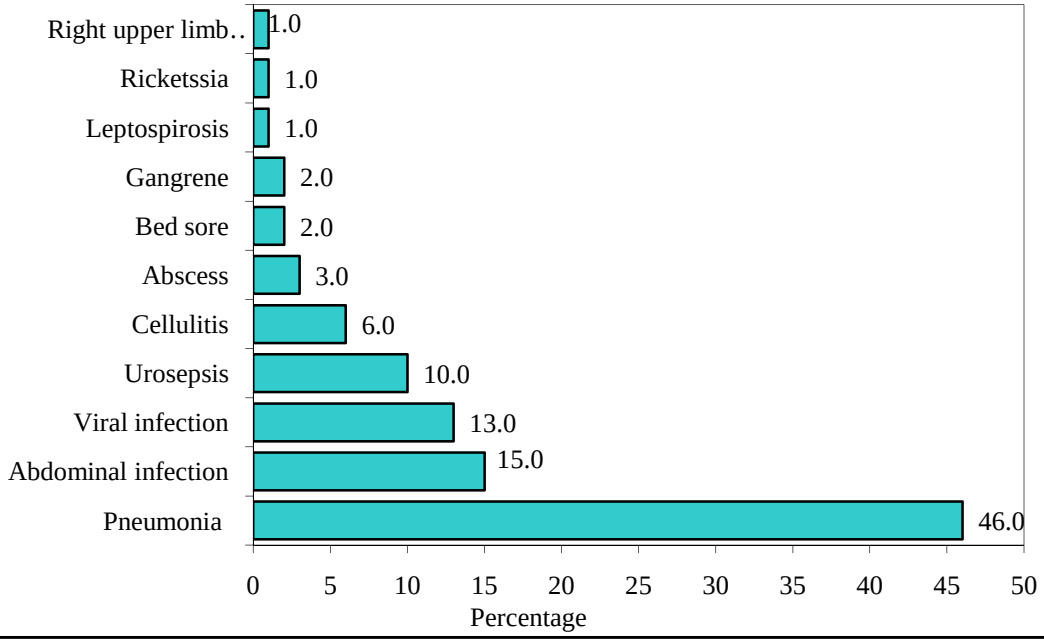
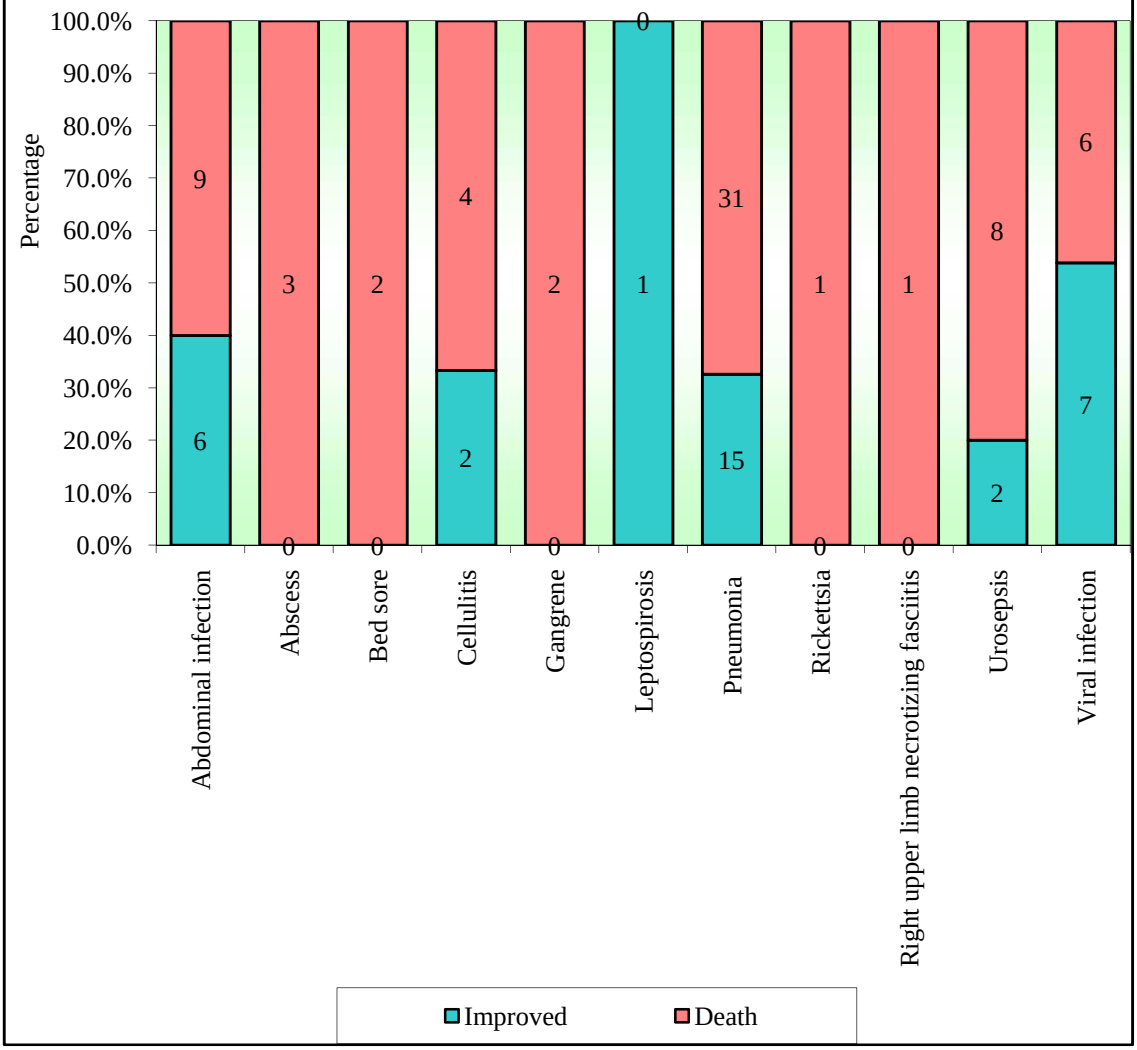


Table 5.8: Association between outcome and Diagnosis - septicemia causes of patients

Diagnosis - septicemia cause	Improved	%	Death	%	Total
Abdominal infection	6	40.00	9	60.00	15
Abscess	0	0.00	3	100.00	3
Bed sore	0	0.00	2	100.00	2
Cellulitis	2	33.33	4	66.67	6
Gangrene	0	0.00	2	100.00	2
Leptospirosis	1	100.00	0	0.00	1
Pneumonia	15	32.61	31	67.39	46
Rickettsia	0	0.00	1	100.00	1
Right upper limb necrotizing fasciitis	0	0.00	1	100.00	1
Urosepsis	2	20.00	8	80.00	10
Viral infection	7	53.85	6	46.15	13
Total	33	33.00	67	67.00	100

Graph 5.8: Comparison of Diagnosis - septicemia (causes) with outcome

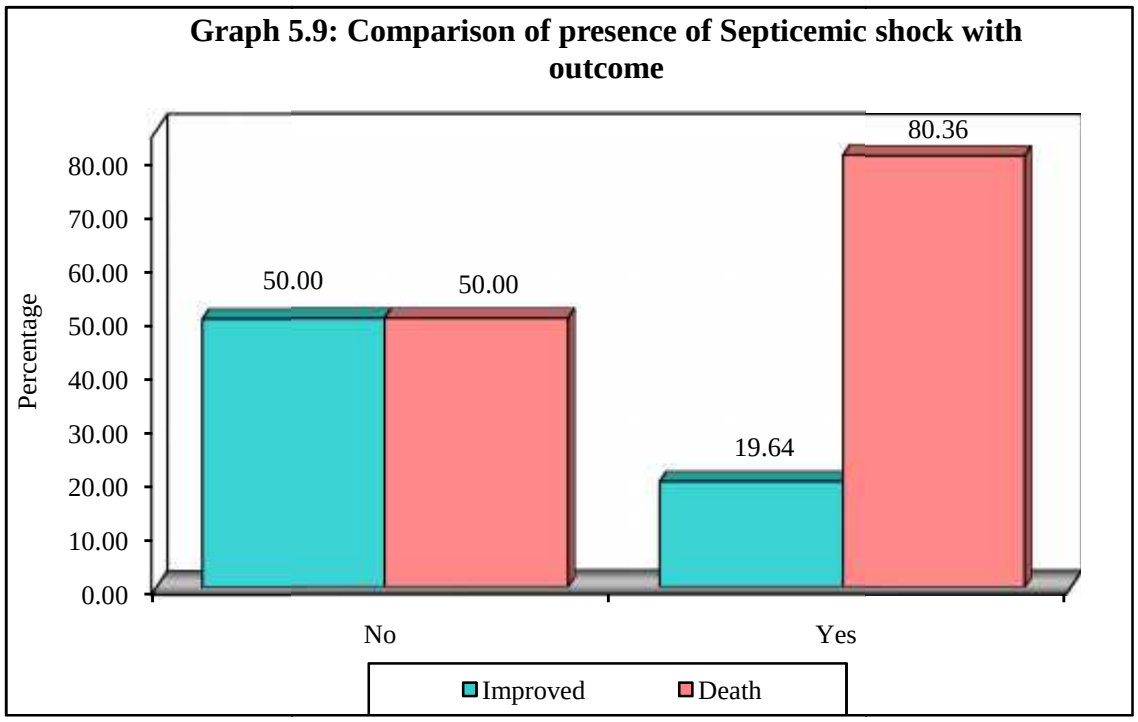


Here we observed that pneumonia (**46.00 %)** was the common etiology followed by abdominal infection (15%) and viral infection (13%). Mortality was observed in **80%** of urosepsis patients, 67% of pneumonia and 66% of cellulitis patients.

Among the causes for sepsis abscess, bed sores and gangrene were associated with **100%** mortality, but these patients contributed **< 10%** of the study population.

Table 5.9: Association between outcome and patients with septicemic shock and without septicemic shock

Septicemic shock	Improved	%	Death	%	Total	χ^2	p-value
No	22	50.00	22	50.00	44	10.2701	**0.0014, S**
Yes	11	19.64	45	80.36	56		
Total	33	33.00	67	67.00	100		

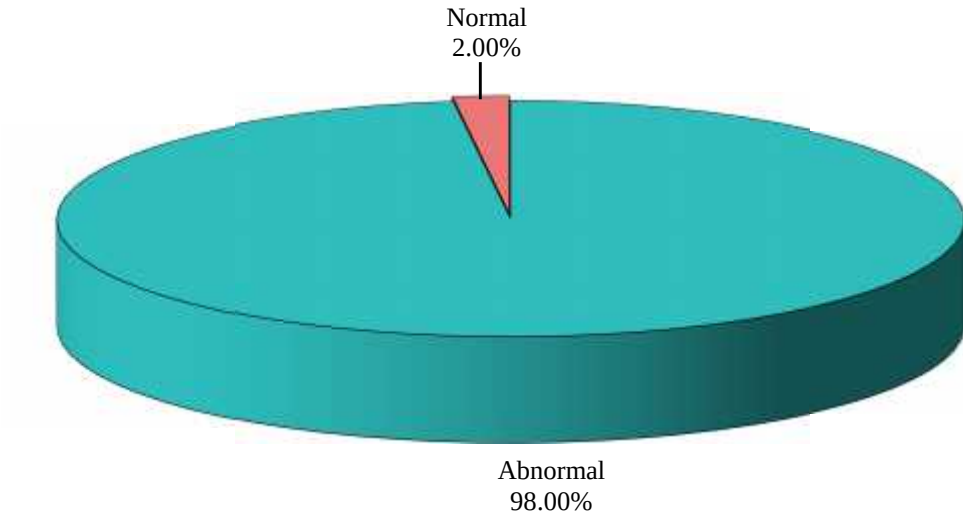


According to our study, **56** patients had septicemic shock with mortality of **80.36 %**, and 44 patients without shock with mortality of 50.00%. The patients with septic shock had higher mortality which is statistically significant with **p value = 0.001**

Table 5.10: Levels of Serum lactate wise distribution

Serum lactate	No of patients	% of patients
Abnormal	98	98.00
Normal	2	2.00
Total	100	100

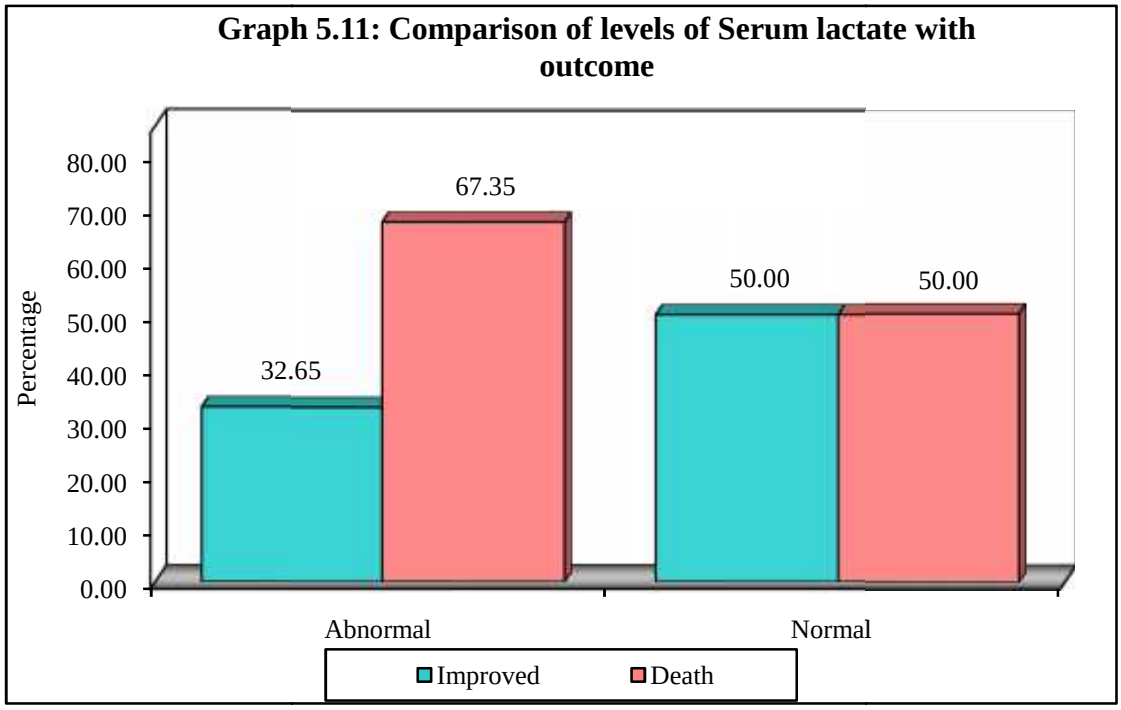
Graph 5.10: Levels of Serum lactate wise distribution of patients



In our study **98%** patients had increased serum lactate levels above >1mmol/L.

Table 5.11: Association between outcome and levels of Serum lactate

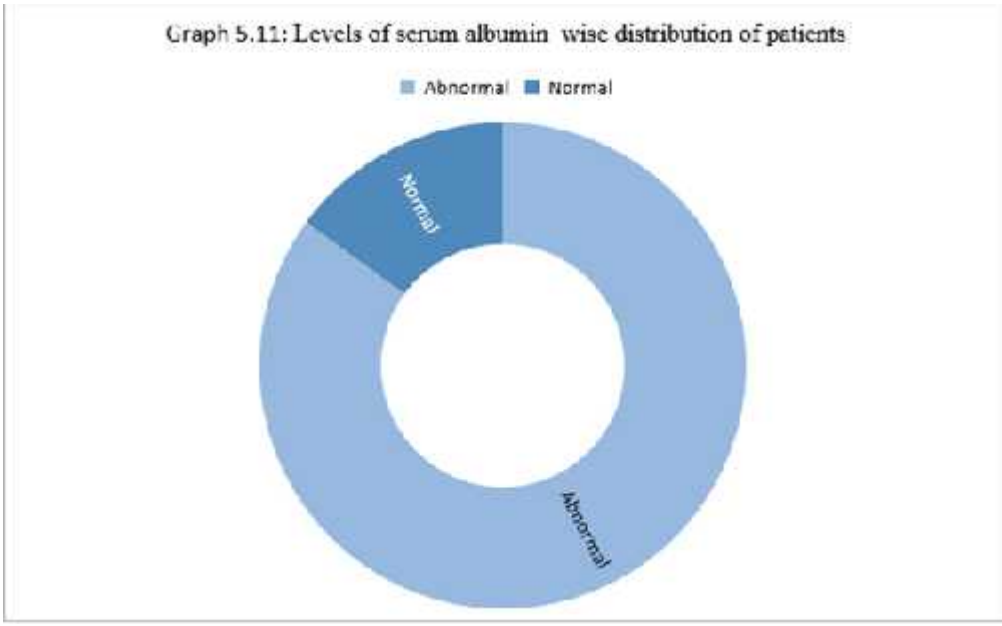
Serum lactate	Improved	%	Death	%	Total	Yates χ^2	p-value
Abnormal	32	32.65	66	67.35	98	0.0000	1.0000, NS
Normal	1	50.00	1	50.00	2		
Total	33	33.00	67	67.00	100		



The patients with increased serum lactate levels had **67.35%** mortality and normal serum lactate groups had 50% mortality. Though the patients with increased serum lactate had higher mortality but it was not statistically significant.

Table 5.12: Levels of serum albumin wise distribution

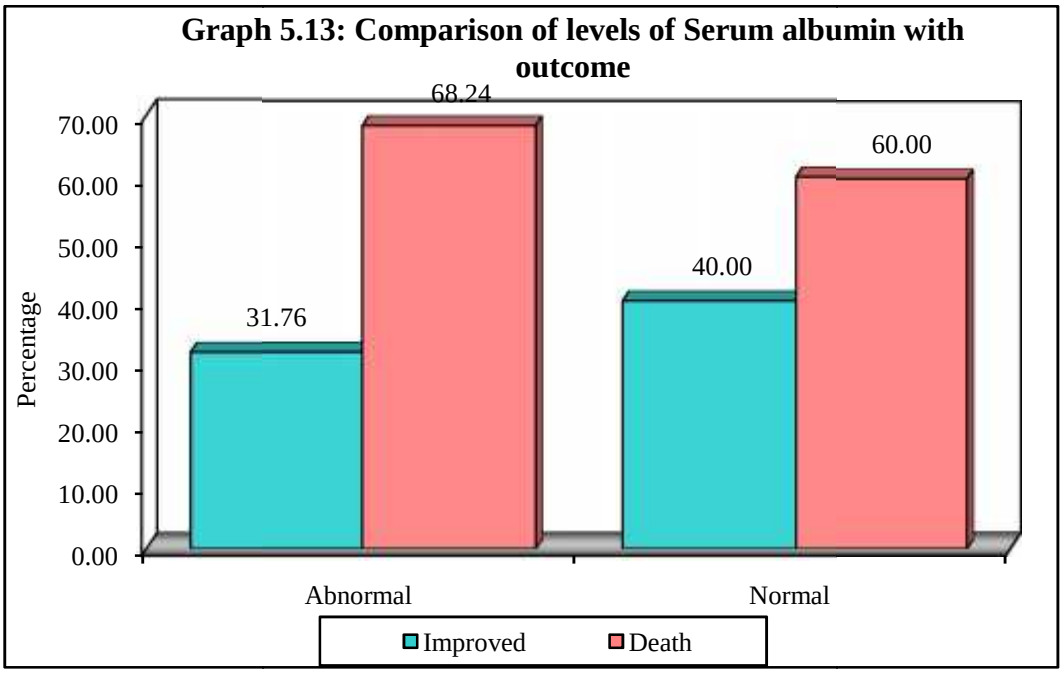
Serum albumin	No of patients	% of patients
Abnormal	85	85.00
Normal	15	15.00
Total	100	100.00



In our study**, 85%** of the sepsis patients had decreased serum albumin values <3.5 g/dL.

Table 5.13: Association between outcome and levels of serum albumin

Serum albumin	Improved	%	Death	%	Total	χ^2	p-value
Abnormal	27	31.76	58	68.24	85	0.1070	0.7430, NS
Normal	6	40.00	9	60.00	15		
Total	33	33.00	67	67.00	100		

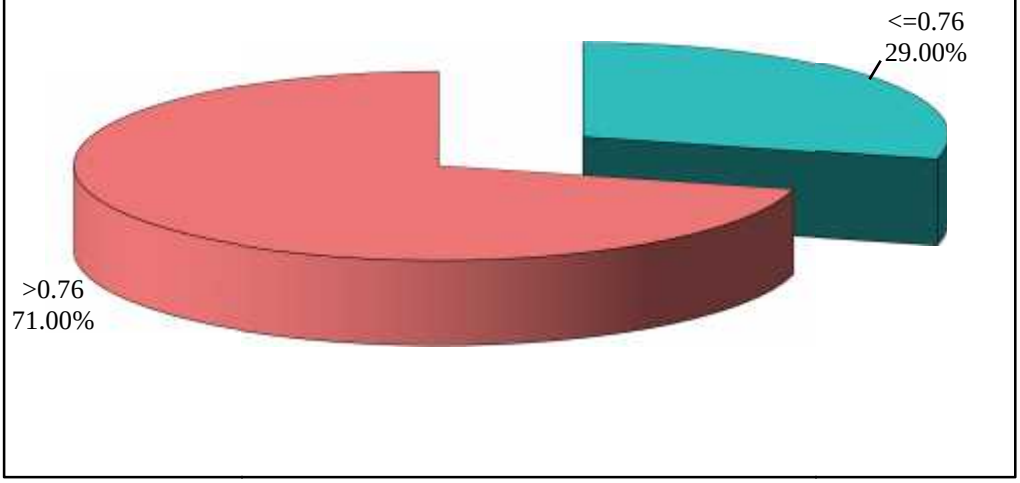


Patients with decreased serum albumin levels had **68.24%** mortality and 60% mortality was seen in normal value groups but the correlation between serum albumin and mortality was not statistically significant.

Table 5.14: Levels of LA ratio distribution

LA ratio	No of patients	% of patients
<=0.76	29	29.00
>0.76	71	71.00
Total	100	100.00

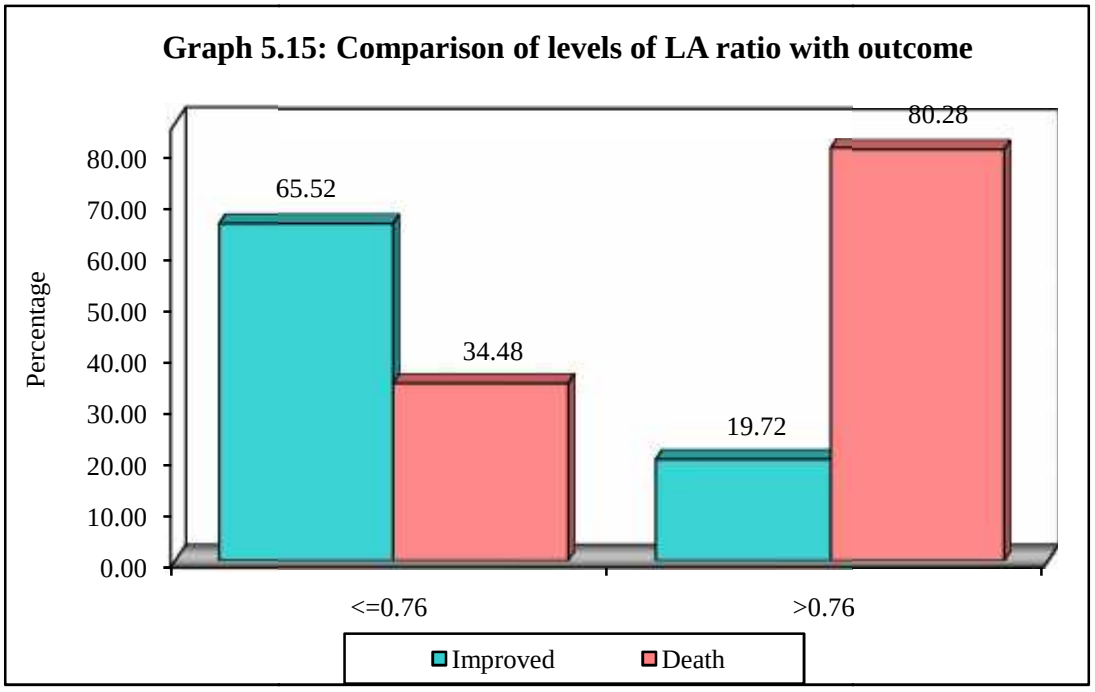
Graph 5.14: Levels of LA ratio wise distribution of patients



According to our study, **71%** of sepsis patients had serum lactate albumin ratio above 0.76 and 29% had values below 0.76.

Table 5.15: Association between outcome and levels of LA ratio

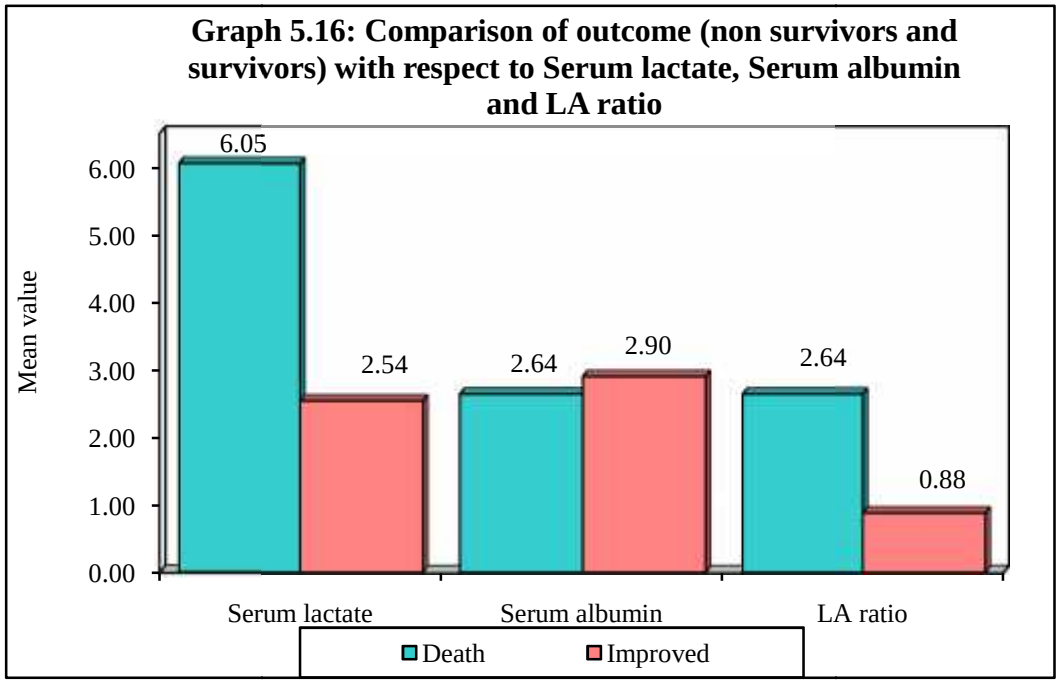
LA ratio	Improved	%	Death	%	Total	χ^2	p-value
<=0.76	19	65.52	10	34.48	29	19.5330	**0.0001, S**
>0.76	14	19.72	57	80.28	71		
Total	33	33.00	67	67.00	100		



We observed that patients with serum L/A ratio >0.76 had mortality of **80.28%** and patients with < 0.76 values had mortality of 34.48 %. It was observed that there was positive correlation with serum lactate albumin ratio (L/A ratio) with mortality with cut off value of >0.76 which is statistically significant with **p value = 0.0001.**

Table 5.16: Comparison of outcome with respect to Serum lactate, Serum albumin and LA ratio by independent t test

Variable	Outcome	Mean	SD	SE	t-value	P-value
Serum lactate	Death	**6.05**	4.12	0.50	4.7160	**0.0001, S**
	Improved	2.54	1.53	0.27		
Serum albumin	Death	**2.64**	0.71	0.09	-1.7257	0.0876, NS
	Improved	2.90	0.65	0.11		
LA ratio	Death	**2.64**	2.43	0.30	4.0803	**0.0001, S**
	Improved	0.88	0.54	0.09		



In our study, on comparison between survivors to non-survivors, serum lactate levels were higher among the non-survivor groups with mean **6.05 +/- 4.12** SD than among the survivor groups with mean 2.54 +/-1.53and was statistically significant with **p value = 0.0001**.

Serum albumin levels were lower among the non-survivor groups with mean **2.64 +/- 0.71** than among the survivor groups with mean 2.90 **+/-** 0.65but was statistically not significant.

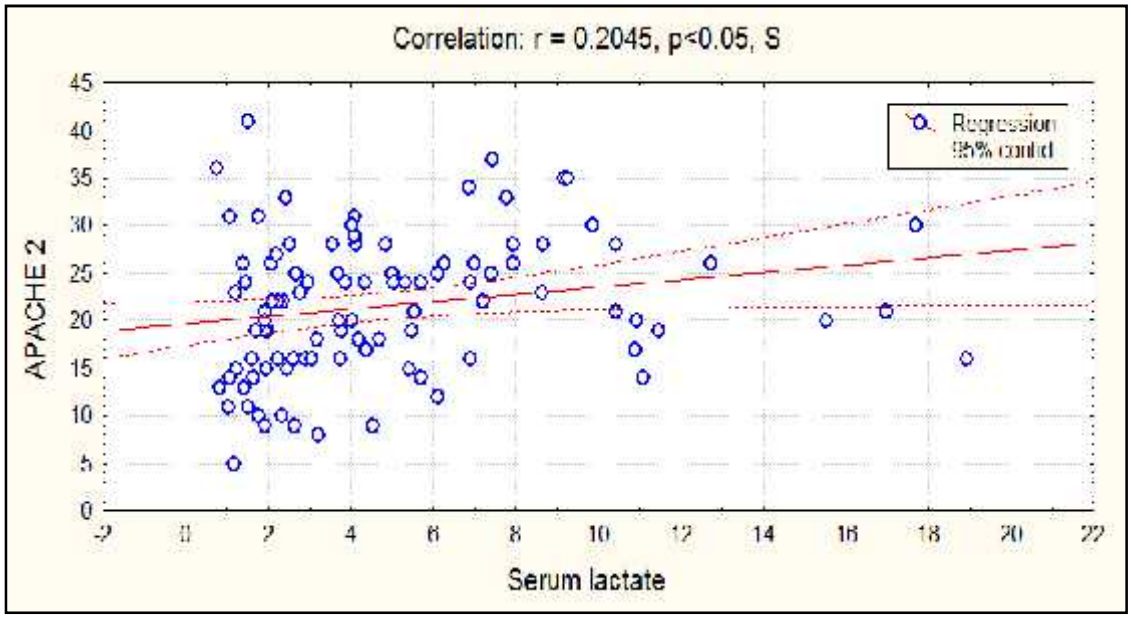
We observed that serum lactate albumin ratio was higher in non-survivor group with mean **2.64 +/- 2.45** than the survivor group with mean 0.88 +/- 0.88 value and was statistically significant with **p value =0.0001**.

Hence concluding that by independent t test, serum lactate and serum lactate albumin ratio in sepsis patients had correlation with mortality with significant p values. However, there was no statistically significant relation between serum albumin and mortality in sepsis patients.

Table 5.17: Correlation between serum lactate, serum albumin and LA ratio with APACHE 2 scores by Karl Pearson's correlation coefficient method

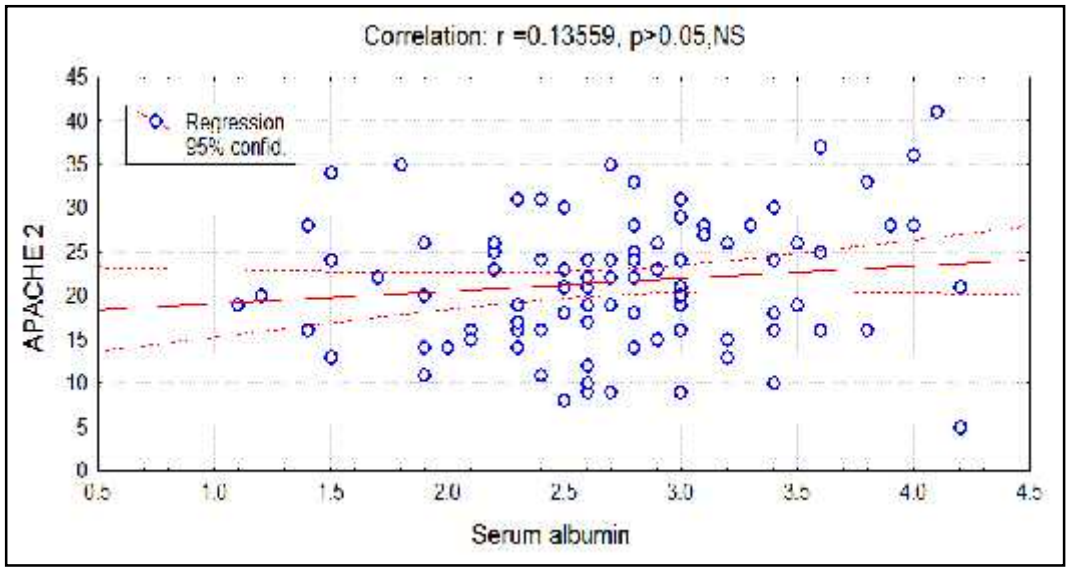
Variables	Correlation between APACHE 2 scores with		
	r-value	t-value	p-value
Serum lactate	0.2045	2.0686	**0.0412, S**
Serum albumin	0.1356	1.3548	0.1786, NS
LA ratio	0.1004	0.9986	0.3204, NS

Graph 5.17: Scatter diagram showing the correlation between serum lactate with APACHE 2 scores



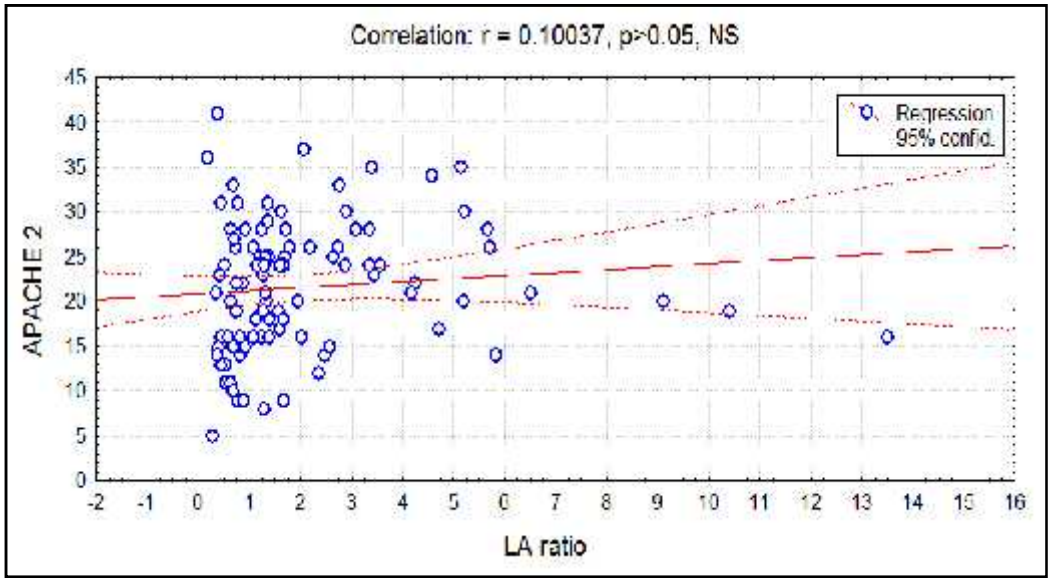
According to the study, when serum lactate and APACHE 2 scores were correlated, there was positive deflection with correlation coefficient of **0.020** which is **less that p value 0.412.** Hence suggesting that there is strong correlation between serum lactate with APACHE 2 scores in the sepsis patients in predicting mortality studied on day one.

Graph 5.18: Scatter diagram showing the correlation between serum albumin with APACHE 2 scores



According to our study, there was no correlation between serum albumin with APACHE 2 scores in the sepsis.

Graph 5.19: Scatter diagram showing the correlation between LA ratio with APACHE 2 scores



According to our study, there was no correlation between serum lactate albumin ratio with APACHE 2 scores in the sepsis.

Table 6: Multiple logistic regression analysis of outcome by other variables

Variables	Adjusted OR	95% CI for OR		p-value
		Lower	Upper	
Gender				
Male	0.50	0.15	1.73	0.2701
Female	Ref.			
Age Groups				
<=40yrs	Ref.			
41-50yrs	1.03	0.17	6.20	0.9750
51-60yrs	3.87	0.53	28.13	0.1810
61-70yrs	1.66	0.29	9.39	0.5680
71-80yrs	1.06	0.13	8.44	0.9580
>=81yrs	2.92	0.26	32.61	0.3840
Hypertension				
Yes	0.24	0.05	1.18	0.0780
No	Ref.			
Type 2 Diabetes				
Yes	14.03	2.27	86.78	**0.0040***
No	Ref.			
IHD				
Yes	7.12	0.41	124.12	0.1790
No	Ref.			
Septicemic Shock				
Yes	2.45	0.76	7.91	0.1350
No	Ref.			
Serum Lactate				
Abnormal	0.19	0.02	1.63	0.1300
Normal	Ref.			
Serum Albumin				
Abnormal	0.79	0.14	4.32	0.7840
Normal	Ref.			
LA ratio				
<=0.76	Ref.			
>0.76	13.00	3.29	51.47	**0.0001***

*p<0.05

In our study we used the serum lactate albumin ratio cut off value of **0.76** by using multiple regression analysis with significant p value = **0.0001**.

This analysis was applied to the above values and was significant with sepsis patients with diabetes mellitus with significant p value = 0.0040.

DISCUSSION

The mortality and morbidity related to sepsis have been escalating over the past years so if one may augur the mortality of patients with sepsis and septic shock at the time of presentation and vigorously resuscitate them, the mortality can be reduced. Hence this study was conducted to look for simple parameters which can help in predicting the poor outcome in sepsis patients.

In our study, **56%** were male patients and 44% were female patients and male to female ratio was 1.27:1. According to our data, mortality was observed in **64.29%** of the male and **70.45 %** of the female patients but there was no significant correlation between the gender and the outcome in the sepsis statistically.

Our results were comparable with study by **Thapa S et al**[72] concluded that "the majority of subjects were males contributing 53.8% and there was no gender correlation with outcome." Study by **Pietropaoli AP et al**[81] concluded that "women with severe sepsis or septic shock had a higher risk of dying in the hospital than men" but this was not comparable to our results.

In our study the patients age range was from 19-90 years with the mean age of **56.24 +/- 18.18** years. The majority of the patients belonged the age group of **61-70** years **(27%)**. It was observed that highest mortality was among the age group between **51-60** years with **82.35%,** followed by 77.78% mortality seen in age group between 61-70 years and lowest mortality **45.00%** was seen in age <40 years. However, statistically the association between the outcome and the age in sepsis was not significant.

Our study results were comparable to study by **Chen C et al**[82] which concluded "that being older was not a significant predictor of mortality for ICU patients with severe sepsis" and to study by **Thapa S et al**[72] "the patients mean age was 49.60 years and however, there was positive correlation of age with outcome."

Here we observed that pneumonia **(46.00 %)** was the common etiology followed by abdominal infection (15%) and viral infection (13%). Mortality was observed in **80%** of urosepsis patients, 67% of pneumonia and 66% of cellulitis patients.

Among the causes of sepsis abscess, bed sores and gangrene were associated with **100%** mortality, but these patients contributed **< 10%** of the study population.

Our results were comparable to study by **J. Shing et al**[74] concluded that "A higher mortality was observed in infection focus subgroups including intra-abdominal and respiratory infections."

In our study frequently seen comorbidities were diabetes mellitus, hypertension and ischemic heart disease accounting for 29%, 29% and 8% respectively. It was observed that mortality was seen in 86.21% of the patients with diabetes, 72.41% of the patients with hypertension and 87.50% of the patients had ischemic heart disease. Statistically those with only diabetes mellitus had correlation with mortality with significant **p value=0.0090**.

Our results were comparable to study done by **Ynosencio et al**[83], they concluded that "both hypertension and diabetes mellitus were commonly found in both non-survivor and survivor groups in sepsis and had increased risk of mortality when compared to other patients."

According to our observation, **56** patients had septicemic shock with mortality of **80.36 %**, and 44 patients without shock with mortality of 50.00%. The patients with septic shock had higher mortality which is statistically significant with **p value = 0.0014**

Our findings were comparable to study by **Martin G et al**[84] in which they concluded that "the patients with septic shock had increased mortality (40% – 80%) as compared to patient without septic shock."

Serum lactate levels were studied on day of the admission and 98% patients had levels above 1mmol/L (normal lactate levels - 0.5 -1 mmol/L). The patients with increased serum lactate levels had **67.35%** mortality and normal value group had 50% mortality. There was significant relation in patients with increased serum lactate with mortality by independent t test with **p value = 0.0001**.

Serum albumin levels were studied on day of the admission and 85% of the patients had low abnormal values (normal serum albumin levels- 3.5-5 g/dL). Patients with decreased serum albumin levels had **68.24%** mortality and 60% mortality was seen in normal value group but the correlation between serum albumin and mortality was not statistically significant.

The cut off value **0.76** for serum L/A ratio was selected by Multiple logistic regression analysis of outcome with L/A ratio with significant p value (<0.05). In total 100 subjects, **71%** had serum L/A ratio above the cut off value.

We observed that **80.28%** of the sepsis patients with serum L/A ratio >0.76 had mortality and 34.48 % mortality was seen in group with < 0.76 values. It suggested that there was positive correlation with serum lactate albumin ratio with the

mortality in the patient with cut off value of 0.76 statistically with significant **p value = 0.0001**.

In our study, on comparison between survivors and non-survivors, serum lactate levels were higher among the non-survivor groups with mean **6.05 +/- 4.12** SD than among the survivor groups with mean 2.54 +/-1.53 and was statistically significant with **p value = 0.0001**.

Serum albumin levels were lower among the non-survivor groups with mean **2.64 +/- 0.71** than among the survivor groups with mean 2.90 **+/-** 0.65 but was statistically not significant.

We observed that serum lactate albumin ratio was higher in non-survivor group with mean **2.64 +/- 2.45** than the survivor group with mean 0.88 +/- 0.88 value and was statistically significant with **p value =0.0001**.

Hence concluding that by independent t test, serum lactate and serum lactate albumin ratio in sepsis patients had positive correlation with mortality with significant p values. However, there was no statistically significant relation between serum albumin and mortality in sepsis patients.

Our results were comparable to these various studies which had similar conclusions - "In laboratory tests, the non-survivor group showed lower albumin levels (median, 2.6 vs. 3.0 g/dL), higher lactate levels (median, 4.5 vs. 3.0 mmol/L) and higher L/A ratio (median, 1.7 vs. 1.0) than the survival group ($P < 0.05$, all)" by **J Shing et al** study[74] and "As expected, non-survivors also evidenced higher lactate levels (3.8 vs. 2.2 mmol/L, $p < 0.01$) and lower albumin levels (18.0 vs. 20.0 mg/L, $p = 0.01$)" by **M Lichtenauer et al** study[73] and **Choi SJ et al** study concluded "The

lactate level was higher (2.5 ± 2.2 vs 8.1 ± 5.1 mmol/L, p<0.001) and the albumin level was lower (2.9 ± 0.5 vs 2.7 ± 0.5 mg/dL, p=0.063) in non-survivors than in survivors."

In study by **Thapa S et al**[72] had similar comparable "Receiver operating characteristics (ROC) curve analysis comparing serum lactate, serum lactate albumin ratio and APACHE II score in predicting mortality. The area under the ROC curves for lactate and lactate albumin ratio were similar in predicting mortality (lactate, 0.91 [95% CI,0.87–0.0.95; p<0.001]) (lactate albumin ratio, 0.90 [95% CI, 0.86–0.94; p<0.001]), where value under the ROC curve for APACHE II score is slightly higher (APACHE II, 0.96 [95% CI, 0.94–0.0.98; p<0.001])."

In study by **Wang B et al**[75] results were "The patients with mortality had increased levels of lactate/albumin ratio (2.876 ± 0.235, n = 5) compared with without MODS (2.080 ± 0.119 mL/kg, n = 49, P = .0122)."

"The 28-day mortality rates were significantly higher when the L/A ratio was above the cut-off point regardless of lactate level (normal: 21.7% vs. 7.6%, P<0.01; intermediate: 28.9% vs.12.6%, P<0.01; high: 46.4% vs. 21.7%, P<0.01)." results from **Choi et al study**[80] were to comparable to this study.

Correlation between serum lactate, serum albumin and LA ratio with APACHE 2 scores was done by Karl Pearson's correlation coefficient method. According to our study, when serum lactate and APACHE 2 scores were correlated, there was positive deflection with correlation coefficient of 0.020 which is less that p value 0.412. Hence suggesting that there is strong correlation between serum lactate with APACHE 2 scores in the sepsis patients in predicting

mortality studied on day one. There was no correlation noted between serum albumin and APACHE 2 score in sepsis patients.

However, in our study there was no significant correlation between the serum lactate albumin ratio and APACHE 2 score with p value- 0.32. But in study by **Thapa S et al**[72] it showed that "there was a positive deflection with correlation coefficient of 0.637 and P value <0.01 indicating that serum lactate albumin ratio showed strong correlation with APACHE II score in predicting mortality in severe sepsis and septic shock."

CONCLUSION

Based on our study it is concluded that, serum lactate albumin ratio can be used as the simple tool as predictor for poor prognosis in the patients with sepsis.

There was no correlation observed between the serum lactate albumin ratio and APACHE 2 score in predicting the mortality in sepsis in our study.

SUMMARY

This was a one year cross sectional study done in the Department of General Medicine, KLES Dr. Prabhakar Kore Hospital and MRC, Belagavi from January 2019 to December 2019. A total of 100 patients who presented with the diagnosis of Sepsis as defined by Harrison textbook of medicine were studied. Serum lactate albumin was evaluated for all patients at admission and follow up was done until day seven or death.

In our study, 56% were male patients and 44% were female patients and with male to female ratio 1.27:1. The majority of the subjects belonged to the age group between 61-70 years (27%) with mean age being 56.24 years. Both the age and gender did not correlate with mortality.

The comorbidities frequently associated in our study were type 2 diabetes mellitus (29%), hypertension (29%) and ischemic heart disease (8%) and on correlation statistically only the patients with diabetes had higher risk of mortality.

The most common cause of the sepsis in this study was pneumonia with 46%, followed by abdominal infection (15%) and viral infection (13%). Mortality was observed in 80% of urosepsis patients, 67% of pneumonia and 66% of cellulitis patients.

In this study there were 56% of patients with septic shock at the time of the presentation and among them 80.36% had mortality. The patients with septic shock had positive correlation with increased mortality.

Serum lactate levels in sepsis patients on day of the admission were above 1mmol/L, 98% had raised values and 67.35% mortality was observed in these patients and increased values were related with increased risk for mortality.

85% of patients were low serum albumin values(<3.5g/dL) and 68.24% mortality was observed in this group. However, the lower serum albumin levels were not significantly related to outcome in the patients with sepsis.

In this study majority (71%) of patients had increased serum lactate albumin ratio (>0.76) calculated on day one with 80.28% mortality. On analysis increased serum lactate albumin ratio correlates with mortality in patients with sepsis.

On comparison, we concluded that in sepsis patients the non-survivor group had higher serum lactate levels (mean, high 6.05 vs low 2.54 mmol/L), low mean serum albumin levels (mean, low 2.64 vs high 2.90 g/dL) and higher serum lactate albumin ratio (mean, high 2.64 vs low 0.88) as compared to survivor groups.

In our study there was no significant correlation between the serum lactate albumin ratio and APACHE 2 score in predicting the prognosis in sepsis. But there was significant correlation between the serum lactate and APACHE 2 score in predicting the prognosis in sepsis.

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ANNEXURE I – CONSENT FORM

To study the serum lactate albumin ratio in the patients with sepsis a one year cross sectional study in KLE Dr.PrabhakarKore hospital and MRC, Belgavi

Principal Investigator:
Post Graduate Student,
Department of General Medicine,
JNMC, Belgaum.

Guide:
Professor &Head,
Dept. of Medicine, J. N. Medical College,
K.L.E. University, Belgaum

Introduction and Purpose: This research is intended to study serum lactate albumin ratio in patients with sepsis. The principal investigator of the study is Dr. _____ under the guidance of Dr. _____This study is intended to study serum lactate albumin ratio in patients with sepsis.

Procedure: If you agree to be part of the research study, you will be asked the relevant history and will be subjected to relevant clinical examination and investigations. You will also have to give blood for the necessary investigations.

Risk and Benefits: The only risk and possible discomfort you might get is while doing investigations.

You may/may not be benefitted by these investigations but you will be part of this study which is going to be useful to others in the future.

Alternatives: Taking part in this study is voluntary. You may choose not to take part in this study.

If you decide to take part you can later change your mind and withdraw from the study. Your decision will not change the present or future health care or other services that you receive. The study doctor or sponsor may stop your participation in this study at any time. If you choose not to take part in the study, you will receive the standard treatment for patients with your condition.

Privacy and Confidentiality: All information collected about you during the course of this study will be kept confidential to the extent permitted by law. The code numbers will identify you in this research record. Information from this study may be published but your identity will be confidential in any publication.

Institution / Sponsor's policy:

Does not apply to this research

Financial incentives for participation**:**

You will not be paid / offered any gifts /incentives for participating in the study.

Authorization to publish the results:

The results of the study would be forwarded to the KLE University, Belgaum as part of requirement towards the completion of MD degree, review and publishing.

In case of the queries during study or in future you may contact following persons,

1. **Dr.Roopa M Bellad$_{MD}$** Professor ,Dept. of Paediatrics, J.N. Medical College, College Ethical Dissertation And Research Committee K.L.E. University, Belgaum – 10

CONSENT FORM

I voluntarily agree to take part in this study by signing below. I may withdraw at any time. I am not giving up any of my legal rights by signing this form. My signature below indicates that I have read this consent form, or it has been read to me and has been explained to me in my vernacular language and all my questions have been answered. I will be given a copy of this consent form.

Signature / Left Thumb print of the Participant or legally authorized representative

Participant's name: ……...

Signature / Left thumb impression ……...

of the participant:

Name of the legally authorized ……...

representative / guardian:

Signature / Left thumb impression: ……...

Witness' name: ……...

Signature / Left thumb impression: ……...

Investigator's name and signature: ……...

Date:

Place:

ANNEXURE-II

PROFORMA

CASE NO:

NAME:

AGE/SEX:

IP NO.:

ADDRESS:

OCCUPATION:

HISTORY:

COMPLAINTS AT PRESENTATION:

FEVER: YES/NO

COUGH: YES/NO

ALTERED SENSORIUM: YES/NO

BREATHLESSNESS: YES/NO

Any other complaint

Past history: Yes/No

Tuberculosis

Bronchial Asthma

Ischemic heart disease

Diabetes mellitus

Hypertension

Chronic

Any other

Family history

Personal history

Treatment history

PHYSICAL EXAMINATION:

Temperature:

Pulse:

Respiratory rate:

Blood pressure:

Spo2:

SYSTEMIC EXAMINATION:

R. S.:

C.V.S.:

P.A.:

C.N.S.:

Diagnosis:

Serum lactate albumin ratio –

APACHE II score-

Temperature-

MAP-

HR- A-

RR-

Oxygenation- B-

Hematocrit-

Serum creatinine- C-

Serum sodium-

Serum potassium-

Arterial pH-

GCS-

Serum Bicarbonate- Total-

WBCs-

Mortality risk=

ANNEXURE-III-ETHICAL CLEARANCE LETTER

K.L.E. ACADEMY OF HIGHER EDUCATION AND RESEARCH
(Deemed – to- be- University)
Accredited 'A' Grade by NAAC (2nd Cycle) Placed in Category 'A' by MHRD (GoI)
JAWAHARLAL NEHRU MEDICAL COLLEGE,
NEHRU NAGAR, BELAGAVI-590010 (KARNATAKA-INDIA)
Website: http//www.jnmc.edu
E-Mail : dome@jnmc.edu
Phone: (+ 91-(0)831 Office : 2472550
Principal: 2471701
Fax No. +91 (0)831 – 2470759

Ref: MDC/DOME/ 34 **Date: 24/11/2018**

To,

Dr.
PG student in, Medicine
J.N.Medical College,
BELAGAVI.

Sub: Institutional Ethical Clearance for the study.

With reference to the above, we wish to inform you that your proposed research project titled **"TO STUDY THE SERUM LACTATE ALBUMIN RATIO IN THE PATIENTS WITH SEPSIS A ONE YEAR CROSS SECTIONAL STUDY IN KLES DR. PRABHAKAR KORE HOSPITAL AND MRC, BELGAVI",** is ethical and justifiable. The proposed research project has been cleared by the JNMC Institutional Ethics Committee on Human Subjects Research.

(Dr. Arathi Darshan)
Member Secretary
JNMC Institutional Ethics Committee
on Human Subjects Research,
J.N.Medical College, Belagavi.

(Dr. Roopa M Bellad)
Chairman,
JNMC Institutional Ethics Committee
on Human Subjects Research,
J.N.Medical College, Belagavi.

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ANNEXURES IV - MASTER CHART

Sl.no	NAME	AGE (years)	GENDER	IP No.	Htn	T2dm	IHD	TEMPERATURE (^{0}F)	HEART RATE (bpm)	RESPIRATORY RATE (cpm)	BLOOD PRESSURE (mmhg)	DIAGNOSIS - SEPTICEMIA (CAUSE)	SEPTICEMIC SHOCK	SERUM LACTATE	SERUM ALBUMIN	LA ratio	APACHE 2 SCORE	MORTALITY RISK	OUTCOME
1	Appasaheb	73	male	968261	no	yes	yes	37.7	124	26	90\60	paraspinal abscess	yes	2.65	2.2	1.2	25	55%	death
2	Govindrao	74	male	969321	no	yes	yes	36.9	100	28	90\60	urosepsis	yes	1.76	2.3	0.76	31	75%	death
3	Renuka	51	female	969297	no	no	no	37.7	136	36	110/70	bilateral pneumonia	no	1.58	3.6	0.43	16	25%	improved
4	Siddappa	55	male	970939	yes	yes	no	37.5	110	38	110\70	urosepsis	no	9.15	2.7	3.38	35	85%	death
5	Shakuntala	75	female	971322	yes	yes	no	37	128	38	140\80	bilateral pneumonia	no	6.25	3.5	1.78	26	55%	death
6	Bapu	75	male	971823	no	no	yes	38.3	128	26	90\70	gluteal region abscess	yes	7.91	2.9	2.72	26	55%	death
7	Prabhu	22	male	971614	no	no	no	37.7	110	34	60\20	right lower limb gas gangrene	yes	15.51	3	5.17	20	40%	death
8	Anjana	24	female	971876	no	no	no	36.1	84	28	110\70	abdominal infection	no	0.8	1.5	0.53	13	15%	improved
9	Bhagyashree	47	female	970646	no	no	no	37.7	140	30	90\50	bilateral pneumonia	no	8.61	2.5	3.44	23	40%	death
10	Heeraba	80	female	973063	yes	no	no	37.7	90	30	100\60	bilateral pneumonia	no	1.22	3.2	0.38	15	25%	improved
11	Balu	65	male	972924	no	no	no	38.3	120	32	100\60	bilateral pneumonia	no	1.63	2	0.81	14	15%	improved
12	Shivalingappa	65	male	972003	yes	yes	no	37.7	120	36	80\60	bilateral pneumonia	yes	2.95	2.6	1.13	24	40%	death
13	Ningawwa	74	female	974721	no	no	no	37	128	28	80\50	bilateral pneumonia	yes	4.37	2.6	1.6	17	25%	death
14	Darigouda	63	male	974743	no	no	yes	37	110	26	80\60	abdominal infection	no	2.34	2.7	0.86	22	40%	death
15	Kashavva	32	female	974752	no	no	no	37.7	123	28	90\60	abdominal infection	yes	1.01	1.9	0.53	11	15%	improved
16	Prashant	45	male	974715	no	no	no	38.3	130	32	110\70	viral infection	no	6.1	2.6	2.34	12	15%	death
17	Chandrakant	62	male	973381	yes	yes	yes	37	97	26	110\70	right lower lobe pneumonia	yes	2.21	3.8	0.58	16	25%	death
18	Kamallavva	55	female	973699	no	no	no	38.3	130	36	110\70	bilateral pneumonia	no	12.71	2.2	5.7	26	55%	death
19	Ballappa	28	male	975031	no	no	no	38.8	120	26	100\60	viral infection	no	1.9	3	0.33	21	40%	improved
20	Shakuntala	52	female	975426	no	yes	no	38.3	120	28	80\40	urosepsis	yes	1.97	2.7	0.72	19	25%	death
21	Shantavva	63	female	975605	yes	yes	no	38.3	120	24	50\20	abdominal infection	yes	7.75	2.8	2.76	33	75%	death

22	Sima	30	female	975533	no	no	no	38.8	100	28	100\70	viral infection	no	1.49	2.4	0.62	11	15%	improved
23	Punappa	80	male	976660	no	yes	no	37.7	120	24	60\30	bilateral pneumonia	yes	7.38	2.8	2.63	25	55%	death
24	Bhagubai	70	male	975764	no	yes	no	37	89	28	120/70	acute cholelithiasis	no	1.38	1.9	0.72	26	55%	death
25	Gangavva	38	female	972543	no	no	no	37.7	110	28	150/90	bilateral pneumonia	yes	11.06	1.9	5.82	14	15%	death
26	Anil	75	male	976121	yes	yes	no	37.7	140	32	100\60	urosepsis	no	6.98	3.2	2.18	26	55%	improved
27	Shivaleela	30	female	976697	no	no	no	37.7	122	42	100\60	bilateral pneumonia	no	1.41	3.2	0.44	13	15%	improved
28	Laxmi	60	female	976587	no	no	no	37.7	127	38	100\70	bilateral pneumonia	no	2.43	2.9	0.83	15	25%	death
29	Vijaya	50	female	976047	no	no	no	37.7	110	40	110\80	bilateral pneumonia	no	1.95	2.9	0.67	15	25%	death
30	Mahadevi	45	female	977421	no	no	no	33.8	120	30	40\20	abdominal infection	yes	4.98	3.6	1.38	25	55%	death
31	Ajit	58	male	971741	no	yes	yes	37.7	90	42	160/90	bilateral pneumonia	no	6.08	3.6	1.68	25	55%	death
32	Gautam	43	male	977832	yes	no	no	37.7	120	38	50\20	acute pancreatitis	yes	3.68	2.8	1.31	25	55%	death
33	Shanta	65	female	978158	yes	no	no	38.3	120	28	90/60	bed sore	yes	5.31	1.5	3.54	24	40%	death
34	Dundayya	26	male	977736	no	no	no	37.7	158	40	120/70	acute pancreatitis	no	4.67	3.4	1.37	18	25%	death
35	Neha	21	female	978469	no	no	no	38.3	160	46	60/30	viral fever	yes	3.72	3	1.24	16	25%	improved
36	Ranjeeth	22	male	976754	no	no	no	38.3	108	40	100/70	right lower lobe pneumonia	no	4.52	2.7	1.67	9	8%	improved
37	ShivalingappaBannur	66	male	977447	no	no	no	38.3	130	42	90/60	abdominal infection	yes	16.95	2.6	6.51	21	40%	death
38	Muragendra	75	male	978762	no	yes	no	37.8	100	44	90/50	bilateral pneumonia	no	1.07	2.4	0.44	31	75%	death
39	Anusha	35	female	978353	no	no	no	38.3	150	44	120/80	bilateral pneumonia	no	2.87	2.3	1.24	16	25%	death
40	Channavva	75	female	972645	yes	no	no	37.4	120	36	60/30	left lower lobe pneumonia	yes	4.03	3	1.34	20	40%	death
41	Ningappa	67	male	978843	yes	yes	no	37.7	100	36	170/100	ricketssial fever	no	2.88	2.1	1.37	16	25%	death
42	Prabhakar	52	male	978974	no	no	no	38.3	120	34	80/50	bilateral lower limb cellulitis	yes	10.92	1.2	9.1	20	40%	death
43	Akshata	21	female	1002650	no	no	no	37.7	88	28	110/70	bilateral upper limb cellulitis	yes	5.69	2.3	2.47	14	15%	death
44	Vitoba	51	male	980562	no	no	no	37.7	88	28	80/50	urosepsis	yes	17.68	3.4	5.2	30	75%	death
45	Narayan	61	male	980443	yes	yes	no	38.3	120	40	80/40	fungal pneumonia	yes	1.89	2.6	0.72	19	25%	improved
46	Lata	50	female	993079	yes	yes	no	37.7	128	34	100/60	left lower lobe pneumonia	no	2.22	2.6	0.85	22	40%	improved
47	Basamma	65	female	1002940	no	no	no	37.7	120	38	100/70	right upper limb cellulitis	yes	7.92	1.4	5.65	28	55%	death
48	Shabbir	37	female	992660	no	no	no	37	120	30	80/60	left lower limb cellulitis	yes	3.16	2.8	1.12	18	25%	death
49	RenukaLadawa	29	female	979426	no	no	no	38.8	100	36	110/70	viral infection	no	1.89	2.6	0.76	9	8%	improved
50	Akkatai	62	female	979432	no	no	no	37.7	130	48	40/20	bilateral pneumonia	yes	9.83	3.4	2.89	30	75%	death
51	Chandubai	78	male	978907	no	no	yes	37	128	30	110/70	abdominal infection	no	1.19	2.9	0.41	23	40%	improved
52	Dasharath	85	male	979720	no	no	no	38.3	110	40	100/60	bilateral pneumonia	no	2.4	3.8	0.68	33	75%	improved

53	Shobhana	52	female	979534	no	no	no	38.8	130	43	70/40	urosepsis	yes	6.87	2.4	2.86	24	40%	death
54	Basanagouda	77	male	979706	yes	yes	no	38.3	145	36	130/70	urosepsis	no	1.49	4.1	0.36	41	85%	death
55	Shivalingayya	56	male	979849	yes	no	no	38	110	26	110/70	acute cholangitis	no	3.75	3	1.25	19	25%	improved
56	Mainuddin	44	male	978862	no	no	no	38.8	120	34	110/90	left lower lobe pneumonia	no	1.15	4.2	0.27	5	8%	improved
57	Ballappa	28	male	975031	no	no	no	38	110	40	100/60	left lower lobe pneumonia	no	1.9	3	0.63	20	40%	death
58	Shankar	62	male	979472	no	no	no	37.7	96	40	80/60	bilateral pneumonia	yes	6.86	1.5	4.57	34	75%	death
59	Dundavva	85	male	979802	no	no	no	38.3	142	46	100/60	bilateral pneumonia	yes	2.76	2.2	1.25	23	40%	death
60	Kavita	30	female	979694	no	no	no	38	150	46	80/50	right lower lobe pneumonia	yes	8.65	2.8	3.08	28	55%	death
61	Shirish	65	male	980279	yes	yes	no	37	130	40	70/30	abdominal infection	yes	9.25	1.8	5.13	35	85%	death
62	Sayer	27	male	980029	no	no	no	38	110	26	100/50	bilateral pneumonia	yes	1.74	2.6	0.66	10	15%	improved
63	Digambar	65	male	980558	yes	yes	no	38.8	116	30	80/60	left lower lobe pneumonia	yes	5.68	3.4	1.67	24	40%	death
64	Chintu	75	male	980511	no	no	no	38.3	90	44	80/60	left lower limb cellulitis	yes	6.89	3.4	2.02	16	25%	improved
65	Vishwanath	89	male	980491	yes	no	no	38	120	26	90/60	urosepsis	no	2.5	4	0.62	28	55%	improved
66	Shivabai	60	female	969658	no	no	no	36.9	90	28	110/70	bilateral pneumonia	no	1.04	2.8	0.37	14	15%	death
67	Govishiddappa	65	male	978736	no	no	no	38.8	100	34	70/30	leptospirosis	no	5.4	2.1	2.57	15	25%	improved
68	Jamalsab	46	male	980932	no	no	no	38.3	130	42	50/20	viral fever	yes	5.03	1.5	3.35	24	40%	death
69	Gokuldas	75	male	980891	yes	no	no	38.8	120	42	110/90	right lower lobe pneumonia	no	3.54	3.9	0.9	28	55%	improved
70	Kasturi	55	female	980839	no	no	no	37.7	124	36	90/60	right buttock gangrene	yes	7.2	1.7	4.23	22	40%	death
71	Yallappa	22	male	981595	no	no	no	38.3	130	38	120/80	bilateral pneumonia	yes	1.69	2.3	0.73	19	25%	improved
72	Anushka	25	female	981465	no	no	no	37.7	100	32	90/60	abdominal infection	yes	3.2	2.5	1.28	8	8%	improved
73	Salauddin	52	male	983025	yes	yes	no	37.7	110	38	180/100	bilateral pneumonia	no	5.47	3.5	1.56	19	25%	death
74	Ullappa	45	male	982575	no	no	no	37.7	130	32	80/60	viral fever	yes	1.93	2.1	0.91	15	25%	improved
75	savita	60	female	981975	no	no	no	36.6	110	32	70/50	viral fever	yes	10.42	2.5	4.16	21	40%	death
76	Hanumantappa	21	male	982426	no	no	no	37.7	140	50	110/70	bilateral pneumonia	no	10.4	3.1	3.35	28	55%	death
77	Bhimavva	66	female	983862	no	no	no	37.7	120	30	90/50	urosepsis	yes	18.92	1.4	13.5	16	25%	death
78	Chnadra	59	female	983083	yes	no	no	37.2	110	30	100/60	abdominal infection	no	3.05	3.8	0.8	16	25%	improved
79	Ajjappa	70	male	983838	no	no	no	38.8	120	40	90/60	left lower limb cellulitis	yes	2.08	2.8	0.74	22	40%	improved
80	Chinamma	82	female	986214	no	no	no	38.8	100	32	140/90	bilateral pneumonia	no	2.33	3.4	0.68	10	15%	improved
81	Iranna	65	male	985405	no	no	no	38.3	100	40	90/60	left gluteal region abscess	yes	3.71	1.9	1.95	20	40%	death
82	Vaman	84	male	987043	no	no	no	36.6	98	28	100/50	bilateral pneumonia	no	4.08	3	1.36	31	75%	death
83	Laxmi	75	female	987254	yes	yes	no	37.7	100	40	80/50	bilateral pneumonia	yes	2.07	1.9	1.08	26	55%	death

84	Manjula	60	female	986859	yes	yes	no	37	110	40	80/40	urosepsis	yes	7.42	3.6	2.06	37	85%	death
85	Yallawwa	48	female	986945	no	no	no	38.8	124	36	60/20	bilateral pneumonia	yes	2.59	2.4	1.07	16	25%	improved
86	Mohammad Nayeem	42	male	986011	no	yes	no	39.4	120	32	40/20	PCP pneumonia	yes	4.1	3.3	1.24	28	55%	death
87	Namdev	64	male	987443	no	no	no	38.3	142	40	60/20	bilateral pneumonia	yes	4.08	3	1.36	29	55%	death
88	Appasaheb	65	male	986788	no	no	no	37.7	170	30	130/70	viral infection	no	1.44	2.8	0.51	24	40%	improved
89	Hanumavva	50	female	987897	no	no	no	37	100	34	80/40	viral infection	yes	10.87	2.3	4.72	17	25%	death
90	Renuka	45	female	985970	yes	yes	no	38.3	120	40	80/50	right upper limb necrotising fascitis	yes	4.32	2.7	1.6	24	40%	death
91	Shyam	68	male	988790	yes	yes	no	38	140	40	110/70	viral infection	no	4.83	2.8	1.72	28	55%	death
92	Chandrakant	85	male	989791	no	no	no	38.3	110	36	70/40	bed sore	yes	4.03	2.5	1.61	30	75%	death
93	Subdhara	65	female	990245	no	yes	no	37.7	130	30	90/70	viral infection	yes	4.16	2.5	1.66	18	25%	death
94	Laxman	69	male	990264	no	yes	no	38.8	110	40	80/60	bilateral pneumonia	yes	2.2	3.1	0.7	27	55%	improved
95	Malan	70	female	991096	yes	yes	no	38.3	34	40	90/60	bilateral pneumonia	yes	0.74	4	0.18	36	85%	death
96	Shankar rao	83	male	991778	yes	no	yes	38.8	110	34	80/50	bilateral pneumonia	yes	3.85	3	1.28	24	40%	death
97	Amaresh	44	male	990919	no	no	no	38	90	28	110/70	viral infection	no	2.63	3	0.87	9	8%	improved
98	Yellamma	65	female	1014796	no	no	no	37.7	140	42	80/50	right lower lobe pneumonia	yes	11.44	1.1	10.4	19	25%	death
99	Nirmala	55	female	1013803	yes	no	no	38.3	120	32	80/50	acute appendicitis	yes	3.86	2.4	1.6	24	40%	death
100	Babajan	62	male	1014477	yes	yes	no	37.7	110	28	130/80	left lower lobe pneumonia	no	5.54	4.2	1.31	21	40%	death

ANNEXURE-V

KEY TO MASTER CHART

Htn	-	Hypertension
DM	-	Diabetes Mellitus
IHD	-	Ischemic Heart Disease
L/A ratio	-	Serum lactate albumin ratio
APACHE II	-	Acute Physiology and Chronic Health Evaluation II