STUDY ON THROMBOCYTOSIS AS A PREDICTOR OF SERIOUS BACTERIAL INFECTION IN YOUNG INFANTS

DISSERTATION SUBMITTED FOR THE DEGREE OF

M.D BRANCH VII

PEADIATRIC MEDICINE

REG.NO. 201717104

MAY 2020

MADURAI MEDICAL COLLEGE , MADURAI

THE TAMIL NADU DR.M.G.R.MEDICAL UNIVERSITY

CHENNAI, TAMIL NADU

CERTIFICATE

This is to certify that the dissertation entitled **"STUDY ON THROMBOCYTOSIS AS A PREDICTOR OF SERIOUS BACTERIAL INFECTION IN YOUNG INFANTS"** is the bonafide work of **Dr. M.NITHYA** in partial fulfilment of the university regulations of the Tamil Nadu Dr. M.G.R Medical University, Chennai, for M.D Degree Branch VII – PAEDIATRIC MEDICINE examination to be held in April 2020.

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This is to certify that the dissertation entitled "**STUDY ON THROMBOCYTOSIS AS A PREDICTOR OF SERIOUS BACTERIAL INFECTION IN YOUNG INFANTS"** to the faculty of Pediatrics, The Tamil Nadu Dr. M.G.R Medical University, Chennai in partial fulfillment of the requirement for the award of M.D Degree Branch VII (PAEDIATRIC MEDICINE) is a bonafide research work carried out by him under our direct supervision and guidance.

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CERTIFICATE

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DECLARATION

I, **Dr. M.NITHYA**, solemnly declare that the dissertation titled **"STUDY ON THROMBOCYTOSIS AS A PREDICTOR OF SERIOUS BACTERIAL INFECTION IN YOUNG INFANTS"** has been conducted by me at Institute of Child Health and Research Centre, Madurai under the guidance and supervision of **Prof.Dr.D.RAJ KUMAR M.D.**

This is submitted in part of fulfillment of the regulations for the award of M.D Degree Branch VII (Paediatric Medicine) for the April 2020 examination to be held under The Tamil Nadu Dr. M.G.R Medical University, Chennai. This has not been submitted previously by me for any Degree or Diploma from any other University.

Place : Madurai **Dr. M.NITHYA**

Date :

ACKNOWLEDGEMENT

First, I would like to thank the almighty for giving me this opportunity. My sincere thanks to **Prof. Dr. K.Vanitha** Dean, Government Rajaji Hospital and Madurai Medical College for permitting me to do this study and utilize the institutional facilities.

I express my sincere thanks and gratitude to **Prof. Dr.Balasankar** Professor and Director I/C, Institute of Child Health & Research Centre, Madurai, for his able supervision, encouragement, valuable suggestions and support for this study. I would like give my sincere thanks to **Prof.Dr.D.Rajkumar** for his guidance, critical review, constant encouragement and full support rendered in every aspect of this study..

I would extend my sincere thanks to **Prof. Dr. Nandhini, Prof. Dr. M. Balasubramaniam** for their valuable advice and encouragement at every stage of this study.

I wish to express my sincere thanks to my Assistant Professors of

Pediatrics, **Dr.P.Kannan , Dr. A.N. Karthick** for their constant guidance,

encouragement and support throughout my study.

I also extend my thanks to Dr. P. Ramasubramaniam, Dr. B.vanitha

Dr. K. Ramya **,** Dr. S. Murugesalakshmanan, Dr.R.Suresh ,Dr.S.Sonia Rosalind Martina ,Dr. J.balasubramanian, Dr.R.Venkatramanan, DR, A.Abubackar siddiq, Dr.T.Suganthi for their guidance, supervision, valuable suggestions and support throughout this study.

I thank the Institutional Ethical Committee for granting me permission to conduct the study. I also express my gratitude to all my fellow **Postgraduates** for their kind cooperation in carrying out this study and for their critical analysis.

I thank the institute of microbiology, Department of pathology of Government Rajaji hospital , Madurai for their co-operation throughout my study.

Last but not the least, I submit my heartfelt thanks to the children and their parents for extending full co –operation to complete my study successfully.

CONTENTS

INTRODUCTION

The most frequent clinical condition that requiring medical attention by the pediatrician is fever. Febrile infants without localizing signs are challenge to evaluate because they display limited signs of infection making it difficult to clinically distinguish between a serious bacterial and self –limited viral illness.[1,2] The etiology and evaluation of fever without localizing signs depends on the age of the child. It is classified into the age group less than a month1month to 3 months and beyond 3 months to 36 months old. Fever without a focus-refers to a rectal temperature of 38°C (100.4°F) or higher as the sole presenting feature. The viral infections are more common than the bacterial infections . The prevalence of bacterial infection said to be 20 percent to 25 percent of total febrile infants less than 90 days old.

Serious bacterial infection including bacteremia, urinary tract infection, meningitis, pneumonia and bone and soft tissue infections. Urinary tract infection is the most common serious bacterial infection. E.coli is the most common pathogen identified. Other organisms are group B streptococcus, L.monocytogens, Salmonella enteritidis. Those infants who are suspected to have a serious bacterial infection should undergo detailed evaluation. It is very difficult to define the serious bacterial infection by the single test. Laboratory markers which have been used to

predict Serious bacterial infection include raised white blood cell (WBC) counts, C-reactive protein (CRP), procalcitonin (PCT) and even interleukin-6 levels[2]. WBC count, though easily available and used widely as a predictor of SBI, but it does not comparable with the markers of recent ones like PCT .

Because of the widely available automated hematology analyzers the platelet count become more accurate now .Thrombocytosis is an elevation in the peripheral blood platelet count to values more than 4.5 lakh/mm^3. Thrombocytosis percentage in pediatric population is 3% to 15%. [8]Thrombocytosis in this age group most commonly due to infective etiology. The next most common cause of thrombocytosis in Indian pediatric population is iron deficiency anemia. Chronic hemolytic state also associated with thrombocytosis. Primary thrombocytosis is young pediatric population is extremely rare. Infections of the respiratory, urinary and gastrointestinal tract and the bones and meninges are the most common causes of reactive thrombocytosis. Higher counts are more common in neonates and infants.

Platelets act like an acute phase reactant. During infections, release of interleukin-6 enhances megakaryopoiesis directly and indirectly by stimulating hepatic thrombopoietin.[12-14] However, the platelet count has not been evaluated as a predictor of SBI among febrile infants Hence the

present study proposed to identify the simple test-presence of thrombocytosis which detect the serious bacterial infection in young infants with high predictive value and cost effectiveness .

FEVER WITHOUT FOCUS

Fever evaluation of children traditionally classified into 3 age groups. These are neonates or infants to 1 month of age, infants >1 month to 3 months of age, and children >3 months to 3 years of age. Children in high-risk groups require a more aggressive diagnostic approach and consideration of a broader differential diagnosis.[4] The high risk group include children with sickle cell disease, asplenia, complement or properdin deficiency, congenital heart disease, central venous line, malignancy.

The large majority of children with fever without localizing signs in the 1-3 months age group likely have a viral syndrome. In contrast to bacterial infections, most viral diseases have a distinct seasonal pattern: respiratory syncytial virus and influenza A virus infections are more common during the winter, whereas entero virus and parecho virus infections usually occur in the summer and fall. Fever in this age group should always suggest the possibility of serious bacterial disease but the most common is viral etiology. Organisms to consider include E. coli, group B Streptococcus, Listeria monocytogenes, Salmonella enteritidis,

Neisseria meningitidis, Streptococcus pneumoniae, Hemophilus influenzae type b, and Staphylococcus aureus[15-18].

The most common serious bacterial infection in this age group is upper urinary tract infection (pyelonephritis) and it is also more common in boys who are not undergone circumcision. And infants with urinary tract anomalies also more susceptible to get a serious bacterial disease. E. coli is the most common pathogen identified in bacteremic infants, the majority having pyelonephritis. Group B Streptococcus followed by S. aureus are the next most frequently identified pathogens causing bacteremia. Most significant blood cultures turn positive within 24 hour (91%), with 99% positive by 48 hr. Other potential bacterial diseases in this age group include otitis media, pneumonia, omphalitis, mastitis, and other skin and soft tissue infections.

Ill-appearing (toxic) febrile infants 3 months of age or younger age group should be hospitalized and started on antibiotic therapy[17].Antimicrobial therapy should be initiated after obtaining of blood, urine, CSF for cultures .

Ampicillin (to cover L. monocytogenes and Enterococcus) plus either ceftriaxone or cefotaxime is an effective initial antimicrobial regimen for ill-appearing infants without focal findings. This regimen is effective against the usual bacterial pathogens causing sepsis, urinary tract

infection, and enteritis in young infants. However, if meningitis is suspected because of CSF abnormalities, vancomycin should be included to treat possible penicillin-resistant S. pneumoniae until the results of culture and susceptibility tests are known. Many academic institutions have investigated the optimal management of low-risk patients in this age group with fever without a focus .

The use of viral diagnostic studies (entero viruses, parecho virus, respiratory viruses, rotavirus, and herpes virus) in combination with the Rochester Criteria or similar criteria can enhance the ability to determine which infants are at high risk for serious bacterial infections .

LOW RISK CRITERIA IN A CHILD 1 MONTH TO 3 MONTH OLD WITH FEVER

BOSTON CRITERIA: [3]

Infants are at low risk if they appear well, have a normal physical examination, and have a caretaker reachable by telephone and if laboratory tests are as follows:

• CBC: <20,000 WBC/μL

• Urine: negative leukocyte esterase

• CSF: leukocyte count less than 10×10^6/L

PHILADELPHIA PROTOCOL:[3]

Infants are at low risk if they appear well and have a normal physical examination and if laboratory tests are as follows:

• CBC: <15,000 WBC/μL; band: total neutrophil ratio <0.2

• Urine: <10 WBC/HPF; no bacteria on Gram stain

• CSF: <8 WBC/μL; no bacteria on Gram stain

• Chest radiograph: no infiltrate

• Stool: no RBC; few to no WBC

PITTSBURGH GUIDELINES:

Infants are at low risk if they appear well and have a normal physical examination and if laboratory tests are as follows:

• CBC: 5,000-15,000 WBC/μL; peripheral absolute band count <1,500/μL

• Urine (enhanced urinalysis): 9 WBC/μL and no bacteria on Gram stain • CSF: 5 WBC/μL and negative Gram stain; if bloody tap, then WBC:RBC ≤1 : 500

• Chest radiograph: no infiltrate

• Stool: 5 WBC/HPF with diarrhea

ROCHESTER CRITERIA :

Infants are at low risk if they appear well and have a normal physical examination and if laboratory findings are as follows:

- CBC: 5,000-15,000 WBC/μL; absolute band count ≤1,500/μL
- Urine: <10 WBC/HPF at 40×
- Stool: <5 WBC/HPF if diarrhea

Febrile infants in whom a virus has been detected are at low or no risk of a serious bacterial infection. Well appearing infants 1-3 month of age can be managed safely using low-risk laboratory and clinical criteria as indicated in Rochester criteria if reliable parents are involved and close follow-up is assured.

Infants 1-3 months of age with fever who appear generally well;who have been previously healthy; who have no evidence of skin, soft tissue, bone, joint, or ear infection; and who have a peripheral white blood cell (WBC) count of 5,000-15,000 cells/μL, an absolute band count of <1,500 cells/μL, and normal urinalysis and negative culture (blood and urine) results are unlikely to have a serious bacterial infection. The negative predictive value with 95% confidence of these criteria for any serious bacterial infection is >98% and for bacteremia is >99%.

Among serious bacterial infections, pyelonephritis is the most common and may be seen in well-appearing infants who have fever without a focus or in those who appear ill.[22-24] Urinalysis may be negative in infants <2 month of age with pyelonephritis. Bacteremia is present in <30% of infants with pyelonephritis. Biologic markers like procalcitonin, erythrocyte sedimentation rate (ESR), and C-reactive protein may be used in evaluation young infants with fever. Host-based microarray gene expression profiles determined on the patient's leukocytes may be able to detect RNA transcriptional patterns (bio signatures) that distinguish viral from bacterial infection .

The decision to obtain CSF studies in the well-appearing 1-3 month old infant depends on the decision to administer empirical antibiotics. If we are planned to defer the antibiotics close monitoring of clinical condition should be done a lumbar puncture not necessary at this scenario it can be planned later. If the child deteriorates clinically, a full sepsis evaluation should be performed, and intravenous antibiotics should be administered. Blood cultures should be performed all patients with suspected meningitis. Blood cultures reveal the responsible bacteria up to 90% cases of meningitis. Elevation of C-reactive protein, procalcitonin ,Erythrocyte sedimentation rate, have been used to differentiate bacterial meningitis from viral causes of meningitis. The following FIGURE 1

shows the leucocyte gene expression pattern that differs in bacterial and vial infections.

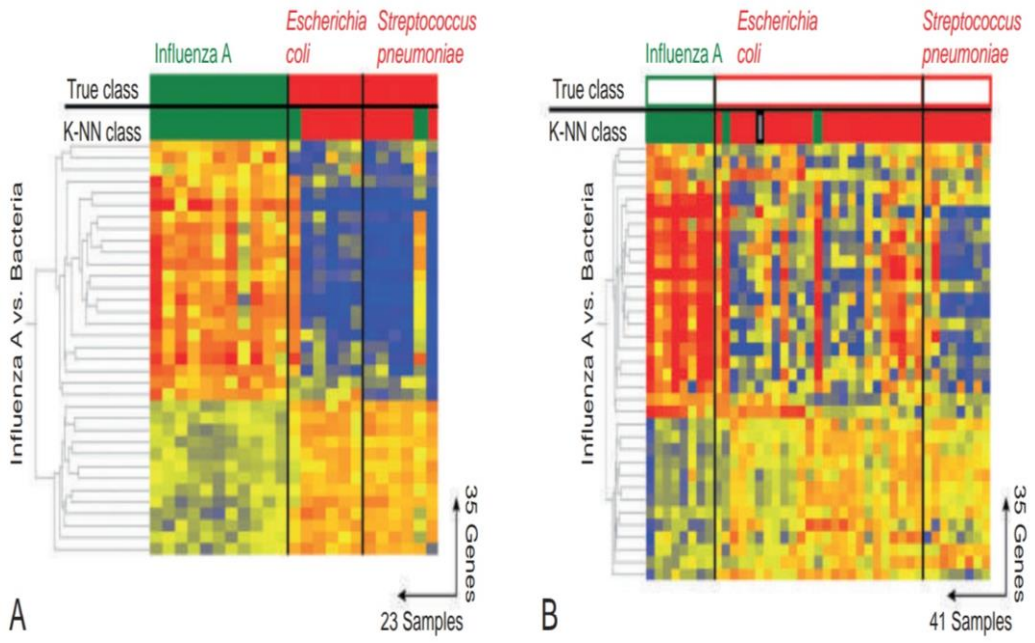


FIGURE 1: Gene expression patterns may discriminate viral vs bacterial infections. A, Set of 35 genes that discriminates patients with viral infections (influenza A; green) and bacterial infections (Escherichia coli and Streptococcus pneumoniae; red). The discriminative pattern is shown by the gene expression patterns in the heat map (red indicates overexpressed genes; blue indicates underexpressed genes). B, The diagnostic signature was tested in an independent set of patients that confirmed its accuracy. K-NN indicates nearest neighbor algorithm. (Modified from Ramilo O, Allman W, Chung W, et al: Gene expression patterns in blood leukocytes discriminate patients with acute infections, Blood 109:20662077, 2007.

MANAGEMENT OF FEVER WITHOUT LOCALIZING SIGNS

If the Child between 1-3 months of age and temperature ≥38°C (100.4°F) the management involves two-step process[3]

1. Determine risk based on history, physical examination, and laboratory studies.

Low risk:

- Uncomplicated medical history
- Normal physical examination
- Normal laboratory studies
- Urine: negative leukocyte esterase, nitrite and <10 WBC/HPF
- Peripheral blood: 5,000-15,000 WBC/mm3; <1,500 bands or band: total neutrophil ratio <0.2
- Stool studies if diarrhea (no RBC and <5 WBC/HPF)
- CSF cell count (<8 WBC/μL) and negative Gram stain
- Chest radiograph without infiltrate.

2. If child fulfills all low-risk criteria, administer no antibiotics, ensure follow-up in 24 hr and access to emergency care if child deteriorates. Daily follow-up should occur until blood, urine, and CSF cultures

are final. If any cultures are positive, child returns for further evaluation and treatment.

3. If child does not fulfill all low-risk criteria, hospitalize and administer parenteral antibiotics until all cultures are final and definitive diagnosis determined and treated

COMPLETE HEMOGRAM

SYSMEX KX21-N

It is a hematology analyzer gives the information about RBC, WBC, HGB, PLT, NEUT %, LYMPH% MXD%, RDW-SD, PDW, MPV.[25]

Up to 60 samples per hour can be done.

ACUTE PHASE REACTANTS

Conventionally used acute-phase reactants are erythrocyte sedimentation rate and C-reactive protein. They are used as markers for inflammation and as a measure of "sickness index" in infectious and also noninfectious conditions.

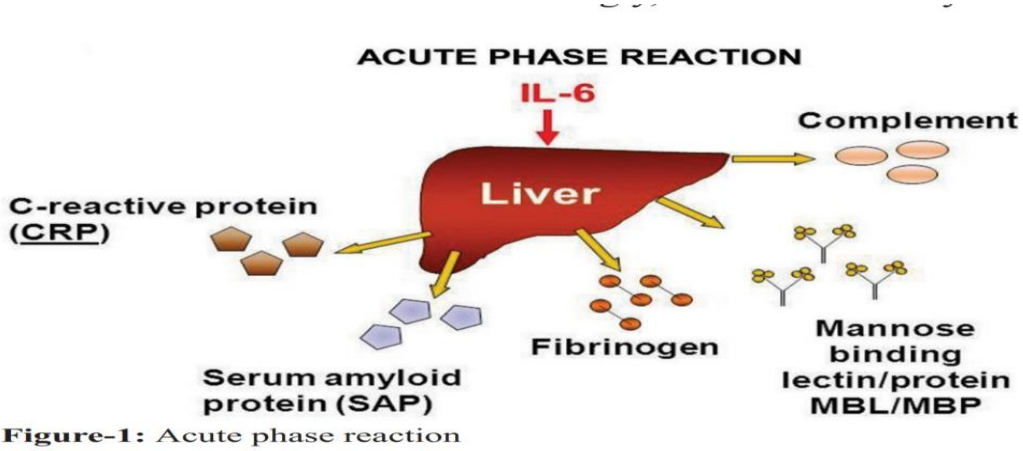


Figure-1: Acute phase reaction

FIGURE 2: shows the release of APR in response to infections

Important APRs include

Erythrocyte sedimentation rate (ESR),

C-reactive protein(CRP),

Procalcitonin (PCT),

Serum amyloid A (SAA) protein,

Fbrinogen,

Ferritin,

Alpha-1 antitrypsin,

Haptoglobin,

Alpha-1 acid glycoprotein,

Ceruloplasmin,

Complement proteins C3 and C4.

The ESR , CRP, are currently the most commonly used acute-phase markers in clinical practice. Procalcitonin as a marker in bacterial infections has generated a lot of interest in the last decade, and there is increasing evidence to support its usefulness in specific infections. Other acute-phase markers are not used regularly in clinical practice for many reasons such as difficulty in measuring levels, lack of standardization and uniformity in reporting, and paucity of clinical data.

ERYTHROCYTE SEDIMENTATION RATE

The ESR measures the distance that a vertical column of anticoagulated blood has fallen in one hour. Any condition that affects red blood cells or fibrinogen levels alters the value of the ESR. This is drawback with ESR. So it is not commonly used. Non inflammatory conditions such as age, anemia, pregnancy, drugs, and obesity can cause elevation in ESR. It may be elevated up to 60 mm/hour in patients with chronic renal insufficiency and nephrotic syndrome. The ESR rises within 24–48 hours of the onset of inflammation and falls back slowly with resolution of inflammation.

C-REACTIVE PROTEIN

C-reactive protein has some advantages over ESR because it seems to be a better measure of an acute-phase response and is also more sensitive than ESR to subtle changes in the acute-phase response . It is primarily produced by the liver in response to cytokines, mainly IL-6.[26] The sole determinant of circulating CRP concentration is the synthesis rate, which increases proportionally with the intensity of the inflammatory process stimulating CRP production, and vice-versa. In healthy individuals, the CRP level is generally below 2 mg/L but can be up to 10 mg/L. There may be slight variation with age, sex, and race In infants CRP considered elevated if it is above 20 mg/L. It has a half-life of

approximately 19 hours, begins to rise after 12–24 hours, and peaks within 2–3 days. CRP latex agglutination test done by the following methods after making all the test reagents into room temperature place a drop of serum positive control and negative control on a separate circle the add a regent to each drop of circle and observe for agglutination.[26]

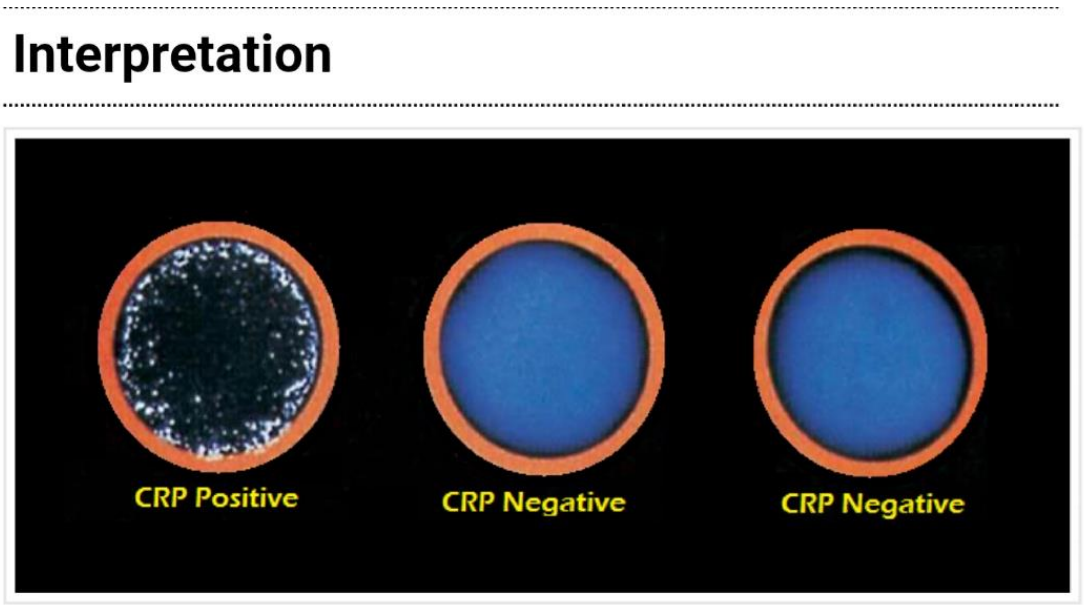


FIGURE 3: CRP- Latex card test –qualitative test

Positive : agglutination of latex particles, indicating the presence of C-reactive protein at significant and detectable .

Negative- no agglutination

PROCALCITONIN

Procalcitonin is the peptide prehormone of calcitonin that, under normal conditions, is secreted by the C-cells of the thyroid gland in response to hypercalcemia. FIGURE 3 shows the structure of procalcitonin

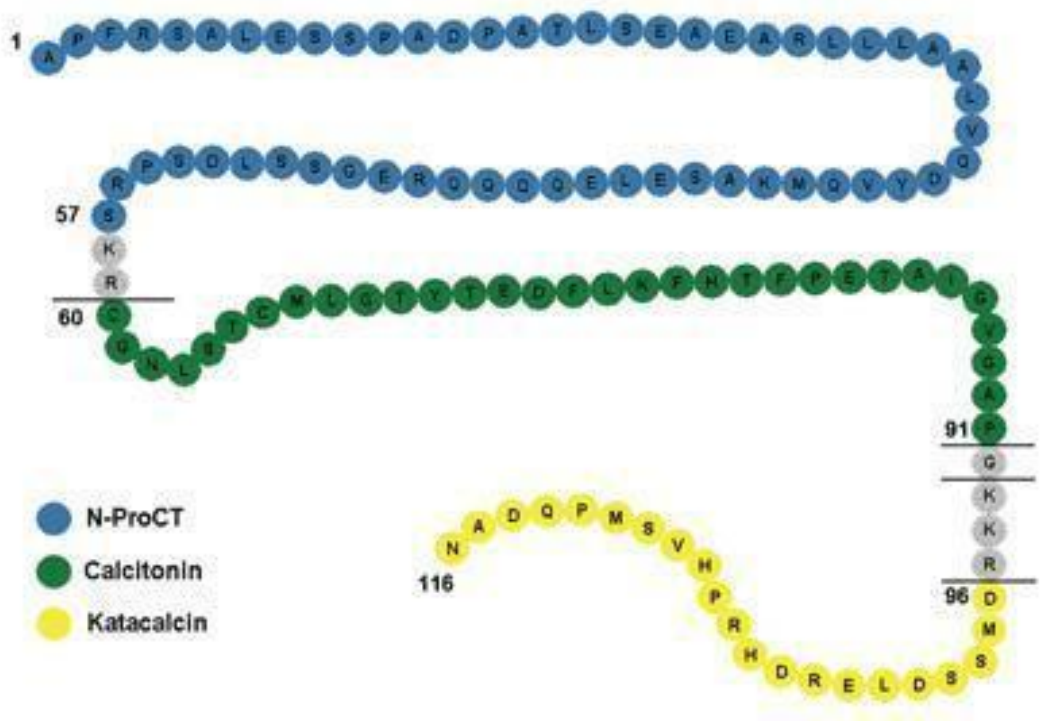


FIGURE 4: Procalcitonin structure- 116 Amino acid peptide-precursor of hormone Calcitonin.

In systemic inflammatory conditions and, in particular, bacterial infections, lipopolysaccharide of the bacterial cell membrane stimulate the release of calcitonin into circulation. PCT secretion is stimulated by various cytokines such as IL-1, IL-6, and tumor necrosis factor-alpha. In viral infections, the PCT production is downgraded likely from increased interferon gamma production . Procalcitonin has several advantages over CRP and ESR as a biological marker.

Serum concentrations of PCT are normally <0.05 ng/ml. Procalcitonin levels become detectable within 3–4 hours and peak within

6–24 hours, which is earlier than both CRP and ESR. Elevated PCT levels are not seen in other noninfectious inflammatory conditions. The sensitivity for differentiating bacterial from viral infections was also higher for PCT compared to other acute phase reactants which are commonly used. Levels of procalcitonin in varying clinical conditions given in FIGURE 5 and FIGURE 6

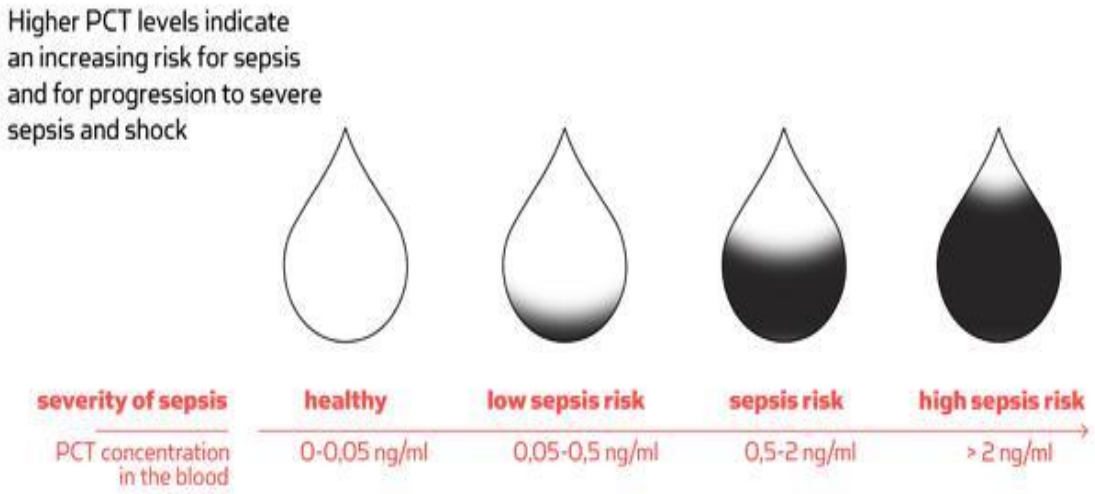


FIGURE 5 Levels of procalcitonin in varying clinical condition**.**

FIGURE 6 : Levels of procalcitonin in varying clinical condition**.**

C-REACTIVE PROTEIN VERSUS PROCALCITONIN

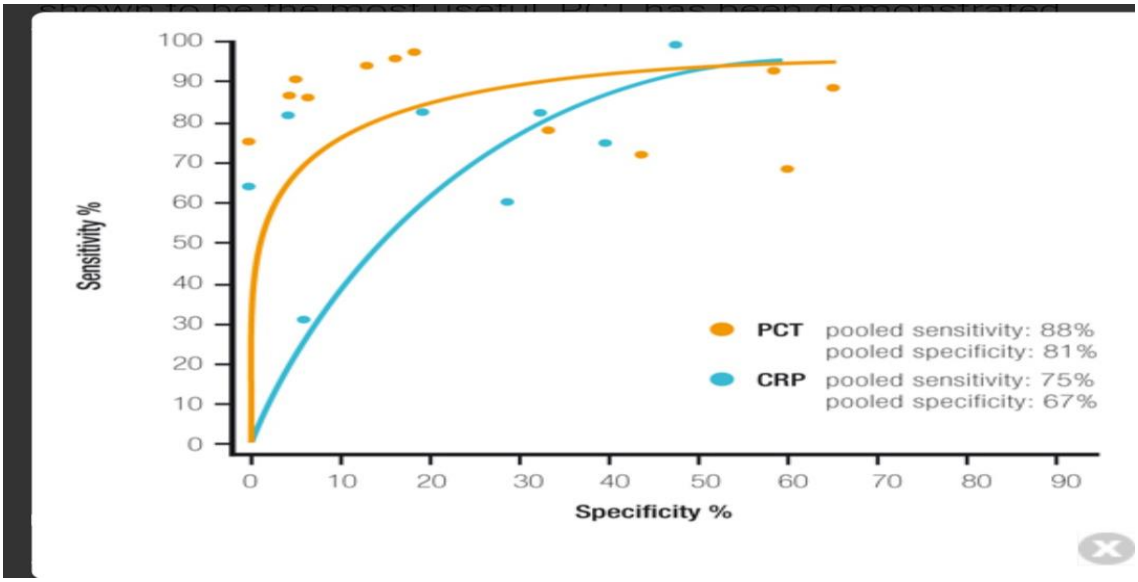


FIGURE 7: Comparison of diagnostic performances of various markers for diagnosis of bacterial infection

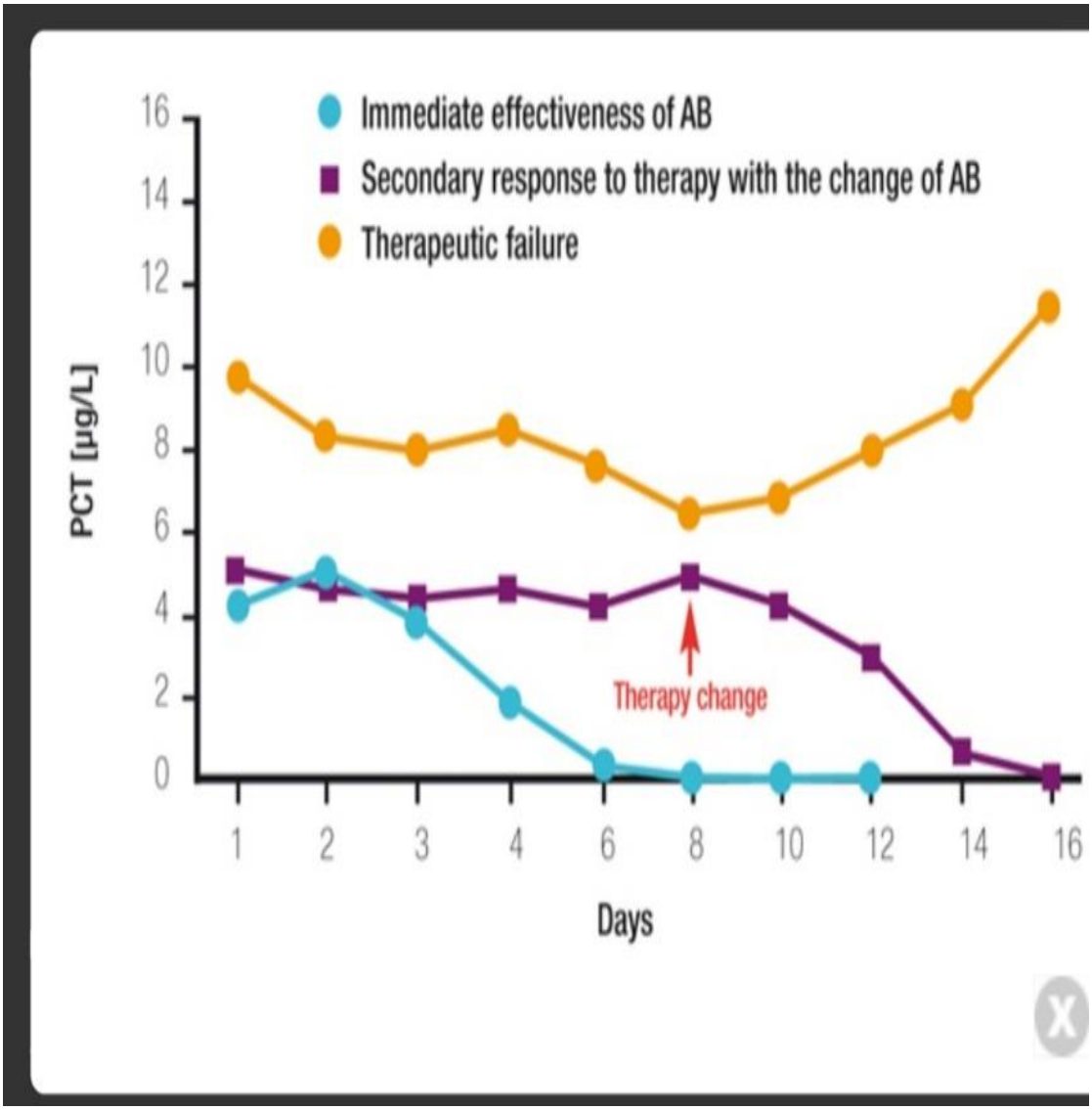


FIGURE 8 : Typical course of PROCALCITONIN serum level according to patient' response to antibiotic therapy.

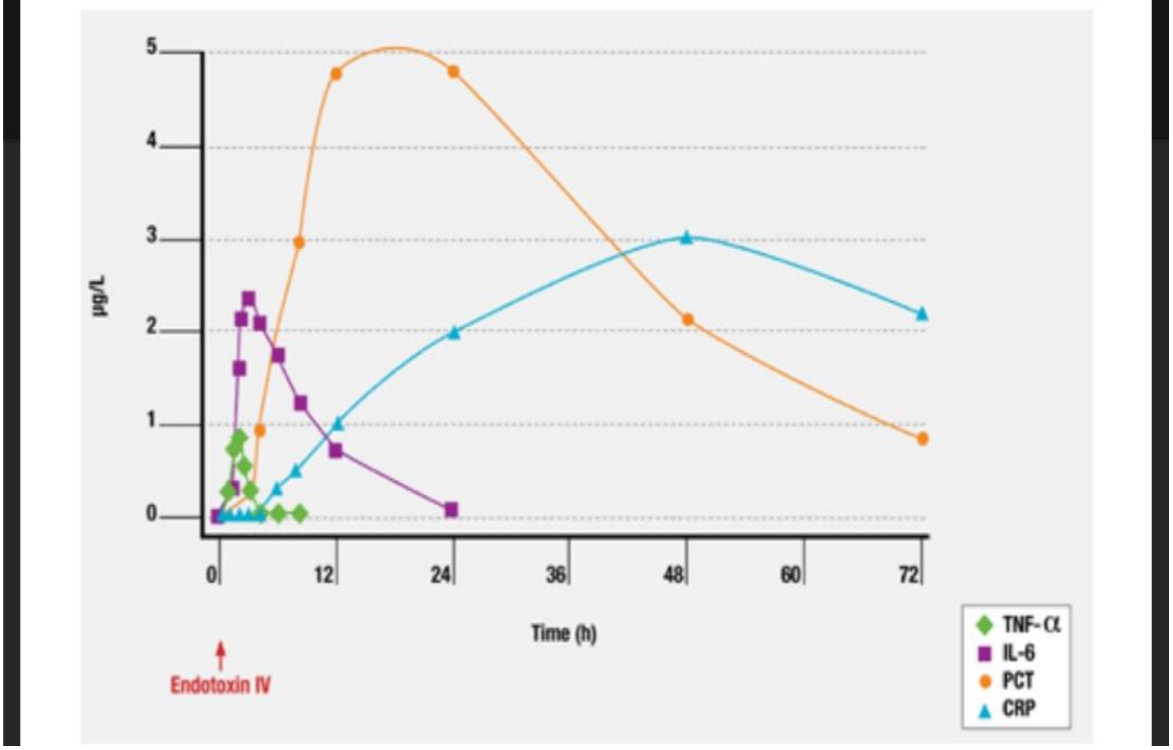


FIGURE 9: Kinetics of procalcitonin compared to other inflammatory markers upon infection

ADVANTAGES OF PROCALCITONIN

In addition to high degree of specificity for bacterial infections ,PCT affords superior kinetics in relation to biomarkers such as CRP and lactate. Typically rising within 3 to 4 hours of an infectious challenge, peaking within 6 to 24 hours, and correlating with the severity of the infection, circulatory levels of PCT remain elevated until appropriate therapy is provided, declining only as the infection resolves. PCT kinetics given in FIGURE 9.

BLOOD CULTURE

Following cleaning of the venous site with 70% Alcohol and 10% povidone iodine, 1-2ml of blood was aspirated and injected to sodium thioglycolate broth in the ratio of one part of blood to ten parts of broth. (1ml blood for every10 ml broth).

Culture bottles were sent to microbiology lab, incubated at 37 degree Celsius for 24hour. Once properly incubated subcultures were done, by using blood agar plates, chocolate agar plates, Mac conkey agar, nutrient agar.

Growth once identified was sent for standard biochemical test panel . From the Growth, isolates were identified with the help of bacteriological processing technique and their peculiar appearance according to the media used. Gram smear methods, haemolytic methods , biochemical tests including catalase test, coagulase test, urease test, triple sugar technique, oxidase test etc were used. Antibiotic sensitivity and resistance were studied by using Muller Hinton plates.[24] Antibiotic discs were placed at the growth area in muller hinton agar plate. Modified Kirby Bauer disc diffusion method was used for antiobiotic susceptibility. Clinical and Laboratory Standards Institute (CLSI) guidelines were followed for measuring zone diameter.

BACT/ALERT-3D

It is an totally automated test system capable of incubating, agitating continuously monitoring aerobic and anerobic media inoculated with patients specimens suspected of having bacteremia, fungemia.

PRINCIPLES OF DETECTION

If microorganisms present in the test sample carbon dioxide produced as the microorganisms metabolize substrates in the culture medium when the growth of microorganisms produces carbon dioxide colour of the sensor in the bottom of culture bottle changes from dark to light .(FIGURE 10)

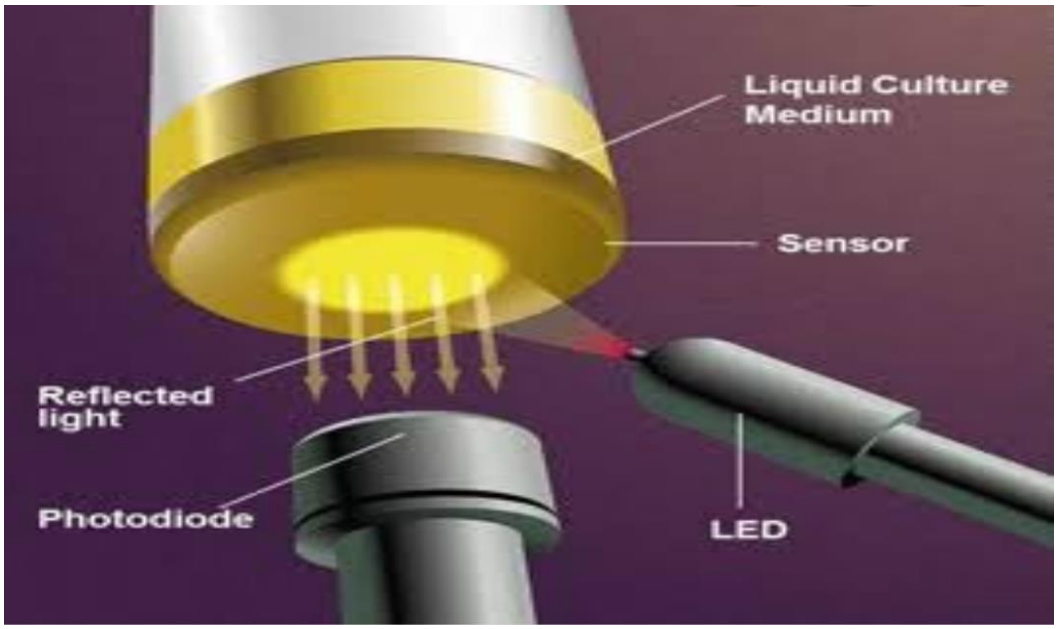


FIGURE 10 : principle of BACT/ALERT-3D

A light emitting diode projects light in to the sensor. the light reflected is measured by the photo detector as more carbon dioxide is generated more light is reflected this information is compared to the initial sensor reading .if there is high initial carbon dioxide content, an unusually high carbon dioxide is production, and/or a sustained production of carbon dioxide , the sample is determined to be positive.

If the carbon dioxide level does not change significantly after a specific number of days at optimal condition the sample determined to be negative .**False positive results :**

More the 10^5 leukocytes/ml

If the bottles are filled with more than a required amount of blood

Above conditions blood cell count is high enough to trigger acceleration of rate algorithms

URINE EXAMINATION:

TRANS URETHRAL BLADDER CATHETERIZATION:

It is safe and effective method of obtaining urine samples for culture. Technique: For girl child the child is restrained in the supine position. The anterior urethra is cleansed with povidine iodine solution. The lubricant jelly is applied end of appropriately sized catheter. In boys the foreskin of glans is gently retracted till the complete visualization of

urethra. The urethra is straightened by using the non -dominant hand to hold the penis .gentle retraction is applied.as the catheter is being advanced it can be palpated along the posterior aspect of penis resistance being encountered at the base of the penis due to contraction of external bladder sphincter.

PROCESSING OF URINE SAMPLES:

The urine samples should be sent immediately to the bacteriology because the bacteria will continue to proliferate in the warm medium of freshly voided urine leading to increased bacteriological count. If not possible store at 4˚c. cooling stop the growth of bacteria until it is incubated. The diagnosis of UTI requires lab confirmation of significant bacteriuria and pyuria.

Significant bacteriuria defined as recovery of ≥ 100,000 CFU /ml of uropathogen from a clean catch specimen , ≥ 50,000 CFU/ml of a single pathogen , ≥ 1000 CFU/ml of uropathogenic bacteria from a suprapubic aspirate.

Pyuria is defined by positive leucocyte esterase (≥1+) on dipstick analysis , ≥5 WBC/high powerfield on a standardized microscopy.

CHEST RADIOGRAPH:

A chest radiograph is helpful in identifying the source of infection in an infant with atleast one sign of pulmonary disease. If chest radiograph showed a alveolar disease (consolidation or air bronchogram) ofr bronchopneumonia(diffuse bilateral pattern with increased peribronchial markings) it is suggestive of bacterial pneumonia.

CSF ANALYSIS

Indicated if the infant is ill appearing and diagnostic evaluation identifies the high risk for invasive bacterial infections ,had a history of seizures.

CSF should be sent for protein, sugar cell count bacterial culture, and gram stain Suggest lumbar puncture with collection of CSF studies for patients that have any one of the results

WBC ≤ 5000/μL or ≥ 15 000/μL :Absolute band count > 1500

PCT >0.5 ng/ml

CRP >20 mg/ L

Pneumonia on chest radiograph

Positive urine microscopy

DEFINITION OF SERIOUS BACTERIAL INFECTION:

Serious bacterial infection is defined as invasive infections such as bacteremia , Urinary tract infection (UTI) pneumonia, bacterial meningitis, and infection of skin and soft tissue , bacterial gastroenteritis.[4,5]

Urinary tract infection is defined as a single known pathogen on urine culture with ≥5x10000 Colony-forming units (CFU) /ml of urine obtained by urethral catheterization. The diagnosis of UTI is based on culture of properly collected specimen.

Pneumonia is defined as the presence of a focal infiltrate on chest radiographs.

Occult bacteremia is defined as pure growth of a single pathogenic micro-organism on blood culture of a febrile young infant without any apparent focus of infection on history and clinical examination.

DETAILED STUDY PROPOSAL

AIM OF THE STUDY:

To detect the incidence reactive thrombocytosis in febrile infants and

to assess the utility of platelet count as a predictor of serious bacterial infection (SBI)

MATERIALS AND METHODS

A. STUDY AREA:

The study will be carried out in Institute Of Child Health And Research Centre, Government Rajaji Hospital, Madurai.

B. STUDY DESIGN:

Hospital based prospective study was done at paediatric ward of Institute of child health and research centre, Madurai medical college, Madurai.

C. STUDY PERIOD :

Study done in the period of 6 months from April 2019 to September 2019.

D. INCLUSION CRITERIA

Infants with 1 month to 3 months of life .

Admitted with fever

(Axillary temperature > 38.5 degree C /101.4 degree F)

D. EXCLUSION CRITERIA:

Infants who are treated with antibiotics prior to presentation.

H/O recent vaccination.

Infants with anemia

Infants on corticosteroid therapy and iron supplements

(Table 1: Shows the upper and lower reference range of various age group in weeks)

HB RANGE IN INFANTS FROM 1 MONTH TO 3 MONTHS OF AGE (TABLE 1)

AGE IN WEEKS	LOWER REFERENCE INTERVAL	LOWER REFERENCE INTERVAL
4.5	11.1	15
5.5	10.8	14.2
7	10.1	13.3
9	9.6	12.7
11	9.4	12.5
12	9.3	12.4

E.STUDY PROCEDURE:

I am going to follow the cases of all infants aged 1 month to 3 months, admitted in Institute Of Child Health And Research Centre, Government Rajaji Hospital.Madurai.

Totally 140 children were recruited for this study after obtaining informed consent from their parents.

Baseline data including

- Name,
- Age/sex,
- Complaints,
- Day of illness
- Heart rate
- Respiratory rate ,
- Temperature
- Central and peripheral pulses
- Capillary refill time
- Systemic examination including Cardiovascular system, respiratory system, gastrointestinal system, central nervous system.

- Positive clinical findings were recorded .
- All patients who fulfilled the inclusion criteria undergo sepsis evaluation including WBC count, platelet count, blood culture, urine microscopy and culture and serum CRP levels. Chest xray and CSF analysis based on clinical conditions

The WBC count with differential and the platelet count were done with hematology automated laboratory equipment (Sysmex KX 21).Blood cultures were monitored by an automated system (BacT/ALERT 3D). Urine was obtained by urethral catheterization using a sterile technique. The WBC in the urine were quantified by standard microscopic examination and expressed as WBC >5 per high power field (HPF) in centrifuged sample.[9]The urine, CSF, Blood cultures were monitored using standard laboratory techniques.. UTI was the diagnosis if a single known pathogen growth ≥1000 colony forming units (cfu)/ml of urine obtained by supra pubic needle aspiration or≥100,000cfu/ml of urine obtained by urethral catheterization. The presence of a focal infiltrate on chest radiograph with clinical findings diagnosed as pneumonia.[10]Bacterial meningitis was diagnosed by CSF analysis if a positive gram stain or culture, or all of WBC >100/mm3, polymorphonuclear lymphocytes >80, protein >200mg/dl, glucose <40mg/dl or ratio of CSF/blood glucose<0.4.[11]

Those getting diagnosed as serious bacterial infection were one group and those without were categorized as non SBI group.

The study was approved by the ethics committee of the Madurai medical college, Madurai, Tamil Nadu

STATISTICAL ANALYSIS

MS excel was used for data entry and was analyzed using computer software, Statistical Package for Social Sciences (SPSS) version 16. Non-parametric data are expressed as mean with standard deviation.

For all statistical evaluations, a two-tailed probability of value <0.05 was considered significant.

REVIEW OF LITERATURE

Shumila manzoor et al conducted study in pediatric tertial care unit for a period of one year out of the 149 infants studied, the percentage of serious bacterial infection is 26.2 %. 39 infants identified as a case of SBI. Platelet count was significantly higher in infants with SBI compared to those without {Platelet count ≥ 4 lakhs /mm3 in SBI (84.6%) vs. Non SBI (542.4%). Mean platelet count 5.1 ± 1.1 in SBI vs. 3.9 ± 1.6 in non SBI which was statistically significant (P<0.05). predictability of SBI inrelation to platelet count is found to be moderate [Area under curve area under the curve: 0.760]. The combination of platelet count ≥450,000/mm3, WBC ≥15,000/mm3, C-reactive protein ≥2 mg/dl and pyuria ≥5 White blood cells (WBC) per High power field (HPF) resulted in misclassification of only 2 infants with SBI (5.1% of SBIs). The study conclude that the eactive thrombocytosis was a frequent finding in young infants with SBI. Thrombocytosis ≥450,000 cells/mm3, in combination with leukocytosis, elevated C-reactive protein (CRP) and pyuria, may help in early recognition of febrile young infants at risk for SBI.

Merin Eapen, et al Of the 120 infants studied, 24 (28%) had SBI. Platelet count was significantly higher in infants with SBI compared to those without {Platelet count ≥ 4.5lakhs /mm3 in SBI (70.3%) vs. Non SBI

(30.2%). Mean platelet count 4.82±1.4 in SBI vs. 3.9±1.2 in non SBI which was statistically significant ($p<0.05$). Thrombocytosis had moderate ability in predicting SBI (Area under curve area under the curve: 0.720). The combination of platelet count ≥450,000/mm3, WBC ≥15,000/mm3, C-reactive protein ≥1 mg/dl, pyuria ≥5 White blood cells (WBC) per High power field (HPF) and erythrocyte sedimentation rate (ESR) >30mm/hr resulted in identification of all infants with SBI. Conclusions: Thrombocytosis in combination with leukocytosis, elevated C-reactive protein, ESR, and pyuria, may help in early recognition of febrile young infants at risk for SBI.

Deepak Mishra et al The incidence of serious bacterial infection was found 43 (56.6%). Thrombocytosis, elevated C-reactive protein and pyuria were significantly higher in serious bacterial infection cases (p value <0.05). Thrombocytosis alone had the sensitivity of only 53.5%, but had specificity of 90.9%. Elevated C-reactive protein had the best sensitivity (81.4%). Combination of leukocytosis, elevated C-reactive protein, pyuria and thrombocytosis had better sensitivity (93.0%) than these parameters alone. The overall ability of platelet count to identify infants with SBI was only moderate (AUC: 0.722). Elevated C-reactive protein was found to have better ability to identify infants with serious

bacterial infection (AUC: 0.846). Conclusions: Thrombocytosis is a common finding in young infants diagnosed with serious bacterial infection. It has however, moderate ability in identifying infants with serious bacterial infection. Combining thrombocytosis with elevated C-reactive protein, leukocytosis and pyuria has better sensitivity in diagnosing serious bacterial infection than these individual parameters alone. Hence, combining these parameters may help in early prediction of febrile young infants at risk of serious bacterial infection.

.**Fouzsa et al** Main: Of the 408 infants studied, 103 (25.2%) had SBI. Platelet count was significantly higher in infants with SBI compared to those without (median 513000 /mm3 [interquartile range 455,000–598,000/mm3] vs median 398000/mm3; [interquartile range 313,000–463,000/ mm3]; P<0.001). Thrombocytosis had only moderate ability in predicting SBI (area under the curve: 0.74, 95%CI 0.70-0.79). The combination of platelet count ≥450,000/ mm3, WBC ≥15,000/mm3, C-reactive protein ≥2 mg/dL, and pyuria ≥10 WBC/hpf would lead to misclassification of 4 infants with SBI (3.9% of SBIs; negative likelihood ratio 0.08). The study was concluded that the Reactive thrombocytosis was a frequent finding in young infants with SBI. Thrombocytosis ≥450,000 cells/mm3, in combination with leucocytosis, elevated CRP and pyuria, may help in early recognition of febrile young infants at risk for SBI.

RESULTS

TABLE1-PROFILE OF STUDY POPULATION (AGE WISE)

AGE(days)	SBI	Non SBI	Total
29 - 60	16	31	47
61 - 89	28	65	93
Total	44	96	140
p value	0.779 Not significant		
chi square value	0.078		

Table 1- Of 140 infants 47 were in the age group of 29 days to 60 days old.(33%) , 93 were in the age group 61 days to 89 days old. (66%). Age determinant is not significant among SBI and non – SBI groups. (p value 0.078)

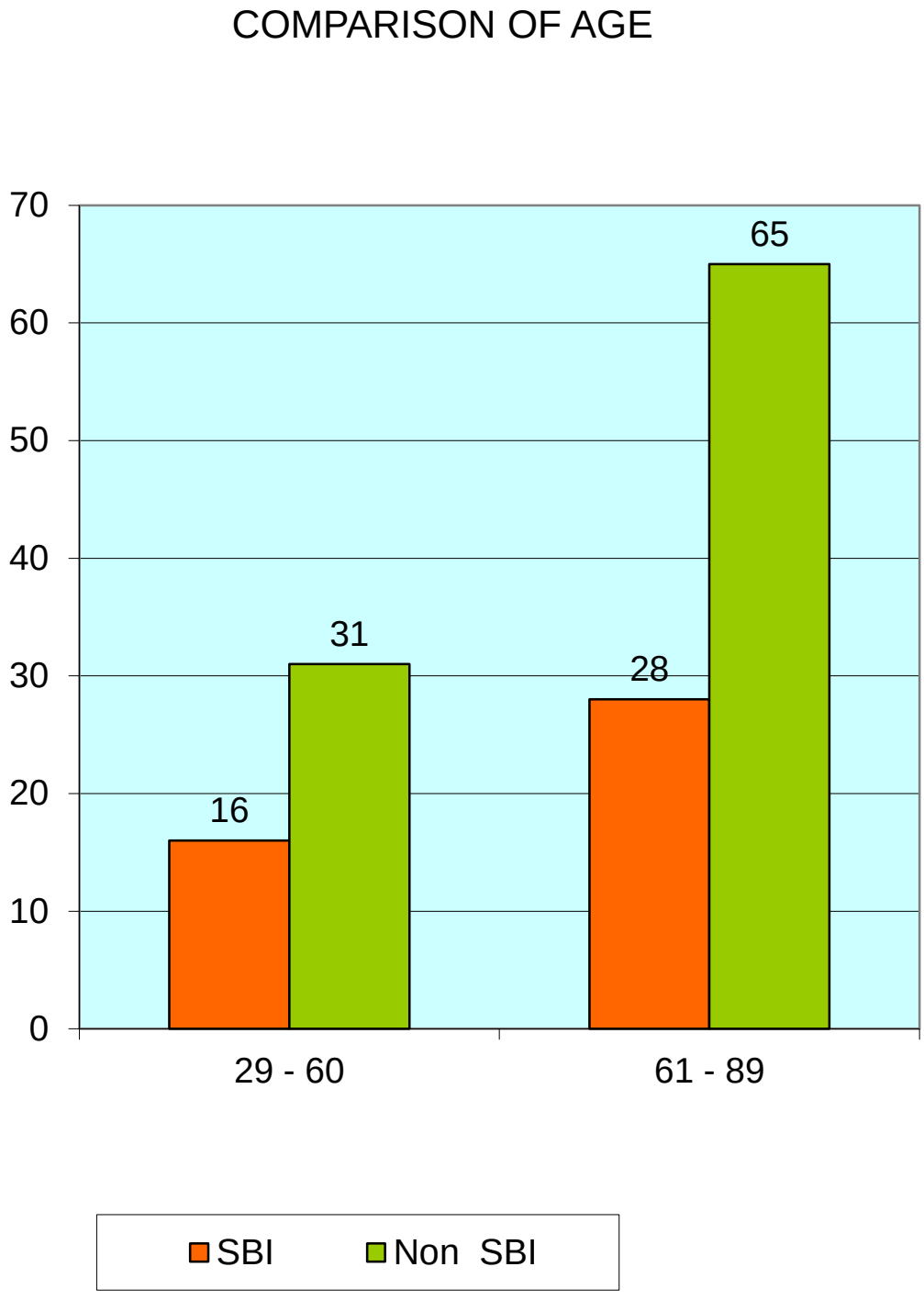


FIGURE 1: Age wise distribution of study population

TABLE 2-PROFILE OF STUDY POPULATION (GENDER WISE)

GENDER	SBI	Non SBI	Total
MALE	25	62	87
FEMALE	19	34	53
Total	44	96	140
p value	0.489 Not significant		

Table 2-Out of 140 infants, the number of male infants were 87(67%), and the female were 53 (37%). Sex determinant was not significant among SBI and non SBI groups (p value 0.0498).

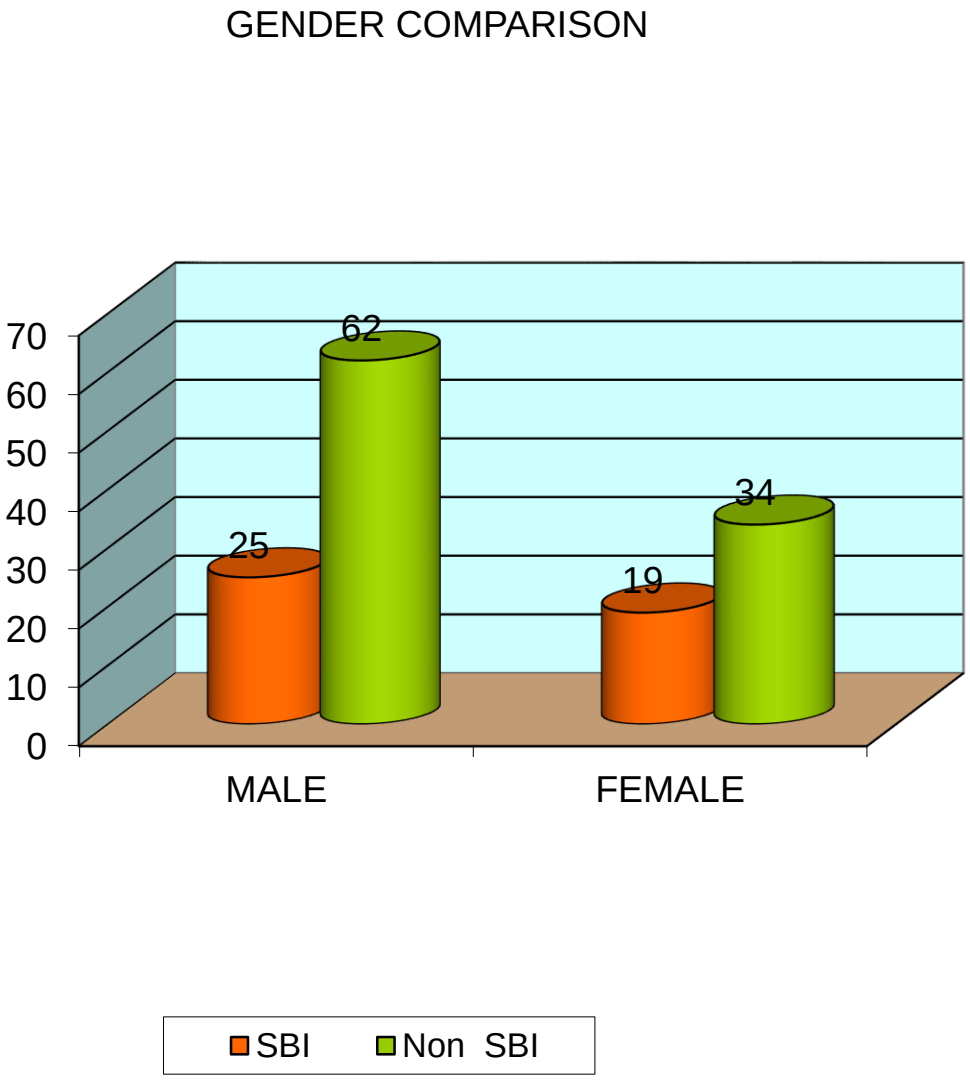


FIGURE 2: Gender DistributioniIn Study Population

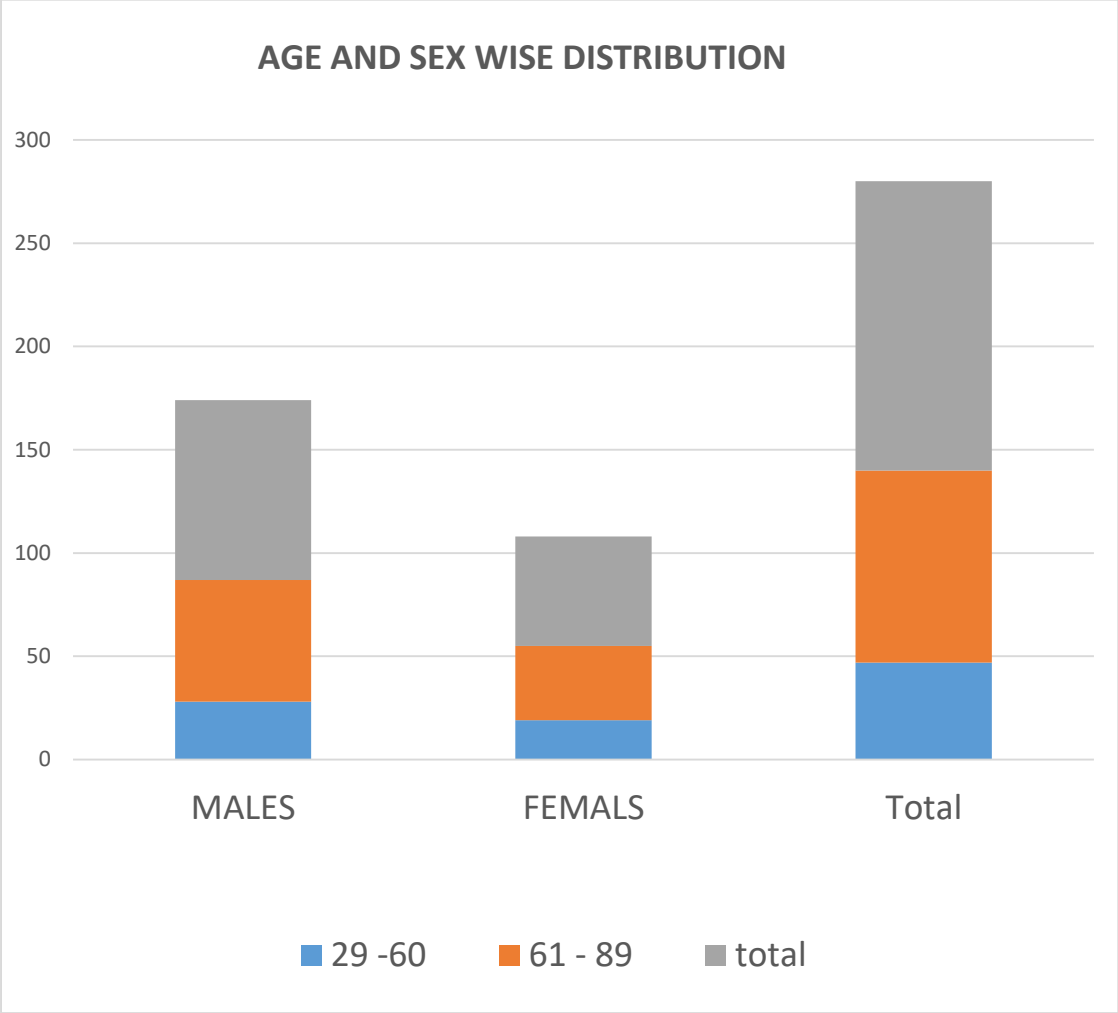


TABLE 3: The probability of occurrence of serious bacterial infections are not significant based on age and sex wise distribution .

SYMPTOMATOGY ANALYSIS

SYMPTOMS	NO OF CASES	PERCENTAGE
RESPIRAOTYR SYMPTOMS	98	70%
GASTROINTESTINAL SYMPTOMS	7	5%
NO FOCUS OF INFECTION	28	20%
RESPIRAOTY SYMPTOMSAND CNS SYMPTOMS	7	5%

TABLE 4: Out of 140 infants, 98 of them were present with respiratory symptoms (70%). 28 cases were presented without focus of infection.(20%).7 cases were presented with gastrointestinal symptoms.(5%)

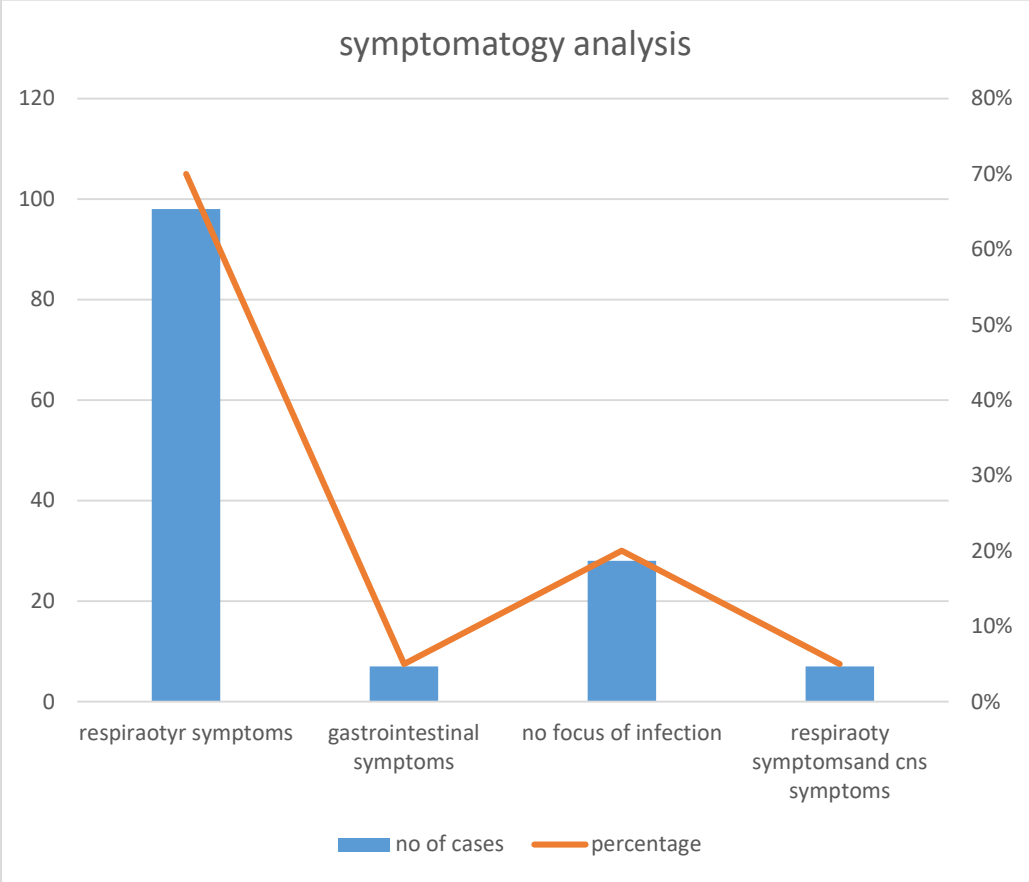


FIGURE 3: Percentage and no of infants present with varying symptoms

WBC COUNT VS OUTCOME

WBC	SBI	Non SBI	Total
<15000	24	93	117
>15000	20	3	23
Total	44	96	140
p value	< 0.001 Significant		

TABLE 5: Among the study population 16% showed the WBC count more than 15, 000.Out of 44 SBI cases, 20 cases had a WBC count > 15,000.(45%). In non-SBI population 3 cases were showed the WBC count >15,000(3%).The difference is found to be statistically significant (p value is <0.001)

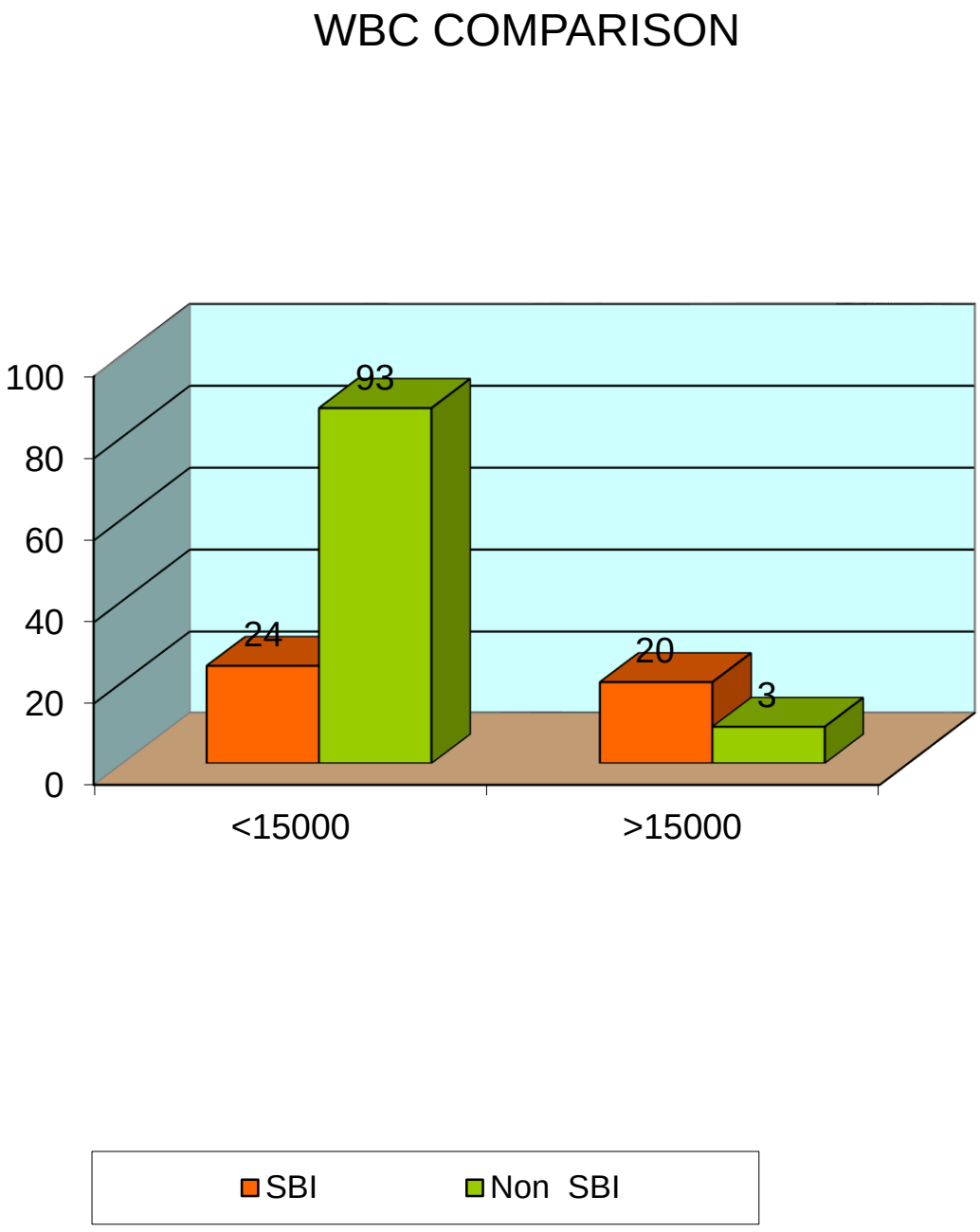


FIGURE 4: WBC count in SBI vs non-SBI

TABLE 5: PLATELET COUNT AND OUTCOME

platelet	SBI	Non SBI	Total
4.5 - 5Lakhs	7	24	31
5 - 8Lakhs	17	0	17
8 – 10 Lakhs	5	0	5
Normal count	15	72	87
Total	44	96	140
p value	< 0.001 Significant		

TABLE 5: Out 140 case 53 cases had a Thrombocytosis. In SBI population, out of 44 cases 29 were platelet count above 4.5lakh/mm^3 The occurrence of thrombocytosis among SBI group was 65.9 %. In non- SBI group 24 out of 96 had a thrombocytosis (25 %). The SBI group with normal platelet count was 34%. The non-SBI group with normal platelet count was 77%. The probability of occurrence of thrombocytosis was significant. p valve(<0.05)

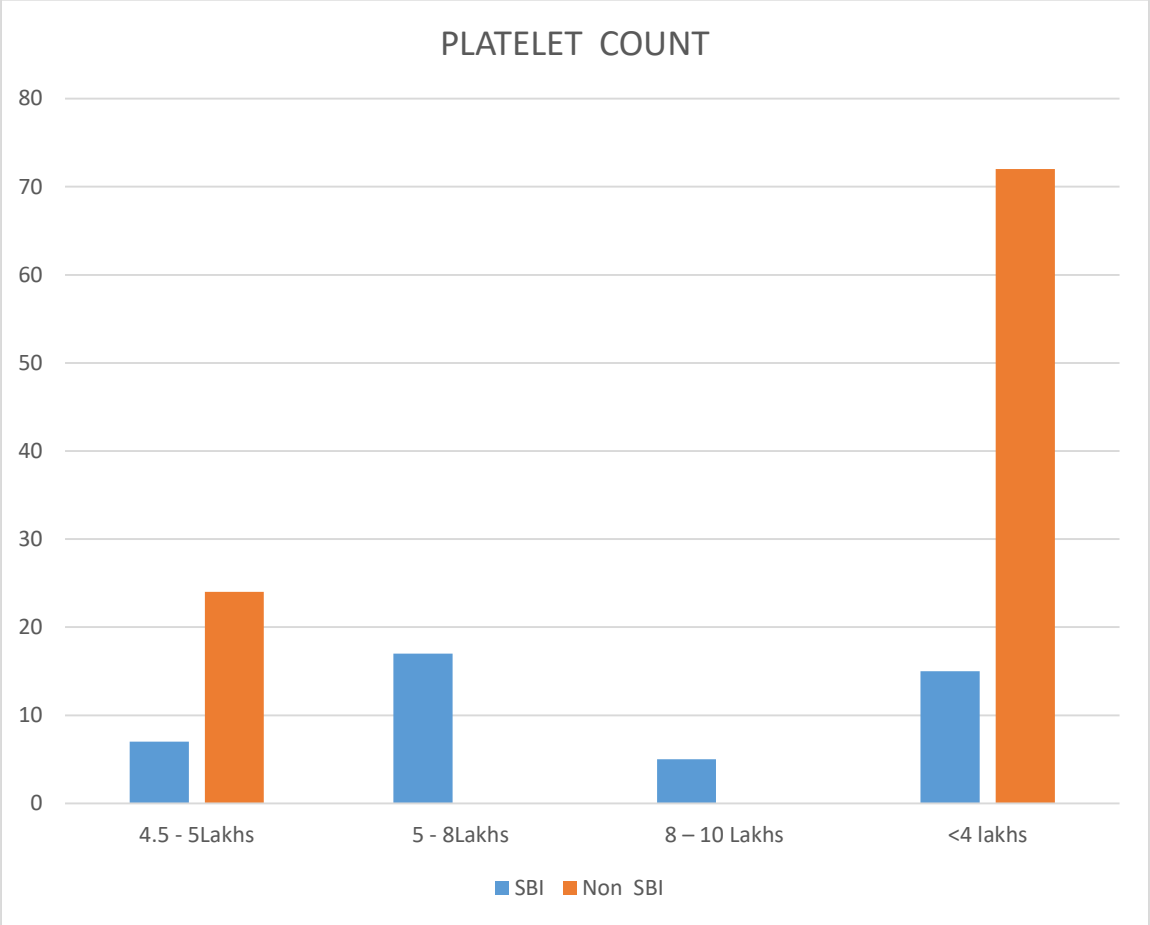


FIGURE 5: PLATELET COUNT AND OUTCOME

Among SBI cases 65.9% cases were present with thrombocytosis in contrast to non SBI it was 25% .

TABLE 6 : The mean platelet count in lakh/mm^3 in SBI subgroups and NON SBI

DIGNOSIS	Mean platelet count
PNEUMONIA	5.8±1.1
MENINGITIS	5.5±1.9
UTI	5.1±1.8
SEPSIS	4.38±1.2
BONE AND SOFT TISSUE INFECTIONS	5.5
NON-SBI	3.7±0.5

The mean platelet count in SBI was 5.4±1.3 lakh/mm^{3}and the mean platelet count among non-SBI group was 3.7±0.5.The mean platelet count of each in each SBI subgroup given in table 6.The highest mean platelet count was noted in infants with pneumonia. Thrombocytosis was present in 71.4% of UTI cases and 87.5% of bacterial pneumonia and 50 % cases of meningitis.

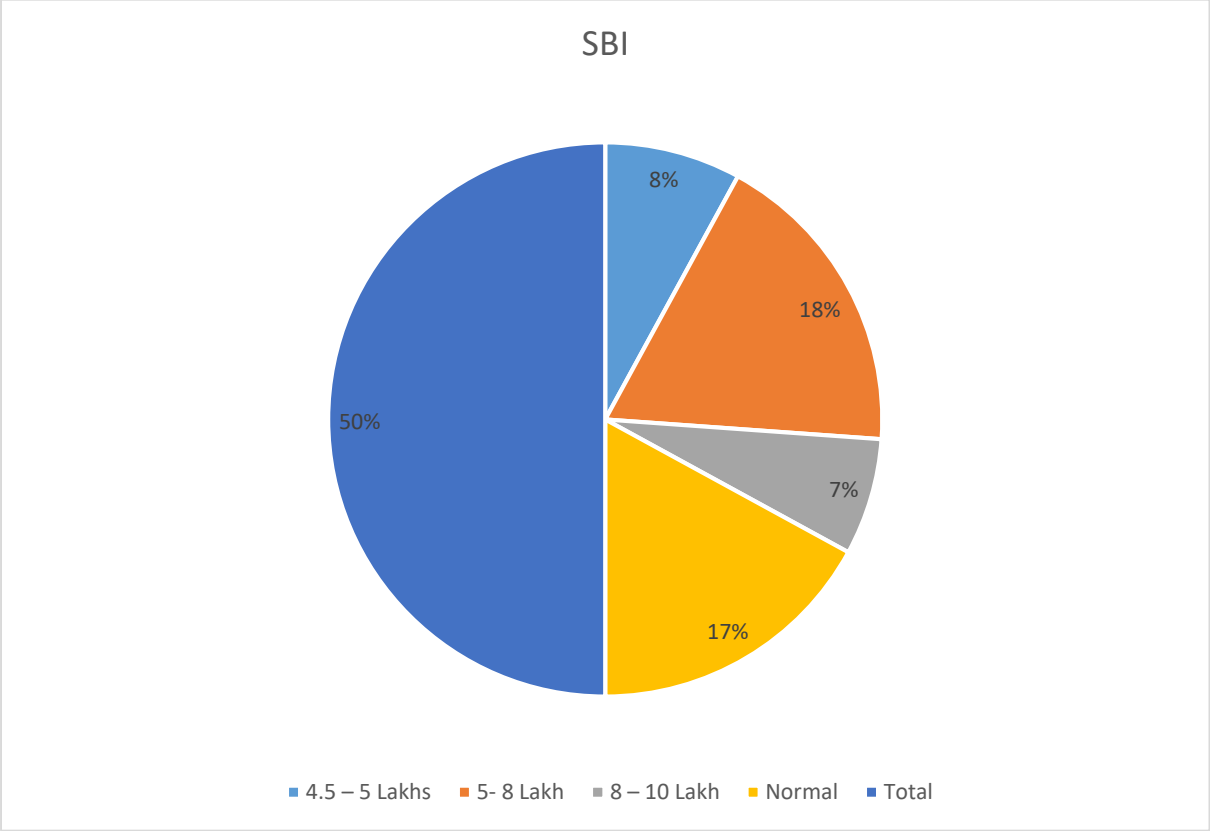


FIGURE 6: Percentage of different platelet threshold in SBI population

TABLE 7: URINE MICROSCOPY vs OUTCOME

URINE R/E	SBI	Non SBI	Total
Normal	39	83	131
Abnormal	5	13	9
Total	44	96	140
p value	0.049 Significant		

TABLE 7: Out of 140 cases , abnormal urine microscopy was found in 18 cases. Urine microscopy examination in predicting the SBI was statistically significant. (p value is < 0.05).

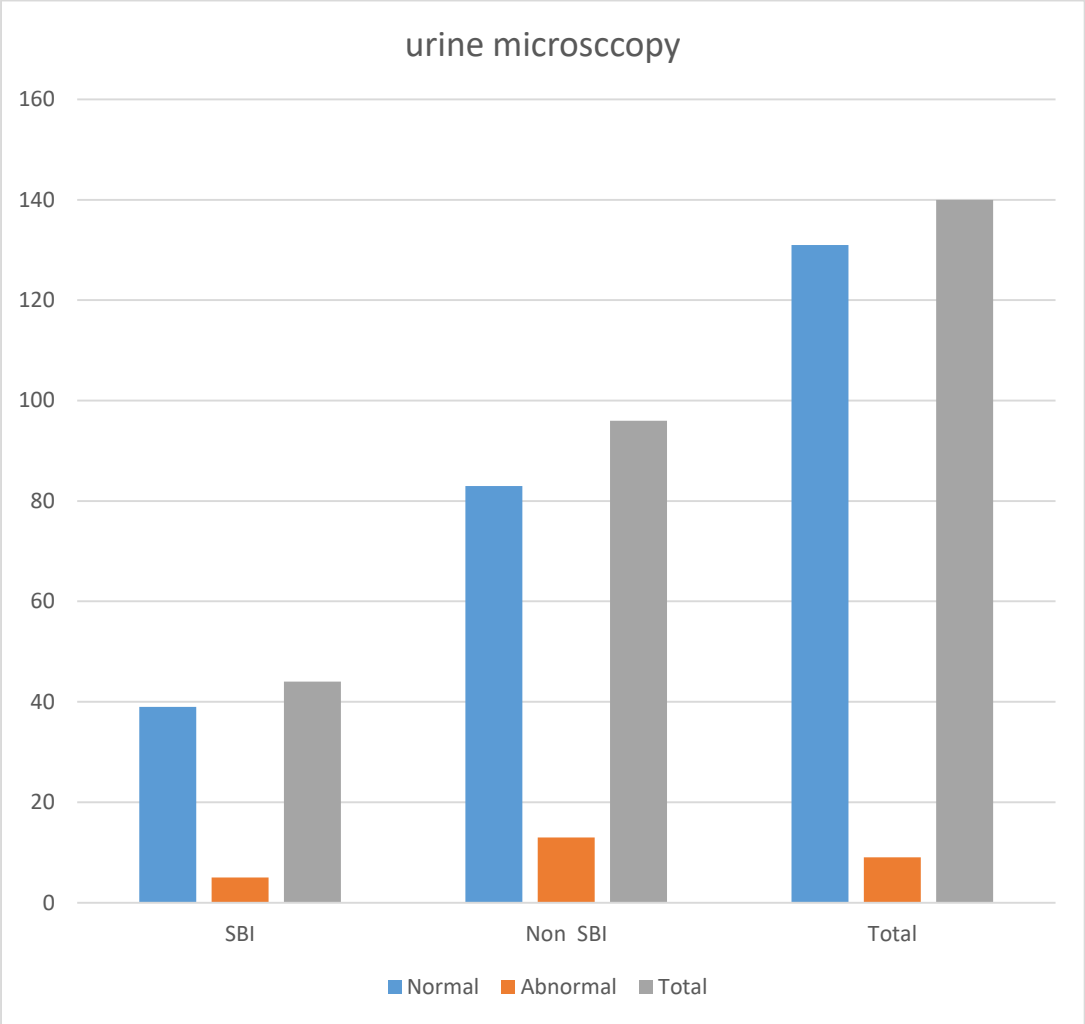


Figure 7: Urine microscopy in predicting outcome

The mean urine pus cells count was 4.5 ±2.6.in SBI population. and the mean urine pus cells count was 2.3±1.4 in non – SBI cases.

CRP RESULTS VS OUTCOME

CRP	SBI	Non SBI	Total
Positive	24	38	62
Negative	20	58	78
Total	44	96	140
p value	< 0.001 Significant		

TABLE 8: Of 44 cases with SBI 24 cases had a positive CRP.The percentage of CRP positivity among the SBI group was 54% and non SBI group was 39 %. The difference is statistically significant. (p value is <0.001)

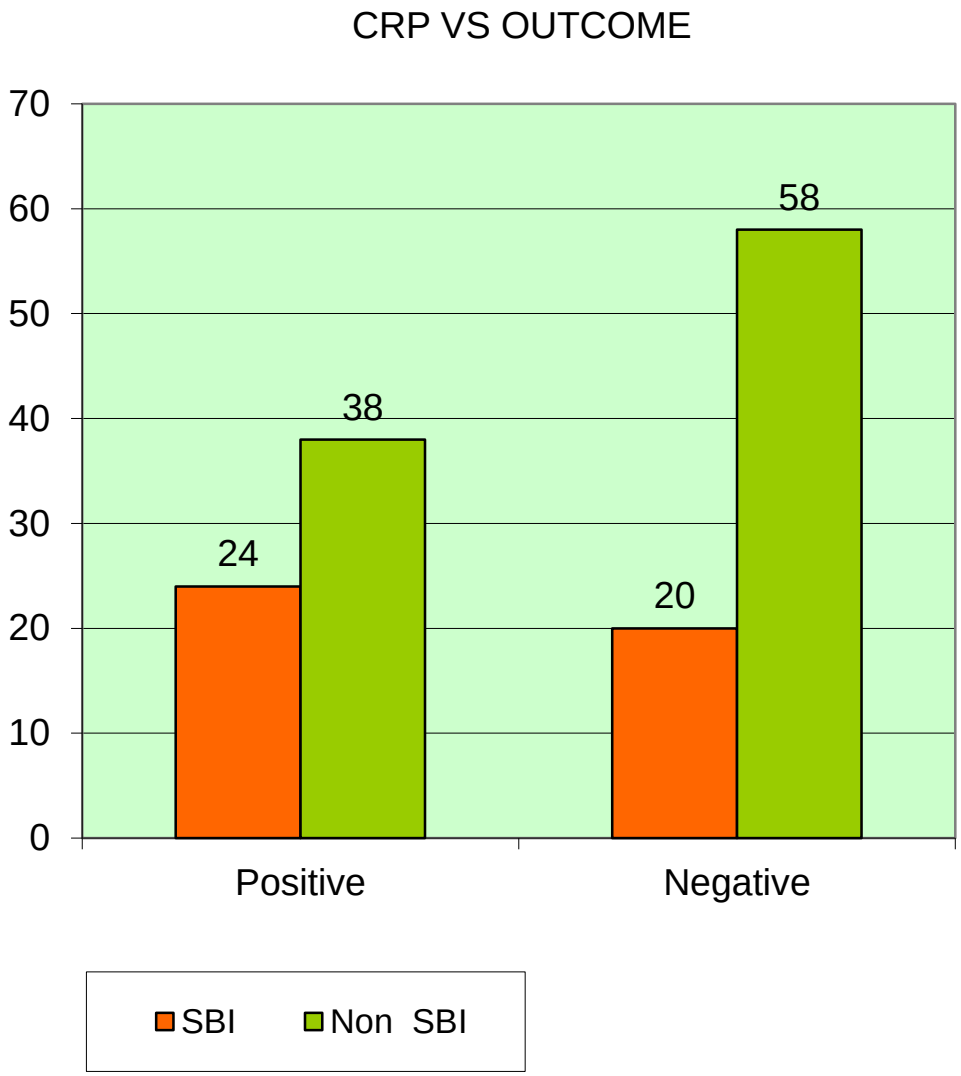


FIGURE 9: CRP Positivity and Outcome

Out of 44 case 24 were CRP positive in SBI group. Among negative results in non SBI population out 96 cases 58 of them negative for CRP.(60.%)

CHEST XRAY EXAMINATION

Chest x-ray diagnosis	No of cases
bronchopneumonia	27
bronchiolitis	65
Normal chest x-ray	25

TABLE 9 : Chest Xray Diagnosis

The percentage of patients present with respiratory symptoms as already mentioned was 68.9% . chest x ray done for 117 cases . Among 117 cases 27 cases were showed the features of bronchopneumonia . 65 cases were showed the features of bronchiolitis. 25 cases had a normal chest x-ray

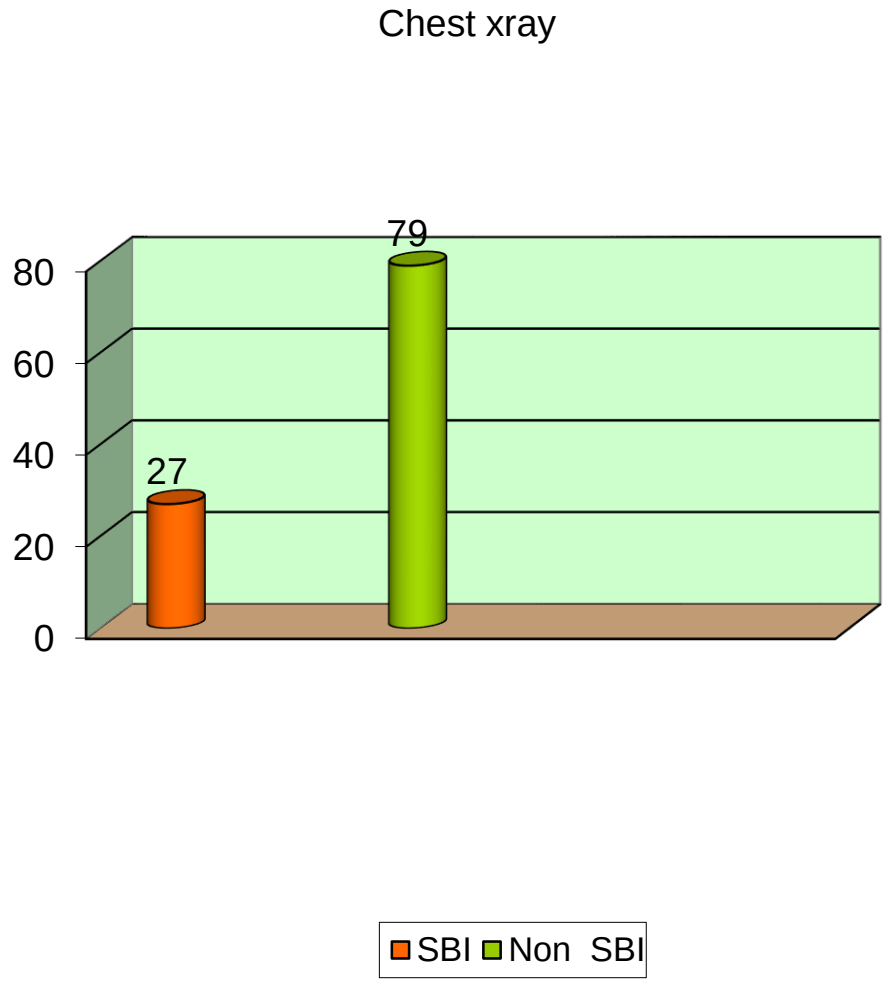


FIGURE 10: chest x-rayabnormalities in SBI and non-SBI group

There was a 27 cases of bacterial pneumoniaout of them were 4 cases showed the positive blood culture. 3 cases positive for staphylococcus aureus and one case positive for klebsiella. Out 4 case 1 case had a x-ray picture of pneumatocele.

BLOOD CULTURE RESULTS

BLOOD CULTURE	SBI	Non SBI	Total
Growth Present	13	0	13
No Growth	31	96	131
Total	44	96	140
p value	< 0.001 Significant		

TABLE 10: Of 13 cases with culture positive sepsis,3 cases were positive for enterococci,2 cases were positive for non fermentative gram negative bacilli, 4 cases were positive for klebsiella growth,3 cases positive for citrobacter,1 case was positive for staphylococci.

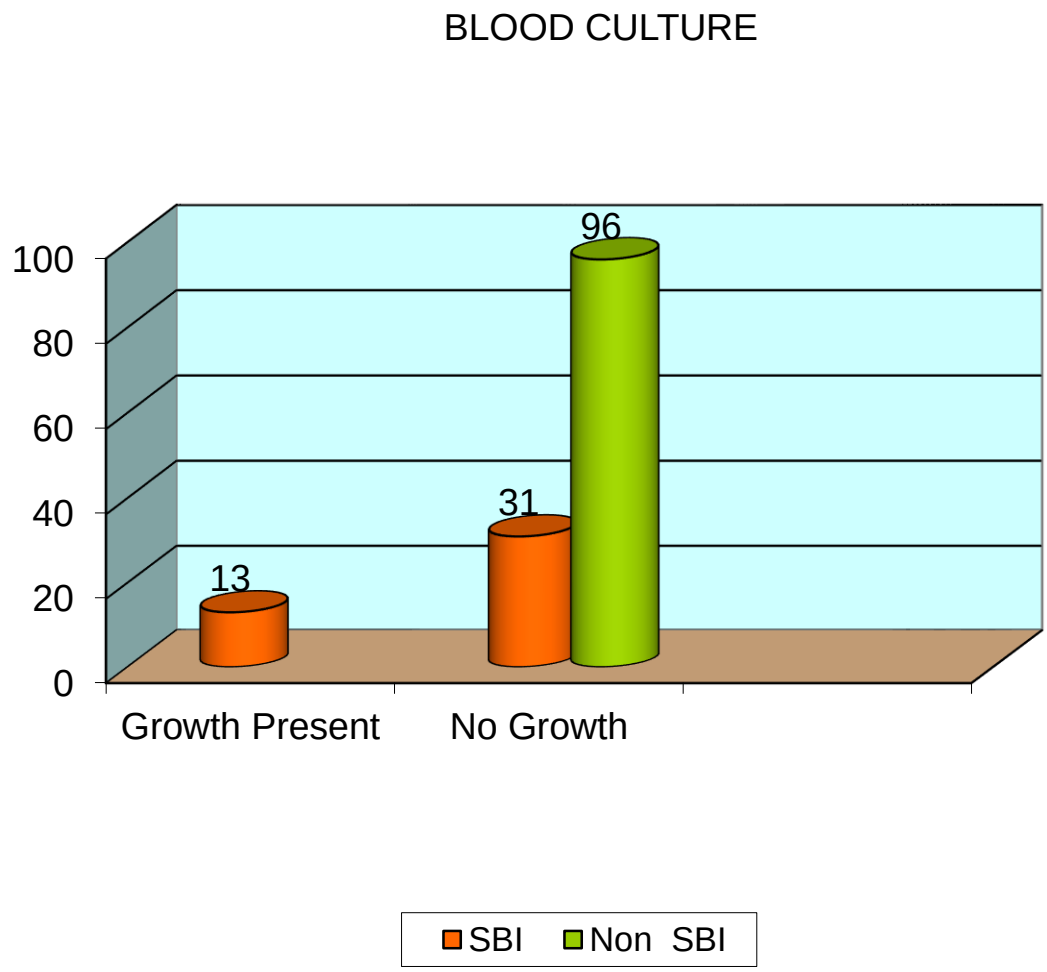


Figure 11: Blood culture results

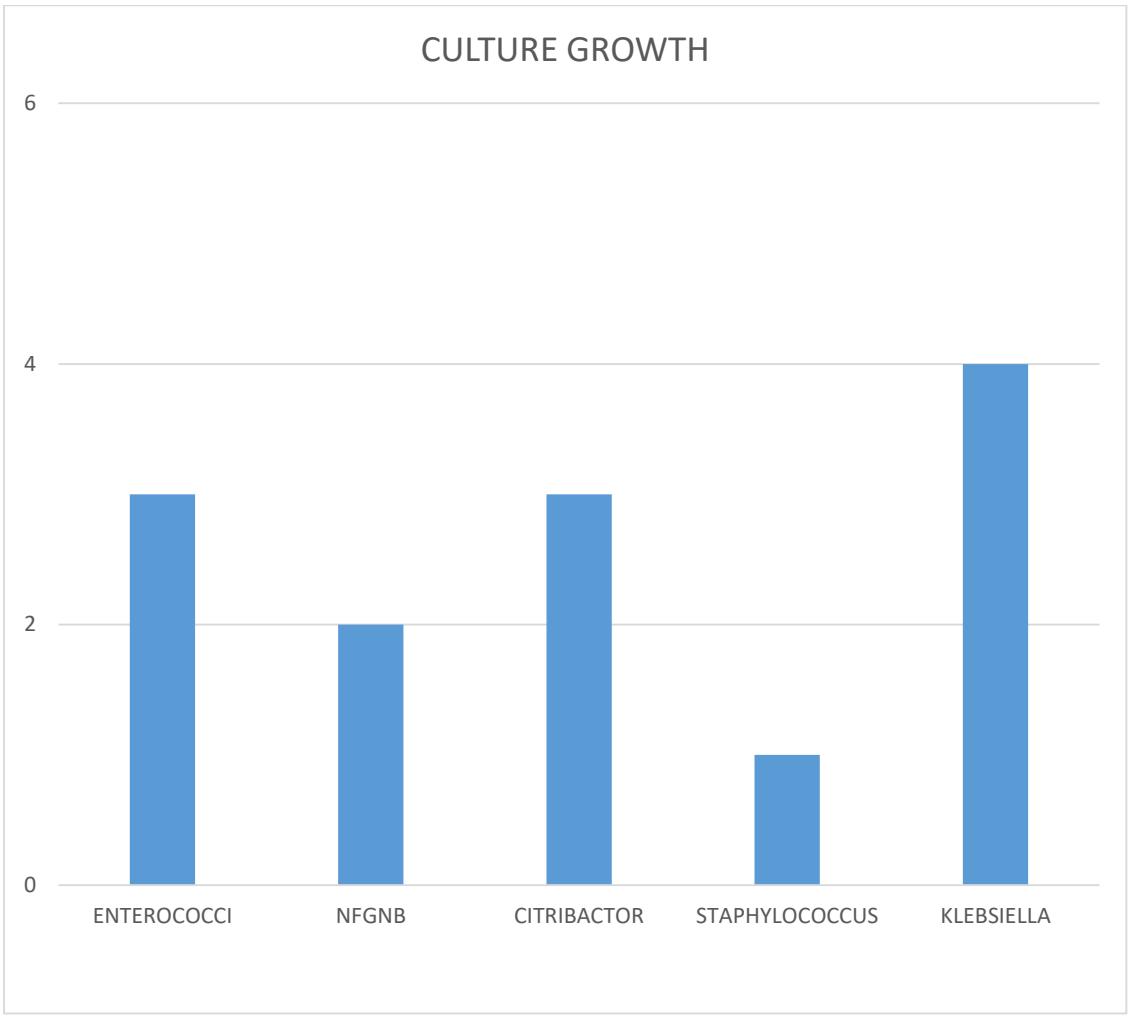


FIGURE 12: profile of organisms isolated from the culture positive group

TABLE 11:URINE CULTURE RESULTS

URINE CULTURE	RESULTS
Growth Present	4
No Growth	17

Among the 4 cases were diagnosed as urinary tract infection out of which 2 of them was positive for E. coli growth other 2 was positive for klebsiella .

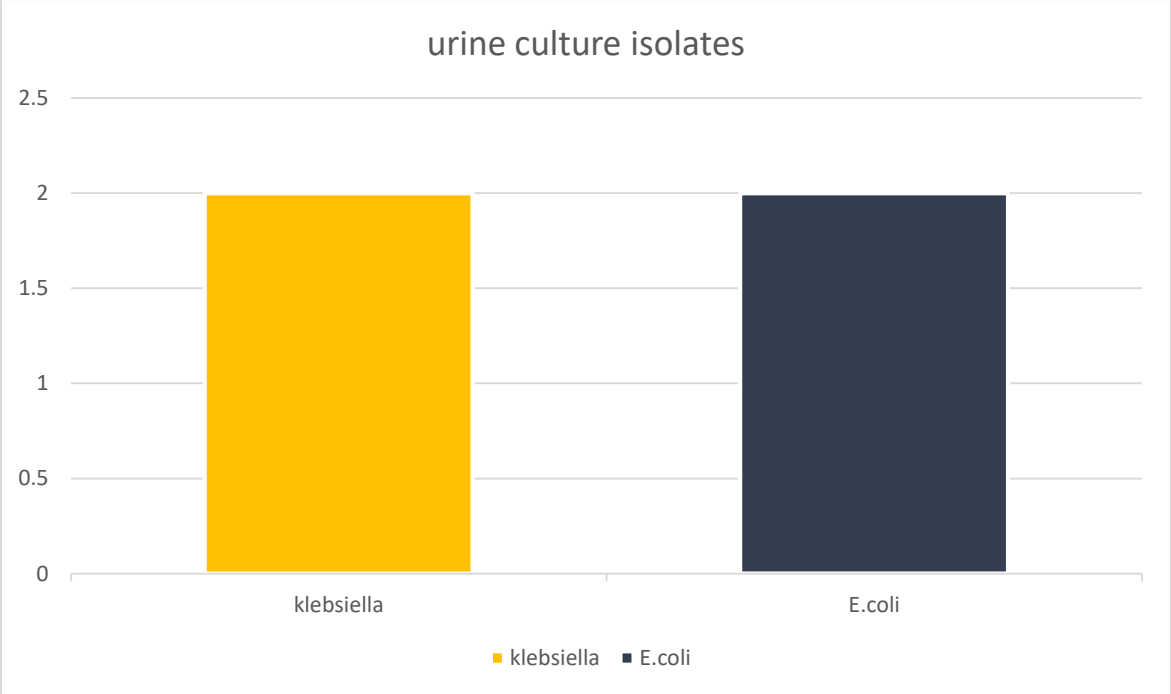


FIGURE 13: urine culture isolates

TABLE 12 LUMBAR PUNCTURE RESULTS

LUMBAR PUNCTURE	SBI	Non SBI
Growth Present	5	0
No Growth	0	1

Table 12: Lumber puncture done in patients with CNS symptoms .Out of 6 cases were presented with CNS symptoms out of that 5 cases were culture positivite .1 case were positive for Igm antibody for chikungunya virus .

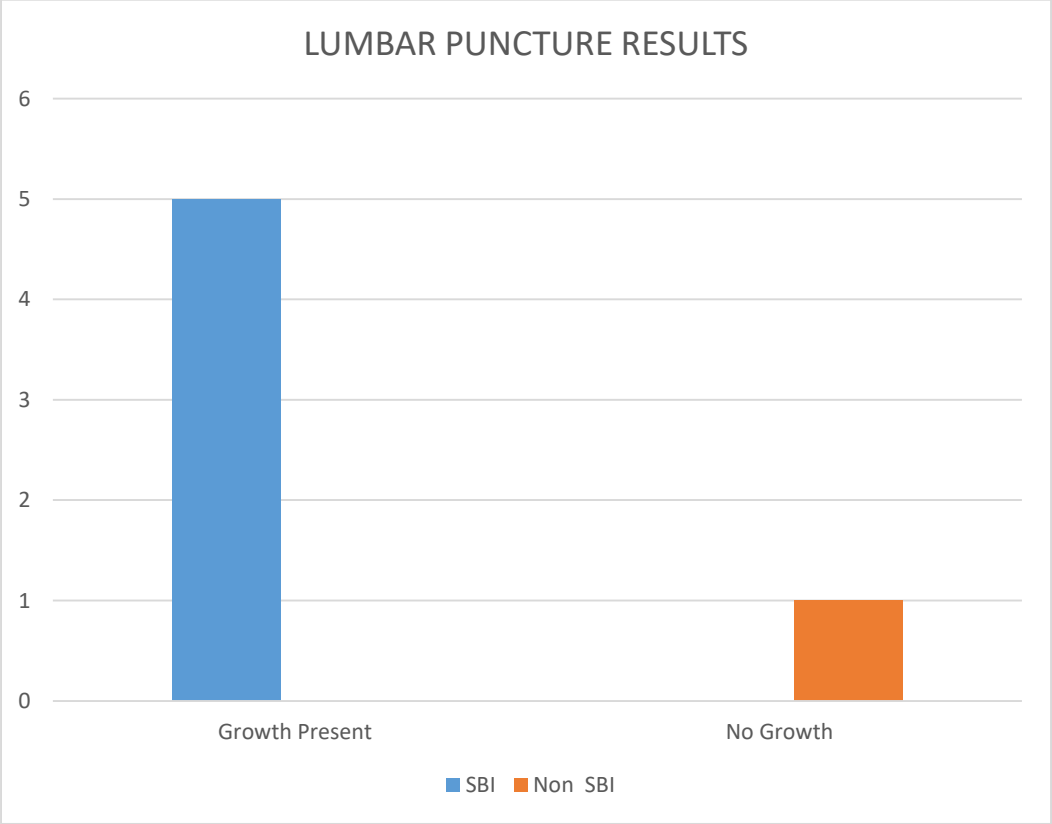


Figure 14: Lumbar puncture results

PERCENTAGE OF SBI AND NON- SBI IN A STUDY POPULATION

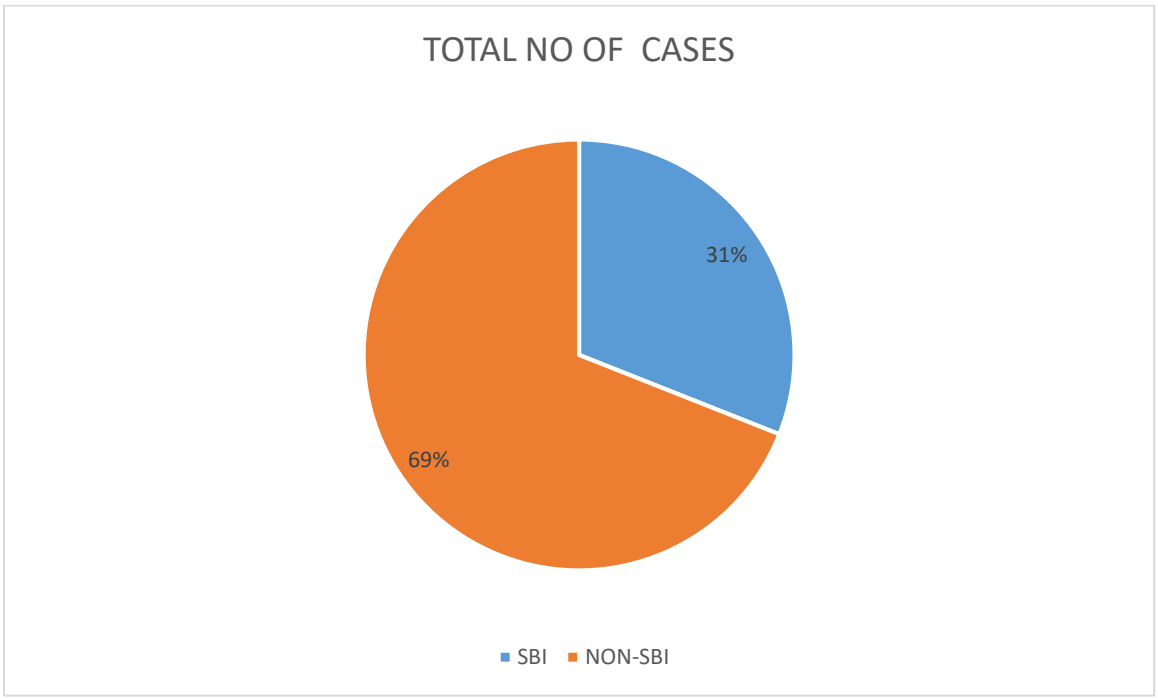
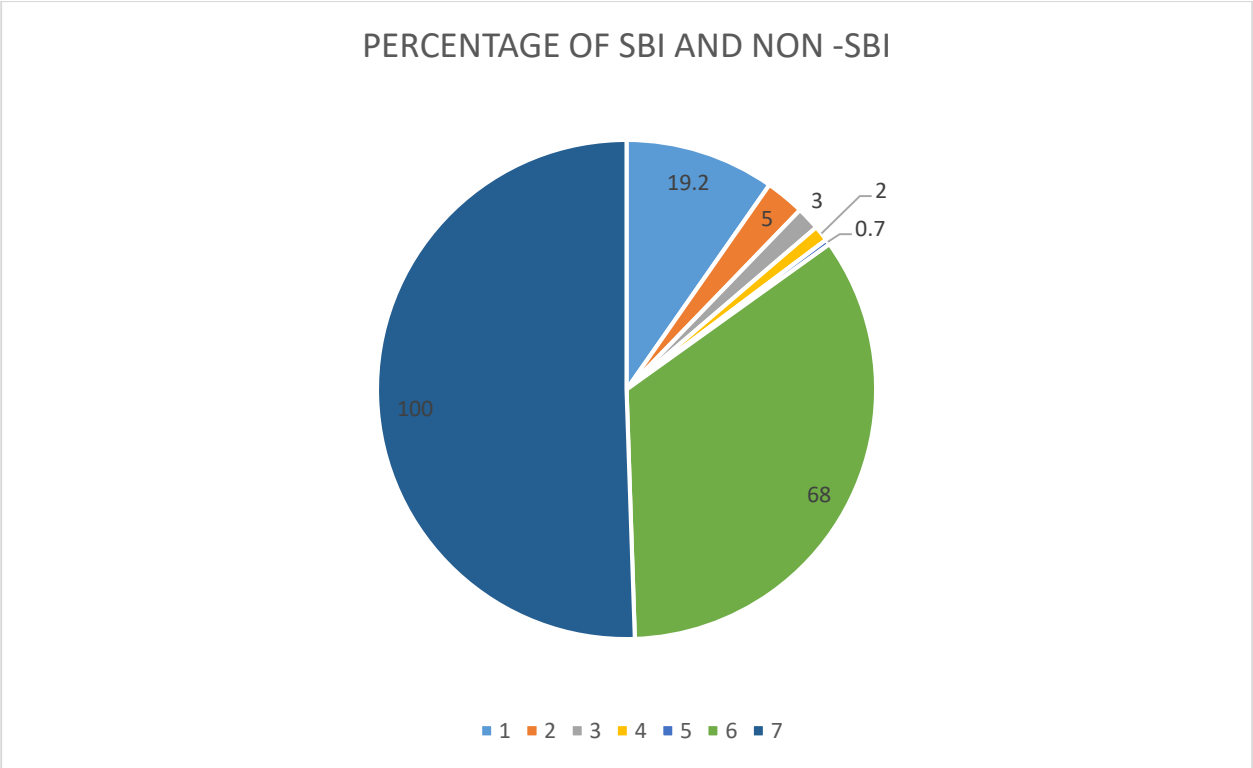


Figure 15: In a study population the percentage of SBI was 31% and the non –SBI population was 69 %

TABLE 12:SPECTRUM OF DISEASES IN A SBI POPULATION

SBI	No of cases	Percentage
Pneumonia	27	19.2
Sepsis	7	5
Meningitis	5	3.5
UTI	4	2.8
Bone & Soft Tissue Infections	1	0.7
NON SBI	96	69
Total	140	100

TABLE 12: Among the SBI subgroups the most frequently occurred infection in my study population was pneumonia and second most common infection was culture positive sepsis. The percentage of pneumonia in study population was 19.2 % .


PERCENTAGE OF SBI AND NON -SBI
19.2
5
3
2
0.7
100
68
1 2 3 4 5 6 7

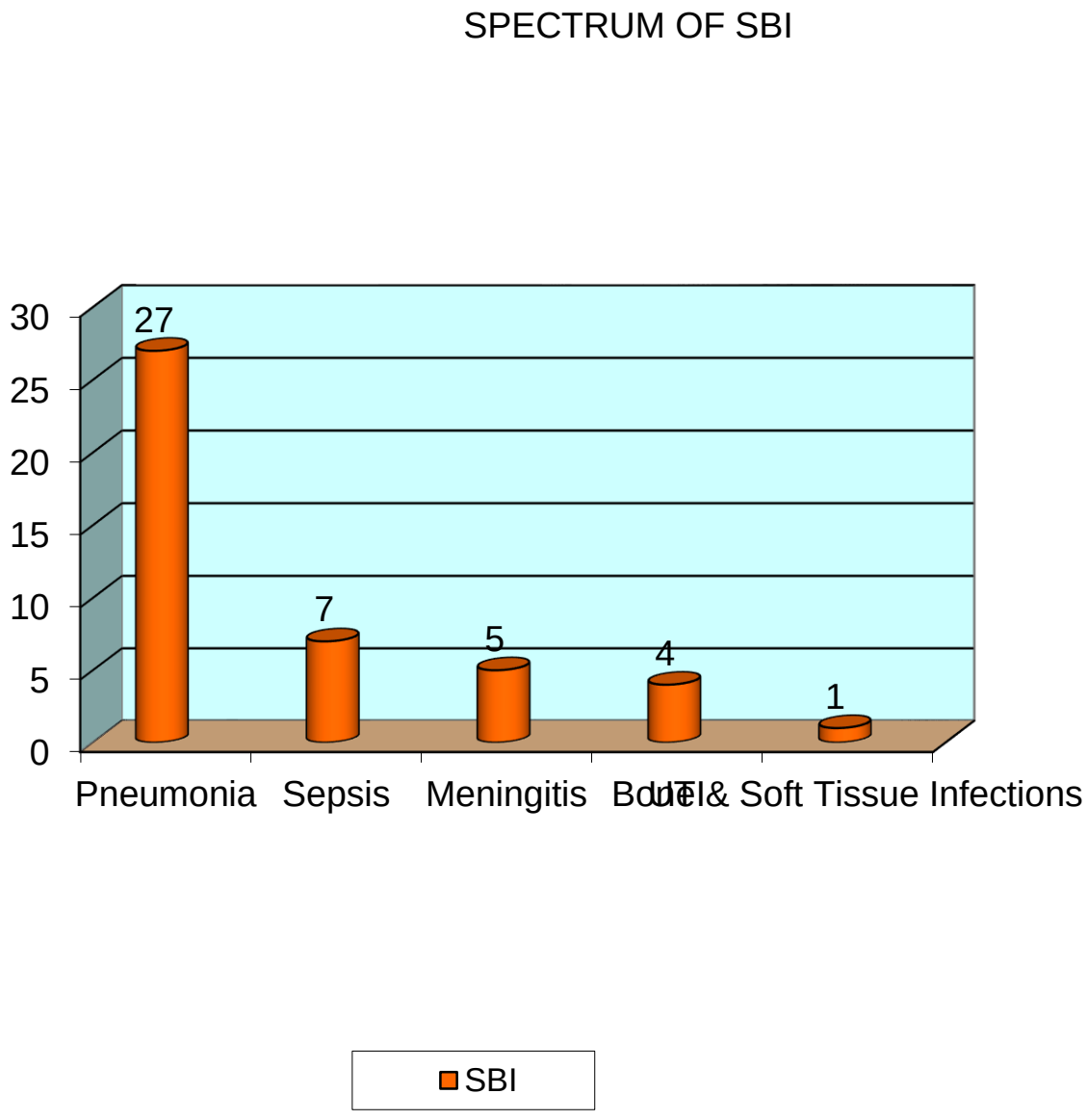


FIGURE 16: Spectrum of diseases in SBI population.

TABLE :13 TEST CHARACTERISTICS OF DIFFERENT PLATELET THRESHOLD

Platelet count	SBI N=44	Sensitivity	Specificity	PPV	NPV	Accuracy
Platelet > 4.5	29	65.91	62.5	44.62	87.91	80
> 6	22	75.86	82.08	32.35	87.72	67.6
> 8	5	17.24	95.5	42.2	91.43	62

According to test characteristics for different platelet count thresholds, we came to know that platelet count of ≥4.5 lakh/mm3 carried an accuracy of 80 %, sensitivity 65.91 %, specificity 44.62%, Negative predictive value (NPV) 87.72% and Positive predictive value (PPV) 44.62% than any other platelet threshold. So, the platelet count of ≥4.5 lakh/mm3 had a differential tendency to pick up the maximum patients out of SBI and lesser patients out of Non SBI.

At the decision threshold of >4.5 lakh/mm^3 , in the SBI population only 15 infants out of 44 misclassified as a low risk group. The percentage was 34 % . If the higher platelet count threshold was taken into an account , the sensitivity of the test was so low to recommend as a cut off.

TABLE 14 :THE TESH CHARACTERISTICS FOR DIFFERENT DECISION THESHOLD

Investigation	SBI	Non SBI	Sensitivity	Specificity	PPV	NPV	Accuracy
	n=44	n=96					
Platelet > 4.5 lakhs	29	36	65.91	62.5	44.62	80	63.57
WBC > 15000	20	87	45.45	29.38	18.69	27.27	72.71
CRP	24	83	54.55	13.54	22.43	39.39	76.43
Urine R/E	41	86	43.18	40.91	29.93	50	79.29

The platelet count of ≥4.5 lakhs alone identified 29 out of 44 infants with SBI; while total count ≥15,000/mm3 identified 20 of them and CRP Positivity 24 of them.

INVESTIGATION	SBI (n=44)	NON-SBI(96)	Sensitivity (%)	Specificity (%)	PPV (%)	NPV (%)	Accuracy
PLATELET COUNT+ CRP	24	80	71.5	46.2	34	80	58
PLATELET COUNT+ TC	31	80	72.59	12.63	23.9	49.9	52.5
PLT COUNT+TC+ PYURIA	41	91	92.2	3.4	27.1	49.9	28.3
PLT COUNT+TC+CRP	38	94	93.9	1.16	26.9	34.1	28.3
PLT COUNT+TC+CRP+ PYURIA	44	94	100	1.16	29	100	27.9

TABLE :15 A combined high-risk criterion of two tests (≥15,000/mm3 for WBC and ≥4.5 lakhs for platelet), did not pick up more SBI than platelet count alone did; while 80 infants were falsely classified as high-risk out of non SBI. Further combination of platelet count ≥4.5 lakhs, WBC ≥15000/mm3, pyuria ≥5 WBC /HPF, and CRP positivity led to the identification of all 44 infants with SBI. Thus, the combination of five tests may help in early prediction of serious bacterial infection in febrile young patients

DISCUSSION

Fever in infants is the most common presenting problem in peadiatric outpatient department. Most of these infants have self- limiting illnesses. Only few of them have serious bacterial infections .Because of vague clinical presentation these infants are often overlooked. Sometimes,these infants under 2 to 3 months of age undergo full diagnostic work up for sepsis including blood, urine ,spinal fluid cultures and many infants are hospitalized and started with empiric antibiotic therapy pending negative culture results.

In the process of finding newer and cost effective diagnostic modality in diagnosing infants with fever, platelet count could play a significant role by acting as an acute phase reactant . During an infection Interleukin-6 , Interleukin- 8,Tumour Necrosis Factor –A stimulate megakaryopoiesis in bone marrow both directly and by stimulating hepatic thrombopoietin .Thrombocytosis or elevation peripheral blood platelet > 4,50,000/mm ^{3} is common during infectioninfancy and childhood, occurring in 3 to 13% of cases.

Our study was study conducted in Instituite of child health and Research centre, Government Rajaji Hospital, Madurai Medical College, Madurai. A total of 144 infants between 29 days to 89 days were enrolled into the study of which 44 had SBI and 96 infants had a non-SBI infections

AGE AND SEX OF INFANTS ENROLLED IN MY STUDY

Out of 140 infants 47 infants were between 29 days to 60 days of life and 93 of them were 61 to 89 days old. In total study population 87 were male infants and 53 were female infants .Age and sex determinant are not statistically significant among study population (table1 &2)

SYMPTOMATOLOGY ANLYSIS

Out of 144 infants 70% were present with respiratory symptoms in association with fever . 20 % of cases present without focus of infection (figure3) in 20 % cases present with both respiratory and CNS symptoms

COMPARISON OF WBC COUNT AND PLATELET COUNT IN A STUDY POPULATION

Out of 140 infants were studied ,of which 45% had higher WBC count compared to 65.9% had higher platelet count among SBI group Sensitivity WBC and platelet were 45.9% and 65.9%.and specificity were 62.5% and 29.38%..But he detection of SBI in study population by WBC count was statistically significant.

COMPARISON OF CRP POSITIVITY AND PLATELET COUNT

Out of 140 infants , CRP positivity among SBI group was 24 case out of 44 compared 29 cases had a thrombocytosis out of 44. In detection those who were not had SBI the CRP detected 58 cases out of 96 and platelet detected 72 cases out of 96 . CRP positivity is statistically significant determinant in predicting the SBI.

PROFILE OF BLOOD CULTURE RESULTS IN A STUDY POPULATION

Isolated organisms in culture positive sepsis cases were included enterococci.'nonfermentative gramnegative bacilli, klebsiella ,citrobactor

COMPARISON THROMBOCYTOSIS IN A STUDY POPULATION

Thrombocytosis was noted in 37% of the total study population. Among the infants with SBI, the percentage of thrombocytosis was 65%. Among the non –SBI group the percentage of thrombocytosis was 25% In a study conducted by Merin et al at 2014 the occurrence of thrombocytosis was 70 % in SBI population and 30 % in non –SBI population.

COMPARISON OF SBI AND NON SBI INSTUDY POPULATION

In our study the SBI percentage was 31% o and non- SBI was 69%. compared to other studies it was higher rest of the reported incidence of 25

% to 28%. Because our institute is a tertiary care pediatric institute the incidence was higher compared to other studies .

Study conducted by the Shumila et al , the percentage of serious bacterial infection is 26.2 %. Compared to my study it was 31 % . 39 infants identified as a case of SBI out of 124 and the SBI population thrombocytosis percentage 84.6% compared to my study 44 infants out of 144 belongs to SBI group and thrombocytosis was 69 %

Study	**Shumila et al**	**Our study**
SBI percentage	26.2%	31%
Non –SBI percentage	73.8%	69%
Percentage of thrombocytosis in SBI group	84.6%	70%
Percentage of thrombocytosis in non SBI group	84.6%	70%

Study conducted by a Misra et al the incidence of SBI was 56.6 % compared my study it was 33% . the sensitivity of thrombocytosis in predicting SBI 53.5% compared my study it was 65.91% and specificity was 90.9 %compared to my my study it was 62.5 %

Thrombocytosis was a significant finding in proportion of an infants with proven bacterial infection. The highest platelet count was noted in pneumonia

Study	**Our study**	**Misra et al**	**Merin et al**
Sensitivity	65.91%	53.5%,	70.6%
specificity	62.5%	90.9%	69.8%

Statistic	Formula	Value
Sensitivity	$\frac{a}{a+b}$	65.91%
Specificity	$\frac{d}{c+d}$	62.5%
Positive Likelihood Ratio	$\frac{Sensitivity}{1-Specificity}$	1.71
Negative Likelihood Ratio	$\frac{1-Sensitivity}{Specificity}$	0.56
Positive Predictive Value	$\frac{a}{a+c}$	44.62%
Negative Predictive Value	$\frac{d}{b+d}$	80%
Accuracy	$\frac{a+d}{a+b+c+d}$	57.58%

The platelet count > 4.5 lakh /mm^3 had a good accuracy in predicting infants with SBI. The mean platelet value was 5.4±1.3 the mean platelet count among non-SBI group was 3.7±0.5.Merin et al reported that the mean platelet count in their SBI population was 4.82±1.4 lakh/mm^3 vs 3.9±1.2lakh/mm^3 in the non-SBI population

The parameters in association with platelet count , WBC count, urine microscopy CRP had good predictive tool to the physician to decide further investigation and treatment .

LIMITATION

The major limitation of the study was that Lumbar puncture was not done for all infants who did not have CNS symptoms as the parents did not give consent for LP and CSF examination.

CONCLUSION

Estimation of platelet count in infants with fever can predict serious bacterial infection and also it is a cost effective investigation. The sensitivity of reactive thrombocytosis in predicting SBI was 65.91%, specificity was 62.5%. positive predictive value 44.62%, negative predictive value was 80%, accuracy 63.57 %.

The sensitivity was very high reaching100 % in association with other parameter like WBC count., CRP, Urine pus cells were used to diagnose the serious bacterial infection.

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PROFORMA

NAME

DOB&AGE

SEX

INFORMANT

HOSPITAL NO

HISTORY

h/o fever

h/o any other complaints

CLINICAL EXAMINATION:

GENERAL EXAMINATION:

VITALS

HR: RR: PERIPHERAL PULSE: TEMPERATURE:

CRT

SYSTEMIC EXAMINATION:

CVS

RS

CNS

ABDOMEN

OTHER SYSTEMS

LAB INVESTIGATIONS:

PATHOLOGY:

WBC COUNT

PLATELET COUNT

MICROBIOLOGY

CRP TESTING

BLOOD CULTURE AND SENSITIVITY

URINE CULTURE AND SENSITIVITY

CSF ANALYSIS

RADIOLOGY

CHEST X RAY

ABBREVIATION

CBC - complete blood count;

CSF - cerebrospinal fluid;

HPF - high-powered field;

RBC - red blood cell;

WBC - white blood cell.

CRP - C-reactive protein (CRP),

PCT - procalcitonin

IL-6 - interleukin-6

PPV - positive predictive value

NPV - negative predictive value

SBI - serious bacterial infection

PLT - platelet

CONSENT FORM

I hereby give consent to participate in the study being conducted by Dr.M.NITHYA. postgraduate in the Institute of Paediatrics, Madurai medical college, Madurai and to use my personal clinical data and result of investigations for the purpose of study the diagnostic accuracy of platelet count in diagnosis of serious bacterial infection. I also give consent for further investigations.

Place: Signature of the parents / guardian

Date:

MASTER CHART

AGE

1- aged between 29 days to 60 days of life

2-aged between 60 days to 89 days of life

SEX

M-male child

F-female child

WBC COUNT

1- < 15,000

2 ->15,000

PLATELET COUNT

1- 4.5 -5 lakh/mm^3

2- 5 -8 lakh/mm^3

3- >8 lakh/mm^3

URINE ROUTINE EXAMINATION

1->5PUS CELLS /MM^3

2- NORMAL

CRP

A-NEGATIVE

B- POSITIVE

CHEST X-RAY

1-FEATURES SUGGESTIVE OF BRONCHOPNEUMONIA

2- FEATURES SUGGESTIVE OF BRONCHIOLITIS

3- NORMAL CHEST X-RAY

BLOOD CULTURE

1- GROWTH PRESENT

2-NO GROWTH

3- NO GROWTH

LUMBAR PUNCTURE

1- GROWTH PRESENT

2-NO GROWTH

URINE CULTURE

1- GROWTH PRESENT

2- NO GROWTH

3-NOT DONE

FINAL DIAGNOSIS

1-PNEUMONIA

2-CULTURE POSITIVE SEPSIS

3-MENINGITIS

4-UTI

5- BONE AND SOFT TISSUE INFECTIONS

6- NON SBI- OTHER VIRAL INFECTIONS

OUTCOME

1- SBI

2-non SBI

MASTER CHART

S.NO	age	sex	WBC	platelet	URINE R/E	CRP	CXR	BLOOD CULTURE	LUMBAR PUNCTURE	URINE CULTURE	FINAL DIAGNOSIS	OUTCOME
1	1	M	A	C	2	A	1	3	3	3	1	1
2	2	M	B	A	2	B	2	2	3	3	6	2
3	2	M	B	A	2	A	2	2	3	3	6	2
4	1	F	A	N	2	B	1	3	3	3	1	1
5	2	F	B	N	2	B	2	2	3	3	6	2
6	1	M	A	N	2	A	4	2	3	3	6	2
7	2	F	B	B	2	B	3	1	3	1	2	1
8	2	M	B	N	2	B	4	2	3	3	6	2
9	1	F	B	N	2	B	4	2	3	3	6	2
10	2	F	A	N	2	A	3	1	3	2	6	1
11	1	F	B	B	2	A	4	2	3	3	6	2
12	1	F	B	C	2	B	4	2	1	3	3	1
13	1	F	A	A	2	B	1	3	3	3	1	1
14	1	F	A	B	2	A	1	3	3	3	1	1
15	1	F	B	B	2	B	4	2	2	3	6	2
16	1	F	A	N	2	B	1	3	3	3	1	1
17	2	F	A	N	2	A	3	1	3	3	2	1
18	2	M	B	N	2	B	4	2	3	3	6	2
19	2	M	A	N	2	A	2	2	3	3	6	2
20	2	M	A	B	2	A	2	2	3	3	6	2
21	2	F	A	N	2	B	4	2	3	3	6	2
22	2	M	B	A	2	B	1	3	3	3	1	1

23	2	M	A	B	2	A	3	1	3	3	4	1
24	2	M	B	A	2	B	2	2	3	3	6	2
25	2	M	B	B	2	B	2	2	3	3	6	2
26	2	M	A	B	2	A	1	3	3	3	1	1
27	2	M	A	D	2	B		1	1	3	3	1
28	1	M	B	A	2	B	2	2	3	3	6	2
29	1	M	B	A	2	B	4	2	3	3	6	2
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32	1	M	B	B	2	B	4	2	3	3	6	2
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35	2	F	B	N	2	B	4	2	3	3	6	2
36	2	F	A	B	2	B	1	3	3	3	1	1
37	2	F	B	N	2	B	4	2	3	3	6	2
38	2	F	B	N	2	A	1	3	3	3	1	1
39	2	M	B	A	2	B	2	2	3	3	6	2
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41	2	M	B	A	2	A	1	3	3	3	1	1
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ETHICS COMMITTEE CERTIFICATE

Name of the Candidate	:	Dr.M.Nithya
Designation	:	PG in MD., Paediatrics
Course of Study	:	2017- 2020
College	:	MADURAI MEDICAL COLLEGE
Research Topic	:	Study on Thrombocytosis as a predictor of serious bacterial infection in young infants
Ethical Committee as on	:	08.04.2019

The Ethics Committee, Madurai Medical College has decided to inform that your Research proposal is accepted. \

Member Secretary

Chairman
Prof Dr V Nagaraajan
M.D., MNAMS, D.M., Dsc.,(Neuro), Dsc (Hon)
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Dean / Convenor
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Madurai Medical College
Madurai-20

18 JUN 2019

CERTIFICATE - II

This is to certify that this dissertation work titled "**STUDY ON THROMBOCYTOSIS AS A PREDICTOR OF SERIOUS BACTERIAL INFECTION IN YOUNG INFANTS** " of the candidate **Dr.M.NITHYA** with registration Number 201717104 for the award of M.D., in the branch of **PAEDIATRICS** personally verified the urkund.com website for the purpose of plagiarism Check. I found that the uploaded thesis file contains from introduction to conclusion pages and result shows 12 percentage of plagiarism in the dissertation.

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