Helpful Parameters in Early Detection of Neonatal Sepsis

**Abstract:** The indications of neonatal sepsis are vague. A high file of doubt with or without laboratory confirmations of disease is the key for early conclusion. The diagnosis of neonatal infection is challenged because traditional markers of infection often mislead instead of diagnosis. The point of this review to assess the worth of gastric suction gram stain as an early marker for determination of neonatal sepsis in correlation with C-reactive protein and absolute white platelet counts. The example collected during the period from April 2010 to October 2010 the example were taken from children conceded to the pediatrics-neonatal wards at Tikrit Teaching Hospital who were clinically analyzed as sepsis. The review incorporates 50 cases every one was surveyed clinically by pre-arranged poll including history clinical evaluation and research center boundaries incorporates gastric suction C-reactive protein (CRP) and all out WBC count were finished all cases. This study uncovered that the quantity of likely sepsis was higher in guys 30 (60%) than in females 20 (40%). Among every clinical indication helpless taking care of had the most elevated extent 39 (78%). Only 18 (36%) youngsters were ordinary birth weight while 32 (64%) were low and extremely low birth weight. Investigation of maternal gamble factors uncovered that the most successive variable was maternal disease 30 (60%) . Comparable to positive consequences of examinations the cases with positive gram stain more than cases with positive CRP and unusual WBC count. The results of gastric aspirate showed that 19 (38%) of samples were positive. The results of identification showed that the most bacterial infection were gram positive 14 (74%) while gram negative 5 (26%). Results of WBC count showed that 17 (34%) cases had high or low WBC count while the rest was in the category of normal range. The results of CRP were 15 (30%) positive at which the differences were statistically significant among positive and negative gram stain cases. Accordingly we conclude that gram stain provides early identification of the gram-negative or gram-positive status of the organism for preliminary identification more than other traditional tests (CRP and WBC count) that could be used in diagnosis of early neonatal sepsis.

**Keywords:** CRP, WBC, laboratory.

**INTRODUCTION:**

Neonatal sepsis is characterized as a clinical condition of bacteremia with foundational signs and side effects of disease in the initial a month of life. At the point when pathogenic microbes get entrance into the circulatory system they might Cause overpowering disease absent a lot of limitation (sepsis) or may get prevalently restricted to the lung (pneumonia) or the meninges (meningitis). Neonatal sepsis is the single of most significant reasons for neonatal passings locally representing over portion of them. Whenever determined early and treated forcefully to have anti-infection agents and great strong consideration it is feasible to save most instances of neonatal sepsis. Neonatal sepsis can be ordered into two sub-types relying on whether the beginning of manifestations is before 72 hours of life (beginning stage) or later (late onset). Beginning stage diseases are brought about by creatures pervasive in the maternal genital lot or in the conveyance region. The related variables for beginning stage sepsis incorporate low birth weight delayed burst of films putrid alcohol various per vaginum assessments maternal fever troublesome or delayed work and yearning of meconium. Beginning stage sepsis shows oftentimes as pneumonia and less regularly as septicemia or meningitis. Because the initial clinical manifestations often are non-specific the early clinical diagnosis of neonatal sepsis is difficult. The decision to perform a partial or extended evaluation and to institute antimicrobial therapy remains a matter of clinical judgment. The diagnosis of neonatal infection is challenged because traditional markers of infection often mislead. Body liquid and surface societies are gotten regularly from children when they are first conceded to a neonatal emergency unit trying to distinguish possibly pathogenic life forms and guide anti-toxin treatment however their helpfulness has not been assessed. The aftereffects of such examinations and of microscopy of gastric suction might be utilized as evaluating tests for right on time neonatal sepsis.

**Aim:** To assess the role of gastric aspirate in diagnosis of early neonatal sepsis.
Objectives:
1. Comparison between gastric aspirate markers with white blood cell count (WBC).
2. Comparison between gastric aspirate markers with intense stage reactant C-responsive protein (CRP).
3. Identify the impact of some risk factors related to sepsis.
4. Identify the most common presentations of patients with early neonatal sepsis.

Neonatal Sepsis: sepsis is defined as the growth of microorganisms in blood and other tissues. It is a clinical condition in which an infectious illness results in systemic toxicity and can ultimately result in irreversible shock. It is virtually always caused by a blood-borne bacterial illness. Bacterial sepsis is far more normal in children and young infants than in healthy older children or adults. “sepsis” has alternately been called septicemia. Neonatal sepsis can be a generalized infection such as septicemia or may be a localized deep-seated infection. Septicemia labeled as probable or proven.

1- Proven Septicemia:- This term is applied when there are intriguing clinical appearances of sepsis plus either of the following two parameters:
   - Isolation of the pathogen from a central body fluid.
   - Autopsy evidence of sepsis.

2- Probable Septicemia:- In order to obtain this label, the neonate should have suggestive clinical manifestations plus one or more of the following parameters:
   - Predisposing factors for example maternal pyrexia, delayed crack of film for north of 24 hours putrid alcohol.
   - Positive sepsis screen.
   - Radiologic evidence of pneumonia.

Youngsters are profoundly helpless to disease because of reduced vague (inflammatory) and explicit (humoral) resistance like debilitated phagocytosis deferred chemotactic reaction “insignificant or missing immunoglobulin An and immunoglobulin M (IgA and IgM) and diminished supplement levels. Due to the baby’s helpless reaction to pathogenic specialists there is generally no neighborhood incendiary response at the entryway of section to flag a disease and the subsequent manifestations will quite often be dubious and vague. Therefore analysis and treatment might be delayed. Most neonatal bacterial diseases have an early bacteremic stage going before the improvement of an all out septicemia or the restriction of contamination in organs and tissues. During this stage the clinical signs are subtle.

Epidemiology:
Sepsis is the commonest reason for neonatal mortality; it is liable for around 30-half of the all out neonatal passings in creating countries. It is assessed that up to 20% of youngsters foster sepsis and around 1% pass on from sepsis related causes. Sepsis related mortality is generally preventable with levelheaded antimicrobial treatment and forceful steady consideration. The study of disease transmission of perinatally procured bacterial contaminations depends on broad investigations of Gathering B Streptococcus and less significantly E. coli. The gastrointestinal parcel is the significant site of asymptomatic colonization with both the GBS and E. coli. Without even a trace of anti-microbial treatment between 40 - 70% of newborn children whose moms are colonized at conveyance become colonized themselves with GBS by one of three systems:-
1- Transplacental transmission within the sight of maternal microbes.
2- Climb from the vagina and cervix through minuscule breaks in the amniotic layers or through honestly cracked layers.
3- Surface pollution during entry through the birth channel layer.

Gram negative bacilli currently account for around 20% of cases of late-onset sepsis but this may be increasing. In a study was done in Iraq particularly in Tikrit and Kirkuk showed that the most common pathogen causing neonatal sepsis in Tikrit Teaching Hospital was E. coli followed by Citrobacter spp., Klebsiella and Staph. aureus whereas late onset sepsis was caused by K. pneumoniae and Staph. aureus whereas late onset sepsis was caused by K. pneumoniae and E. coli. The irresistible specialists related with neonatal sepsis have changed throughout the course of recent years. Staph. aureus and E. coli were the most well-known irresistible dangers for youngsters during the 1950s in the US. GBS then at that point supplanted Staph. aureus as the most well-known Gram-positive specialist causing beginning stage sepsis during the following many years. During the 1990s GBS and E. coli kept on being related with neonatal contamination; notwithstanding coagulase-negative staphylococci are presently noticed all the more every now and again. Different life forms like L. monocytogenes Chlamydia pneumoniae Haemophilus influenzae Enterobacter aerogenes and types of Bacteroides and Clostridium have additionally been distinguished in neonatal sepsis.

In agricultural nations Gram negative creatures are more prominent. Serratia marcescens has arisen during the 1980s as a known reason for sepsis in neonatal serious consideration units (NICU) much of the time including pre-term low birth weight and other safe compromised youngsters. Serratia sepsis are very interesting however further muddle a generally hazardous condition.
**Etiology:** The reason for sepsis changes by age. In younger “bunch B streptococci intestinal gram-negative bacilli and listeria monocytogenes are most prevalent.(28) Staphylococcus aureus has been depicted in nursery episodes for over 100 years. It has just been as of late that Staphylococcus epidermidis has gotten consideration as an expanding reason for neonatal sepsis. Staph. epidermidis diseases are particularly normal among newborn children are untimely or who in any case require catheter arrangement” and this living being is the most incessant etiologic specialist of sepsis in some neonatal serious consideration units. Contaminations brought about by bunch A streptococci might be obtained intra-or post pregnancy. Disease might be procured from an asymptomatic transporter or from somebody with clinically evident infection (29). The main Gram - ve bacilli causing neonatal sepsis in created nations are E. coli” Klebsiella pneumoniae” P. aeruginosa “ Serratia marcescens” Citrobacter diversus” Proteus mirabilis and Enterobacter cloae (18). The most common infecting organisms in Early-onset sepsis are Group B Streptococci (GBS) and E. coli which may be present in vagina” Haemophilus influenzae and coagulase negative staphylococci are also commonly seen in early onset sepsis in VLBW infants. Different microorganisms that are held onto in the vagina and that might contaminate the newborn child incorporate gonococci “ Candida albicans” herpes simplex infection (type II)” Listeria life forms and Chlamydia (30-31). With respect to late sepsis the culpable creatures are normally Staph. aureus” Klebsiella” Enterococci and Pseudomonas. Coagulase Negative Staphylococcus is ordinarily observed to be the reason for septicemia in ELBW and VLBW newborn children (17).

**Grouping of neonatal sepsis:** Neonatal sepsis can be arranged into two significant classes relying on the beginning of symptoms.(31)

**Beginning stage sepsis (EOS):** It presents inside the initial 72 hours of life. In serious cases” the child might be indicative upon entering the world. Newborn children with EOS typically present with respiratory misery and pneumonia. The wellspring of contamination is by and large the maternal genital plot. Some maternal/perinatal circumstances have been related with an expanded gamble of EOS. Information about these potential gamble elements would help in early analysis of sepsis. In view of the examinations from India” the accompanying gamble factors appear to be related with an expanded gamble of beginning stage sepsis; (32-31)

1. Low birth weight (<2500 grams) or rashness
2. Febrile disease in the mother with proof of bacterial contamination inside
3. fourteen days preceding conveyance. 
4. Putrid or potentially meconium stained alcohol.
5. Single messy or > 3 clean vaginal examination(s) during work
6. Delayed work (amount of first and second phase of work > 24 hrs)

**7. Perinatal asphyxia (Apgar score <4 at 1 moment)**

Presence of putrid alcohol or three of the previously mentioned hazard factors warrant inception of antimicrobial treatment. Babies with two gamble elements ought to be explored and afterward treated accordingly.(32-31)

**Late beginning sepsis (LOS):** It typically presents following 72 hours old enough. The wellspring of disease in LOS is either nosocomial (medical clinic obtained) or local area procured and children normally present with septicemia” pneumonia or meningitis(33-34). Different elements that incline toward an expanded gamble of nosocomial sepsis incorporate low birth weight” rashness” confirmation in emergency unit” ventilation” obtrusive strategies” organization of parenteral liquids” and utilization of stock arrangements. Factors that could build the gamble of local area obtained LOS incorporate helpless cleanliness” helpless rope care” bottle-taking care of” and prelacteal takes care of. Conversely” breastfeeding helps in avoidance of infections.(32-31)

**Clinical highlights:** Vague elements: The earliest indications of sepsis are frequently unobtrusive and vague; to be sure” a high list of doubt is required for early finding. Children with sepsis might give at least one of the accompanying indications and signs (a) Hypothermia or fever (previous is more normal in preterm low birth weight babies) (b) Laziness” helpless cry” refusal to suck (c) Helpless perfusion” delayed hairlike top off time (d) Hypotonia” missing neonatal reflexes (e) Brady/tachycardia (f) Respiratory pain” apnea and panting breath (g) Hypo/hyperglycemia (h) Metabolic acidosis.(7)

**Explicit highlights connected with different frameworks:** Focal sensory system (CNS): Prostrating foremost fontanelle” empty gaze” shrill cry” overabundance peevishness” daze/unconsciousness” seizures” neck withdrawal. Presence of these elements should raise a clinical doubt of meningitis.

Cardiovascular: Hypotension” helpless perfusion” shock.

Gastrointestinal: Feed narrow mindedness” heaving” the runs” stomach distension” disabled ileus”necrotizing enterocolitis (NEC).

Hepatic: Hepatomegaly” direct hyperbilirubinemia (particularly with urinary lot diseases).

Renal: Intense renal disappointment.

Hematological: Dying” petechiae” purpura.

Skin changes: Various pustules” canker” sclerema” mottling” umbilical redness and release (7).
Assessment of Child with Suspected Sepsis: The way to deal with a youngster with suspected sepsis should start with a background marked by hazard factors. The clinical show should then be evaluated(35). Sepsis assessments are performed and empiric anti-infection treatment started when there is even a distant chance of disease. This is because of the neonatologist’s dare that it could be beyond any good time to treat a disease once it becomes clear that a youngster is septic. Respiratory pain” expansion in apnea and bradycardic occasions” “taking care of narrow mindedness” dormancy” and temperature flimsiness” as well as minor changes in actual assessment or clinical status are a portion of the circumstances that propose a potential neonatal contamination and lead to a sepsis evaluation(36). A child with suspected sepsis should then be exposed to extraordinary examinations” alluded to as a ‘septic stir up” which for the most part incorporates a total blood count (CBC)’ with differential white cell count (WBC) and platelets’ blood societies and discovery of C-receptive protein (CRP). Lumbar cuts ought to possibly be performed in the event that there is solid doubt of meningitis or on the other hand assuming a blood culture is positive. Likewise” pee societies are possibly done assuming there is clinical proof to recommend basic renal irregularities. These exceptional examinations are done in certain youngsters who” albeit asymptomatic” have maternal gamble factors like intravenous anti-biosis while holding up blood. The promptly feasible complete blood count and leukocyte differential tests have generally helpless particularity for diagnosing sepsis. Along these lines” the need endures for worked on symptomatic marks of neonatal sepsis(37;38).

Laboratory Studies: Blood” CSF” and urine cultures:

The highest quality level for the finding of neonatal sepsis is culture of ordinarily sterile body liquids” particularly blood. In any case” the highest quality level itself is unreliable. It gives authoritative outcomes following 72 hours. Most children with suspected contamination are hospitalized and treated with intravenous anti-microbials while holding up blood culture results. A positive blood culture alone doesn’t mean the youngster certainly had sepsis” as specific blood societies might be contaminated(39). It ought to be required some investigation before inception of anti-toxin treatment and if conceivable” when the fever is rising. When anti-toxin treatment is begun” the possibilities getting a positive culture are incredibly diminished. When done inadequately it can present disarray and misconstruing(39).

CBC count and differential count: Can be requested sequentially to decide changes related with the contamination” like thrombocytopenia or neutropenia” or to screen the advancement of a left shift or a raised I/T ratio.(40)

A. The platelet include in the sound infant is seldom under 100’000/μL in the initial 10 days of life. Thrombocytopenia with counts under 100’000 may happen in neonatal sepsis(40).

B. White Platelet Count (Aggregate and Differential counts):-

1- Total Counts :- WBC counts and proportions might be useful in deciding sepsis” albeit typical WBC includes might be seen in as numerous as half of culture-demonstrated sepsis cases(41). Absolute white cell count is the most un-remarkable file” in light of the fact that the ordinary reach is so wide” fluctuates with incubation and post pregnancy age(18). There are a few issues viewing the WBC as a marker of disease. WBC markers are explicit” however not extremely touchy which implies that a patient with sepsis might have typical WBC results(35). A strangely low or high count is troubling” Values <6000/mm³>30’000/mm³ in the initial 24 h of life are strange. The absolute WBC count is an entirely questionable sign of contamination. A typical WBC doesn’t preclude sepsis. Just 50% of babies with WBC < 5000 or > 20’000 have positive blood societies. Review uncover that rehashing the WBC count assists with expanding the legitimacy of the test when it is utilized to evaluate for sepsis(42).

2- Differential Count :- The differential count demonstrates the level of each sort of leukocyte present per cubic millimeter of whole blood. The percentage for each cell type can be multiplied by the total WBC count to obtain the absolute number of each cell type present(43). The promptly feasible complete blood count and leukocyte differential tests have generally helpless particularity for diagnosing sepsis. Along these lines” the need endures for worked on symptomatic marks of neonatal sepsis(44).

C. Neutrophil proportions have been more valuable in diagnosing neonatal sepsis; the I/T proportion is the most touchy. All youthful neutrophil structures are counted” and the most extreme satisfactory proportion for barring sepsis in the initial 24 hours is 0.16. In many infants” the proportion tumbles to 0.12 inside 60 hours of life. The awareness of the I/T proportion has gone from 60-90% and rises might be seen with other physiological occasions; along these lines” while diagnosing sepsis” the raised I/T proportion should be utilized in mix with different signs(43).

3-The CSF

4-IgM

5- Current proof on the utilization of contamination markers” for example” CD11b” CD64” interleukin-6” and interleukin-8 for assessment of sepsis in children shows that they might be useful as adjunctive markers(45).

6-C-reactive protein: C-responsive protein (CRP)” an immunizer like protein” isn’t ordinarily found in the serum. It is delivered by the liver during an intense provocative process(46). C-receptive protein is practically like immunoglobulin G” then again” actually CRP isn’t antigen specific(47). Typically” CRP shows up in the
serum of people in light of different incendiary conditions(48). CRP shows high awareness and negative prescient worth. A solitary typical worth can not preclude contamination in light of the fact that the examining might have gone before the ascent in CRP. Rise of CRP in no tainted youngsters have been seen with fetal hypoxia” RDS” and meconium goal Too” a misleading positive pace of 8%has been found in sound children. In any case” CRP is a significant aide in the finding of sepsis “ observing the reaction to treatment” as well as directing length of treatment(42). C-reactive protein is raised sooner or later in 50-90% of newborn children with fundamental bacterial diseases, it as a rule ascends inside 24 hours of contamination” tops inside 2-3 days” and stays raised until the irritation is settled (43). (49-50)

6-Despite the fact that life form segregated from shallow locales” gastric and amniotic liquid show colonization and may incorporate microbes liable for sickness they don’t lay out presence observation screening is performed regularly in numerous neonatal joined together and might be utilized to screen patterns in safe vegetation and characterized anti-toxin arrangements” it is seen by some to be helpful for foreseeing the event and characterizing the etiology of right on time and late-beginning neonatal sepsis(51-52), yet by others as non-contributory or misleading(55-56). Gastric suction greenery in the neonborn mirror those of the amniotic liquid or birth canal(51-55). Gram stained smears of gastric suction might show the presence of polymorphonuclear leukocytes(PMNs)”but these might be maternal in beginning and may not really address afetal incendiary response(56). their quality is regularly wrongly interpreted(57). Notwithstanding” there are incongruous declarations found in the references and numerous specialists keep on finding their quality huge(58-59).

Management:

1.Strong: Sufficient and legitimate steady consideration is significant in a debilitated child with sepsis. He/she ought to be breast fed in a thermo-unbiased climate taking consideration to keep away from hypo/hyperthermia. Oxygen immersion should be kept up with in the ordinary reach; mechanical ventilation might need to be started if vital. Assuming that the baby is hemodynamically unsteady” intravenous liquids ought to be regulated and the newborn child is to be checked for hypo/hyperglycemia. Volume extension with crystalloids/colloids and sensible utilization of inotropes are fundamental to keep up with ordinary tissue perfusion and circulatory strain. Pressed red cells and new frozen plasma could need to be utilized in case of weakness or draining diathesis.(60)

2.Antimicrobial treatment: There can’t be a solitary suggestion for the anti-microbial routine of neonatal sepsis for all settings. The selection of anti-microbials relies upon the common greenery in the given to give an all inclusive proposal to all settings however sets down expansive rules for the suppliers to settle on an objective decision of anti-toxin mix. Choice to begin anti-infection agents depends on clinical highlights as well as apositive septic screen. Anyway span of anti-infection treatment is reliant upon the presence of a positive blood culture and meningitis.(60)

Selection of anti-microbials: Exact anti-toxin treatment ought to be unit not set in stone by the pervasive range of etiological specialists and their anti-microbial responsiveness design. Anti-microbials once began ought to be changed by the responsiveness reports. The exact selection of anti-microbials is subject to the plausible wellspring of contamination. For contaminations that are probably going to be local area gained where safe strains are far-fetched” a mix of ampicillin or penicillin with gentamicin might be a decent decision as a first line treatment. For diseases that are procured during medical clinic stay” safe microbes are probable and a blend of ampicillin or cloxacillin with gentamicin or amikacin might be initiated. In nurseries where this mix is inadequate because of the presence of different safe strains of klebsiella and other gram-negative bacilli” a blend of a third era cephalosporin (cefotaxime or cefazidime) with amikacin might be proper. third era cephalosporins have awesome CSF infiltration and are generally remembered to have brilliant antimicrobial movement against gram negative living beings. Thus they were viewed as a decent decision for the treatment of nosocomial diseases and meningitis. Nonetheless” ongoing reports proposes that something like 60-70% of the gram-ve life forms are impervious to them. Vancomycin ought to be utilized for the treatment of enterococcosis impervious to the principal line of treatment(60-62).

3.Adjunctive therapy

A-Exchange transfusion (ET):(63) the job of twofold volume trade bonding in septic youngsters with sclerema and showed a half decrease in sepsis related mortality in the treated gathering. We perform twofold volume trade bonding with cross-matched new entire blood as adjunctive treatment in septic children with sclerema.

B- Intravenous Immunoglobulin (IVIG): Non-explicit pooled IVIG has not been viewed as valuable(64).

Complication and prognosis(65-6667-68): By and large” intricacies of bacterial or parasitic contaminations might be separated into those connected with the provocative cycle in essence and those that underlie neonatal issues like respiratory pain and liquid and electrolyte irregularities. Sequelae of sepsis might result from septic shock” DIC” or organ disappointment. Detailed death rates in neonatal sepsis are however low as 10% on the grounds that all bacteremic contaminations may be remembered for the
definition. A few investigations have reported that the sepsis case casualty rate is most elevated for gram-negative and parasitic diseases. The case casualty rate for neonatal bacterial meningitis is somewhere in the range of 20 and 25%. A significant number of these cases have related sepsis. Hazard factors for death or for moderate or serious inability include a duration of seizures for more than 72 hr" coma" necessity for the use of inotropic agents" and leukopenia. Extremely low birth weight infants (<1'000 g) with sepsis are at increased risk for poor neurodevelopmental and growth outcomes in early childhood.

**Subjects and Methods:** Endorsement and authorization to lead the review were gotten from the College of Medicine Tikrit University and the Tikrit teaching hospital.

**Study Design:** A cross sectional similar emergency clinic put together review was done with respect to 50 youngsters suspected to have sepsis conceded to pediatric clinical wards at Tikrit educating medical clinic. The period of the study was from first of April 2010 to first of October 2010.

**Patients consideration standards:**
* Children old enough under 72 hours of life.
* Patients with clinical signs of sepsis.

**Patients rejection standards:**
* Children with past treatment with anti-toxins.

**Development of questionnaire:** The questionnaire contained the clinical information about the patients. Detailed history was taken from every family which incorporate age" sex" development " home " weight hazard factors and clinical introductions of neonatal sepsis. Examinations incorporate gastric suction for gram stain"C-reactive protein and total WBC count were done for all neonates. The questionnaire used in the study can be found in (appendix A).

**Investigations:**

1. **Gastric aspirate gram stain:**

   **Method of gastric aspirate:** The procedure was explained to parents’" hands washed" the baby Placed in the supine position the distance from the tip of the nose to the external part of the ear cartilage down to the xiphisternum was measured"the proximal finish of nasogastric tube size 5 embedded into the picked nostril " slide in reverse and descending along the floor of the nasal entry into the nasopharynx" until the desired length is achieved" and gastric content was aspirated by using a 5 ml syringe. A drop of the gastric aspirate was spread out on a clean glass slide with the help of another glass slide. The smear was stained with gram stain and examined per high power field microscopy.

   **Procedure of gram stain:**
   1. Thin film of the material was prepared to be examined then dried in the air and fixed with heat.
   2. The slide was overwhelmed with Crystal Violet answer for 1 min.
   3. The slide was washed with faucet water.
   4. The slide was overwhelmed with Iodine answer for 1 min.
   5. The slide was washed with faucet water.
   6. The Decolizer was poured until the color disappears (10-30 sec.) depending on the thickness of the film.
   7. Washed with tap water.
   8. The slide was flooded with Safranine solution for 30 sec.
   9. Washed with tap water.

2. **C-Reactive Protein (CRP) and Total WBCs Count:**

   The procedure of taking blood samples for CRP and WBC count:
   1. The vein was chosen to be drawn by touching the skin before it had been disinfected.
   2. The skin at the veinpuncture site was carefully pre-arranged utilizing a bacterial sanitizer (2% color of iodine 70% liquor ) and the sanitizer was permitted to dissipate from the skin surface.
   3. The needle was inserted into the vein and tow samples of 1ml of blood for each one of them were taken from peripheral vein for CRP and WBC count.
   4. The main ml was placed in a cylinder containing EDTA (irritable in the wake of eliminating the needle of the needle).
   5. The remainder of blood test was moved to a plain cylinder to acquire the serum. A serum test was frozen for later assurance of the C-responsive protein.

**A. Assurance of C-Reactive protein(CRP) level in serum:** The test was performed by testing a suspension of plastic particles covered with hostile to human CRP antibodies against obscure serum. The presence of apparent agglutination shows an expansion in degree of CRP to a clinically huge level. The CRP Latex test kit was manufactured by the British company Plasma Tec /plasmatic laboratory product Ltd. Procedure (Qualitative method):

   1. Every part was permitted to arrive at room temperature.
   2. The plastic reagent was tenderly shook to scatter the particles.
   3. A drop of undiluted serum using the sample pipettes provided(50ul) was placed onto a circle of a test slide.
   4. One drop of the plastic reagent was added close to the drop of serum.
   5. The reagent and serum test was spreaded over the whole region of the test circle.
   6. Delicately shifted the test slide in reverse and advances roughly once like clockwork for two
minutes. Positive and negative controls was incorporated at standard stretches. At the finish of the test the slide was flushed with refined water and dried (48).

B. Total WBCs Count Procedure: .
1. 1 out of 20 weakening of blood was finished by adding 20ul of blood to 0.38 ml of weakening liquid in a 75x10 mm glass or plastic cylinder.
2. After firmly stopping the cylinder” the suspension was blended by turning in a cell - suspension blender for something like 1 min.
3. The neubauer counting chamber was filled through a pasteur pipette or strong glass hairlike.
4. At least 100 cells were included in upwards of 1 mm² regions (0.1 μl in volume). The leukocytes were included in every one of the four large(1sq.mm.) corner squares(37).

Factual examination and information the board: The Statistical Package for Social Sciences (SPSS" form 7.5) was utilized for information passage and investigation. Chi square trial of affiliation was utilized to analyze between extents of various variables among cases with similar extents among controls. P worth of < 0.05 viewed as measurably huge.

RESULTS: The review incorporate 50 children conceded to the pediatrics-neonatal wards at Tikrit Teaching Hospital who were clinically analyzed as sepsis. Every one was surveyed by history” clinical evaluation and research center boundaries incorporates gastric suction” C-responsive protein (CRP) and absolute WBC count were finished all cases. A large portion of the cases were guys 30 (60 %) and 20 (40%) of cases were females as displayed in figure (4.1).

![Figure (4.1) Appropriation of Cases According to the Gender](image1)

The greater part of neonatal sepsis cases happen in low and exceptionally low birth weight 32 (64%) and 18(36%) happen in typical birth weight patients. As displayed in figure(4.2).

![Figure (4.2) Distribution of Cases According to the Weight](image2)
A large portion of instances of neonatal sepsis happen in preterm patients 32 (64%) and 18 (36%) happen in full term children as displayed in figure (4.3).

The vast majority of instances of neonatal sepsis happen in youngsters from provincial region 29(58%) and 21(42%) happen in metropolitan region as displayed in figure (4.4).

Most neonatal sepsis cases happen in typical vaginal conveyance 32 (64%) and 18 (36%) happen in C.S. as displayed in figure (4.5).
Maternal disease addresses the most widely recognized gamble component of neonatal sepsis 30 (60%)" trailed by delayed crack of layer 11 (22%)" terrible antenatal consideration 5 (10%) and meconium stained alcohol 4 (8%). As displayed in table (4.1).

Table (4.1) Maternal Risk Factors of Neonatal Sepsis.

<table>
<thead>
<tr>
<th>Maternal Risk Factors</th>
<th>Sepsis</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disease</td>
<td>30</td>
<td>60</td>
</tr>
<tr>
<td>PROM</td>
<td>11</td>
<td>22</td>
</tr>
<tr>
<td>Awful antenatal consideration</td>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td>Meconium stained alcohol</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>All out</td>
<td>50</td>
<td>100</td>
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</table>

The clinical indications of neonatal septic cases were as per the following: Among all helpless taking care of had the most noteworthy extent recording 39 (78%)" trailed by windedness 33 (66%)"pallor had the littlest extent recording 4 (8%)" while the remainder of signs and manifestations were in the middle. As displayed in table (4.2).

Table (4.2) Clinical Manifestations of Neonatal Septic Cases

<table>
<thead>
<tr>
<th>Presentations</th>
<th>Sepsis</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Helpless taking care of</td>
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<td>78</td>
</tr>
<tr>
<td>Windedness</td>
<td>33</td>
<td>66</td>
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<tr>
<td>Helpless reflex</td>
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<tr>
<td>Laziness</td>
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</tr>
<tr>
<td>Paleness</td>
<td>4</td>
<td>8</td>
</tr>
</tbody>
</table>

The gram positive microorganisms found in gastric suction gram stain was dominating 74% against gram negative microbes 26%. As displayed in figure (4.6).
The cases with typical WBC count and positive gram stain were 10 (20%)” ordinary WBC count with negative gram stain cases were 23 (46%) while high or low WBC include more in sure gram stain cases were 9 (18%)” than in cases with negative gram stain were 8 (16%). As displayed in table (4.3).

**Table (4.3) Connection Of Gram Stain With WBC.**

<table>
<thead>
<tr>
<th>No.</th>
<th>%</th>
<th>No.</th>
<th>%</th>
<th>Total</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ordinary</td>
<td>10</td>
<td>20</td>
<td>23</td>
<td>46</td>
<td>33</td>
</tr>
<tr>
<td>Strange (High or Low)</td>
<td>9</td>
<td>18</td>
<td>8</td>
<td>16</td>
<td>17</td>
</tr>
<tr>
<td>Total</td>
<td>19</td>
<td>38</td>
<td>31</td>
<td>62</td>
<td>50</td>
</tr>
</tbody>
</table>

*Leukocyte Count (WBC) 9.30 × 10⁹ cells/L*(75).

\[ x^2 = 2.4 \ P value > 0.05 \ df=1 \ (not significant) \]

Positive CRP results more in cases with positive gram stain were 12 (24%)” than in cases with negative gram stain 3 (6%)” the cases with negative CRP and positive gram stain were 7 (14%) and the cases with negative CRP and negative gram stain were 28 (56%). As displayed in table (4.4).

**Table (4.4) Relation Between Gram Stain and CRP.**

<table>
<thead>
<tr>
<th>CRP</th>
<th>No.</th>
<th>%</th>
<th>No.</th>
<th>%</th>
<th>Total</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>+ve</td>
<td>12</td>
<td>24</td>
<td>3</td>
<td>6</td>
<td>15</td>
<td>30</td>
</tr>
<tr>
<td>-ve</td>
<td>7</td>
<td>14</td>
<td>28</td>
<td>56</td>
<td>35</td>
<td>70</td>
</tr>
<tr>
<td>Total</td>
<td>19</td>
<td>38</td>
<td>31</td>
<td>62</td>
<td>50</td>
<td>100</td>
</tr>
</tbody>
</table>

\[ x^2 = 16 \ P value < 0.05 \ df=1 \ (significant) \]

**DISCUSSION:**

**Incidence of neonatal sepsis according to gender:**- The two guys and females were incorporated 30 (60%) were guys while 20 (40%) were females this concurred with Mosayebi(25) who announced that more guys are impacted contrasted and females. A speculation to clarify the male sex hazard " is that the elements controlling immunoglobulin union might be on the X chromosome" thusly" the presence of two chromosomes produce more noteworthy hereditary variety of the female immunologic protections (16).

**Distribution of neonatal sepsis according to the weight:**- The conveyance of sepsis cases as indicated by birth weight in our review LBW had the most noteworthy worth. Just 18 case (36%) of youngsters were of ordinary birth weight" while 28 (56%) were low birth weight" 4 (8%) extremely low birth weight" concurred with Abad-Al Karen(76) who found that the most inclining factors for the occurrence of infection are low birth weight and prematurity. This LBW might be brought about by untimely birth weight or intrauterine development impediment. Despite the fact that LBW babies might create IgM antibodies” their own IgG reaction to disease is diminished (77).

**Impact of development on neonatal sepsis:**- In the current review” by far most among the instances of sepsis were preterm 32 (64%). Comparative outcomes were seen in Eisenfeld and Usmaniet investigations who discovered that in preterm babies” chemotactic development starts following 2 to 3 weeks of life” continuing gradually. In term newborn children” ordinary chemotactic work is laid out by the age of about fourteen days” while in preterm babies” chemotactic motility stays disabled for no less than 3 weeks(78,79). Preterm birth can intrude on the development of fetal neutrophils and spot the preterm youngster in danger of perilous infections(80). Preterm newborn children are at expanded gamble of contamination because of low degrees of latent invulnerability as the majority of the immunizer move happen over the most recent 10 weeks of gestation(29). Preterm has not gotten the full supplement of maternal antibodies (IgG)” which cross the placenta . These babies likewise have lacks of the substitute and " less significantly" the exemplary supplement actuation pathway which bring about lessened supplement intervened opsonization(75). In preterm newborn children and in septic or focused on babies” the neutrophil respiratory burst movement” phagocytosing limit” or killing limit are essentially discouraged (81”82,83,84).

**The distribution of cases according to type of delivery:**- The bigger number of cases were brought into the world by ordinary vaginal conveyance. This clarifies why the vast majority of study cases happened in the beginning stage sepsis in light of the fact that during the fetal life the fetal climate is ordinarily sterile until the beginning of work and conveyance. After break of the films" the newborn child becomes colonized with miniature creatures from the maternal genital tract(85”89). This prompts climbing disease from
the genital plot and neonatal colonization with microscopic organisms.

**Maternal Risk Factors:** Study of maternal gamble factors uncovered that the most incessant component was maternal contamination followed by delayed break of film "terrible antenatal consideration and meconium stained alcohol." Javed and Memon(87) expressed that the presence of different maternal gamble factors makes a kid more powerless to beginning stage neonatal sepsis.

**Clinical introductions of neonatal sepsis:** This study gives that the most well-known indications and manifestations of neonatal sepsis are helpless taking care of followed by windedness "helpless Moro reflex" dormancy" cyanosis" snorting" jaundice" hyperthermia" hyperthermia" jaundice" hyperthermia" seizure" spewing" tachycardia and whiteness. This outcomes almost like Rodriguez concentrate on which give among the clinical indications and manifestations: helpless taking care of dormancy" espresso ground retching" respiratory trouble" indications of lack of hydration" hyperthermia" whiteness" cyanosis" apnea" mottled skin" sclerma and delayed slim topping off time" announced critical relationship with result of death in neonatal sepsis. This wide scope of introductions might be because of that the signs and side effects of neonatal sepsis are vague and vary from patient to another.

**Complete White Blood Cell Count:** - most of cases 33 (66%) were of typical worth and the rest 17 (34%) were strange (either leucopenia or leucocytosis). Our outcomes are in concurrence with Gomella (82) who announced that a typical WBC doesn't preclude sepsis and just 50% of babies with WBC < 5000 or WBC> 20‘000 have positive blood societies. Additionally concurred with Grant and Hadley (89) who observed that anomalies of WBC counts are not explicit for disease" nor do typical qualities prohibit it further! It concurred with Klein (87) who expressed that an ordinary WBC include in a baby with indications of sepsis " doesn't preclude contaminations. Likewise this study goes with Manroe and Rod well review which showed impeded responsiveness of a solitary WBC include measure in neonatal sepsis (90) White platelet consider have served symptomatic apparatuses for neonatal contaminations. The explicitness and responsiveness of these tests" in any case" are lacking to fill in as the main markers for sepsis(91).

**C-receptive protein:** Fifteen (30%) cases were acquired to have positive CRP brings about our review among 50 presumed sepsis cases. This concurred with Burner(92) who expressed that CRP didn't raise the entire time in demonstrated septic cases. Cytokines invigorate hepatocytes to build the union and arrival of CRP(93). CRP discharge begins inside 4-6 h after excitement" cresting solely after 36 h(94) this could provide some insight why the majority of cases were negative for CRP. Cunha(95)" announced that CRP is vague marker of irritation and ought not be utilized in detachment to decide the requirement for antimicrobial treatment. Anyway our outcome is couldn’t help contradicting Jimenez(96) who detailed that CRP has an awareness of 78% for separating bacterial disease from different reasons for contamination.

**Gastric suction test:** - Regarding gastric suction assessment." in our review gram stain showed 19 case positive (38%) for the most part of gram positive microbes (74%) against gram negative microorganisms (26%) which connected well with the finding of Fuchs and Sanyal(97) who observed that gram positive living beings have been progressively recognized as the wellspring of sepsis and right now outperform gram negative microbes as the etiologic specialists of sepsis. The example of sepsis contrasts from one spot to another and can change in a similar spot over a time of time(98-99). The advantage of gastric suction in analysis of sepsis can be clarified by that the digestive system can be colonized by life forms in utero or at conveyance by gulping tainted amniotic liquid. The immunologic protections of the digestive system are not experienced particularly in the preterm infants(99). Assessment of the bumpy cover with gram or methylene blue stain might show intracellular microorganisms. Show of microbes and fiery cells in gram-stained gastric contaminations on the first day of life might reflect maternal amnionitis" which is a gamble factor for beginning stage infection(100). Other examination's likewise showed that aggravation of the fetal surface of the placenta was related with the presence of leukocytes in the gastric suction" These leukocytes result from access of contaminated alcohol to the stomach of the newborn children. The occurrence of dreariness and mortality expanded straightforwardly with the quantity of cells per high power field(98). Anyway different investigations can't help contradicting our outcome and respected that gram stained smear of gastric contaminations might show the presence of polymorphonuclear leukocytes" however these might be maternal in beginning and may not really a fetal fiery response(105). Other reseaches showed that gastric suction assessment is valuable in the conclusion of neonatal sepsis in high gamble infants" despite the fact that it's anything but an ideal screening test and won't supplant the judgment of the clinician(101). The aftermaths of gastric suction gram stain when contrasted with past tow tests respected with be more successful test .Other investigations showed that gastric suction culture for polymorphs are profoundly touchy in recognition of culture negative instances of neonatal sepsis. Besides" a blend of three tests upgrades the awareness of these tests(102). From this review and from numerous different examinations in various nations we found that the need of gastric suction among different tests since it very well may be accessible promptly after birth and before the aftermaths of blood culture" likewise this test is straightforward and should be possible without
CONCLUSIONS:
1. Males were more frequently affected by neonatal sepsis than females 30 (60%).
2. Neonatal sepsis occurs in LBW and VLBW babies more frequently than in normal birth weight neonates 32 (64%).
3. Babies delivered by NVD more frequently affected by neonatal sepsis than C/S delivery 32 (64%).
4. The prematurity was the most well-known gamble variable of neonatal sepsis among the study cases 32 (64%).
5. Neonatal sepsis was more in rural area 29 (58%) than urban 21 (42%).
6. The most common maternal predisposing factors were maternal infection 30 (60%).
7. Poor feeding and difficult breathing are the most well-known introductions of neonatal sepsis in the study sample 39 (78%) and 33 (66%) respectively.
8. Hematological tests alone cannot confirm bacterial infections since large proportion of sepsis cases had normal WBC range. CRP alone can not discriminate bacterial sepsis nor it can be used for early diagnosis.
9. Gram positive bacteria were the most widely recognized organic entities cause sepsis in the review 14 (74%).
10. According to the results of the investigations positive gastric aspirate gram stain was 19 (38%) and can be used in the early analysis of neonatal sepsis.

Recommendations:
1. To Nurses and Gynecologists:
   a. Preparing the mothers for delivery by good maternal antenatal care.
   b. Treatment of maternal UTI; chorioamnionitis or any fever and using antenatal prophylaxis against group B. strep.
2. To Pediatricians:
   a. An attention to the gamble factors related with neonatal sepsis readies the clinician for early distinguishing proof and compelling treatment for decreasing mortality and dismalness of neonatal sepsis.
   b. Routine use of gastric aspirate gram stain as a rapid "easy" cheap and available diagnostic tool of sepsis in hospitals.
3. To Researchers:
   a. Further studies using a larger sample of cases for a more drawn out timeframe to ensure the benefit of gastric aspirate gram stain in diagnosis of neonatal sepsis.
   b. Using other important parameters like "procalcitonin" neutrophil ratio and interleukin for early determination and follow up of patients with neonatal sepsis.

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