Original Research Article

Comparison Between Total Lymphocyte Count and C-Reactive Protein in Neonate with Meningitis

Abstract:

Meningitis in newborn continue to be major cause of morbidity and mortality, particular in premature infant.

Incidence is 0.2 to 0.4 \1000 live birth and higher in premature infant.

The sign and symptoms of meningitis are not specific and diagnosis depends on laboratory investigation. The most important lab.test is CSF, blood for TLC count differential count and blood culture

Objective:

To find the value of CRP in camper with WBC count in cases proved meningitis based on lumber puncture finding.

Design:

Retrospective study, cross section study.

Setting:

The neonatal intensive care unit in children hospital Benghazi.

Patient and methods:

50 newborn infant with proved meningitis based on lumber puncture result (exclude all neonate with traumatic sample) treated in unit in period from January 2020to November 2021 were included in this study.

Epidemiological data and investigation were obtained from the newborn medical chart.

TLC count <5000/cubic mm or>20000/cubic mm were consider abnormal.

CRP >10 consider high

Results:

The total number of eligible newborn was 50 (28 males and 22 females) the mean of their age was 14.74 days.

All diagnosed to have meningitis based on Lumber Puncture result.

The TLC range from 3900 to 37000/cu.mm and the mean was 15150/cu.mm.

1 neonate out of 50(2%) had TLC>5000/cu.mm. and 10 neonate (20%) had TLC >20000/cu.mm.

While the remaining 39 (78%) normal range.

CRP range from 2.5 mg/L to as high as 285 mg/L.

33 neonate out of 50 (66%) were >10mg/L

Seventeen out of 50 newborns (34%) CRP were <10mg/L.

Conclusions:

Compering with TLC, CRP is more reliable indicator for infection with meningitis and sepsis in neonate.

1-Introduction:

Neonatal bacterial meningitis is uncommon but devastating infection. Meningitis in newborn continue to be major cause of morbidity and mortality, particular in premature infant.

Meningitis can be caused by bacteria, virus, fungal.

Incidence is 0.1 to 0.4 \1000 live birth in developed country and higher in premature infant. (1)

Meningitis may be associated with sepsis or focal infection. Meningitis occurs in less than 20% of early onset neonatal infection.

Bacterial meningitis during neonatal period remains a highly devastating condition with morbidity rate of 20% to 60% (1)

The nationwide mortality can be as high as 40% in treated cases that occur during the first month of life.

The immune immaturity (cellular and humeral) of infant is biggest contributor, especially in premature infant.

While several mechanisms involved in the development of neonatal meningitis but bloodstream infection with secondary hematogenouse distribution to the central

nervous system is most common, for this reason the epidemiology and microbiology of neonatal meningitis is similar to neonatal sepsis.

In neonates, clinical signs and symptoms of CNS (central nervous system) infections are often nonspecific and include fever, hypothermia, refuse feeding, irritability, lethargy or excessive crying. Blood and cerebrospinal fluid (CSF) analyses are often performed to diagnose or rule out meningitis.

Elevated white blood cell (WBC) counts, increased total protein, and a decreased CSF/serum glucose ratio are widely used indicators of meningitis.

C-reactive protein (CRP), WBC count, and neutrophil percentage are commonly use inflammatory biomarkers in blood in patient with sepsis meningitis.

2-Patient and methods:

1.2. Population study:

Retrospective cross sectional study carried out in the neonatal intensive care unit of children hospital Benghazi over a period of 23 month from January 2020 to November 2021.

The inclusion criteria to the study was all newborn infant with proved meningitis based on lumber puncture (WBC. count, protein, CSF /serum glucose).

All the data obtained from medical chart of the patient's age in days, gender, lumber puncture result and blood biochemical result CRP and WBC count.

2.2 microbiology of CSF:

All CSFculture were no growth or contaminating sample.

So we depend on CSF character (WBC.count, protein, CSF/serum glucose

2.3. CSF and blood characteristic:

We exclude all traumatic lumber puncture based on unreliability of CSF result

Traumatic sample was defined as RBCS >150

CSF normal finding (2)

WBC in CSF 7cell (0 -32)

Protein 90mg% (20-170)

Sugar 52mg% (34- 119)

CSF to blood glucose ratios 51%.

Blood characteristic:

CRP level >5mg/L positive

CRP consider high in meningitis >10 mg/L

WBC count is >20000cell/cubic mm/ or <5000cell/cubic mm consider indication of infection.

2.4. Statistic:

The data were analyzed by SPSS.

They will be presented as an absolute number, percentage and mean.

3-Result:

3.1. Study population:

A total of 50 newborn infant were found eligible for study.

Out of 50 newborns, 28(56%) were males and 22(44%) the females were male to female ratio 1.27:1 (figure no.1).

Their age ranged from 1 to 30 days and the mean was 14.74 days (figure 2).

26 newborn infant were from Benghazi and other 24 infant were outside Benghazi

The CRP ranged from 2.7 mg% to 285mg% and the mean was (47.16).

Thirteen out of 50 newborns (26%) had normal value of CRP.

Four newborn (8%) were between 5 to 10 mg%

Thirty three out of them (66%) had more than 10 mg %(figure no. 3).

Leukocyte count ranged from 3900 to 37000cell/cu.mm and the mean was (15.15)

One out of 50 newborns less than 5000cell/cu.mm (2%).

Thirty of them between 5000-20000 cell/cu.mm (60%).

Nine of them more than 20000cell/cu.mm (18%). (Figure no 4)

Figure 1

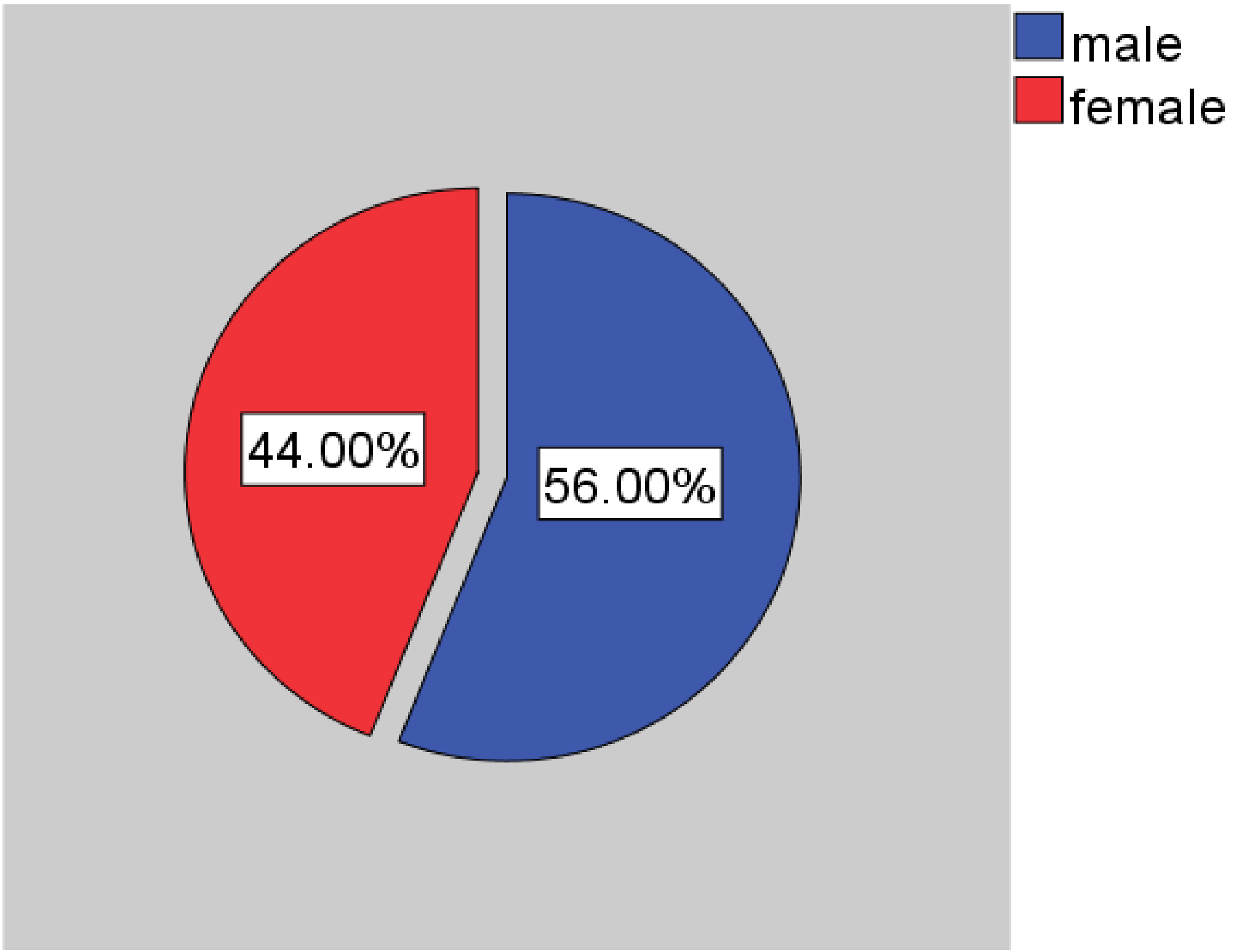

Figure 1 Gender

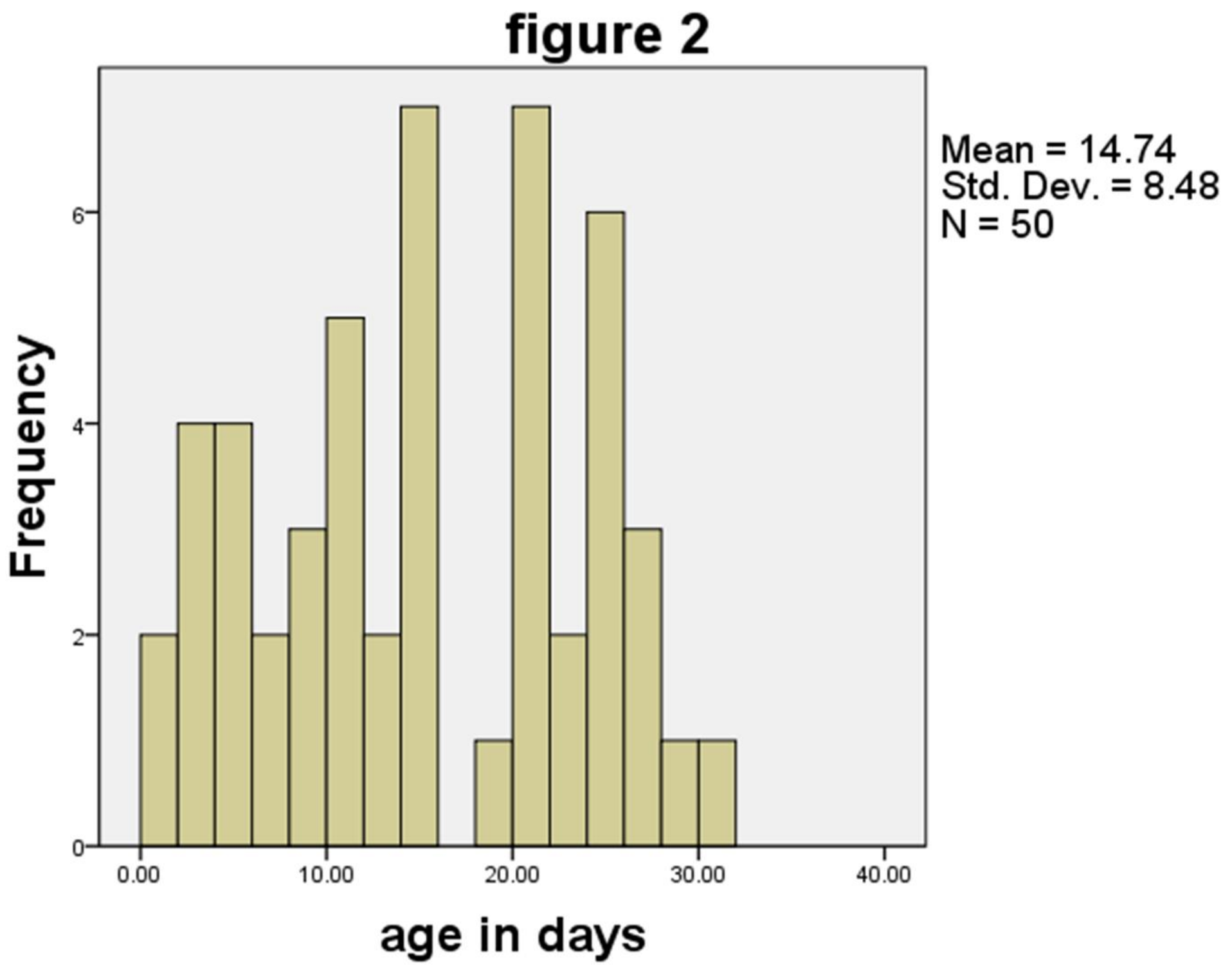

Figure 2 Age in days

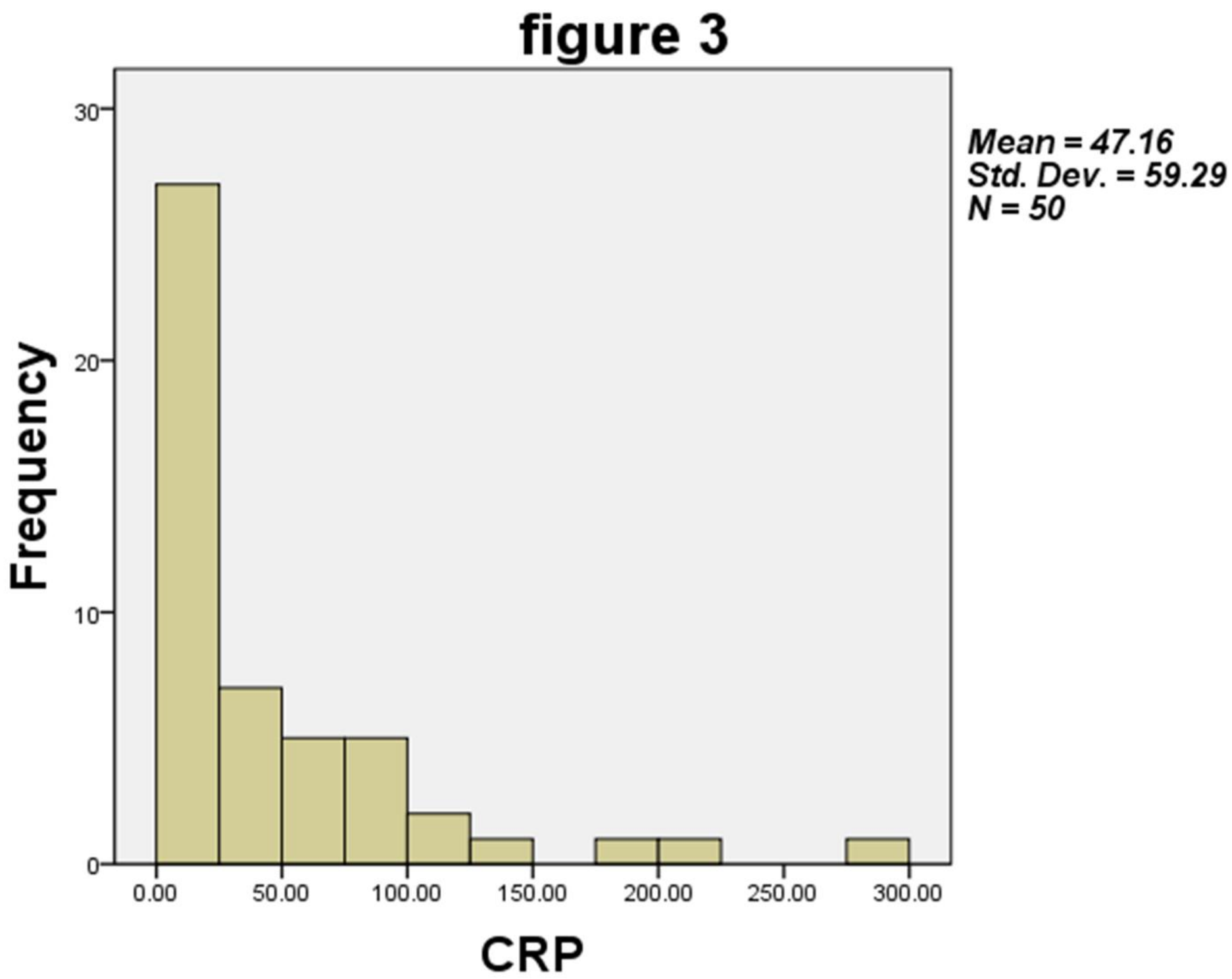
figure 3
Mean = 47.16
Std. Dev. = 59.29
N = 50
Frequency
30
20
10
0
0.00
50.00
100.00
150.00
200.00
250.00
300.00
CRP

Figure 3 CRP

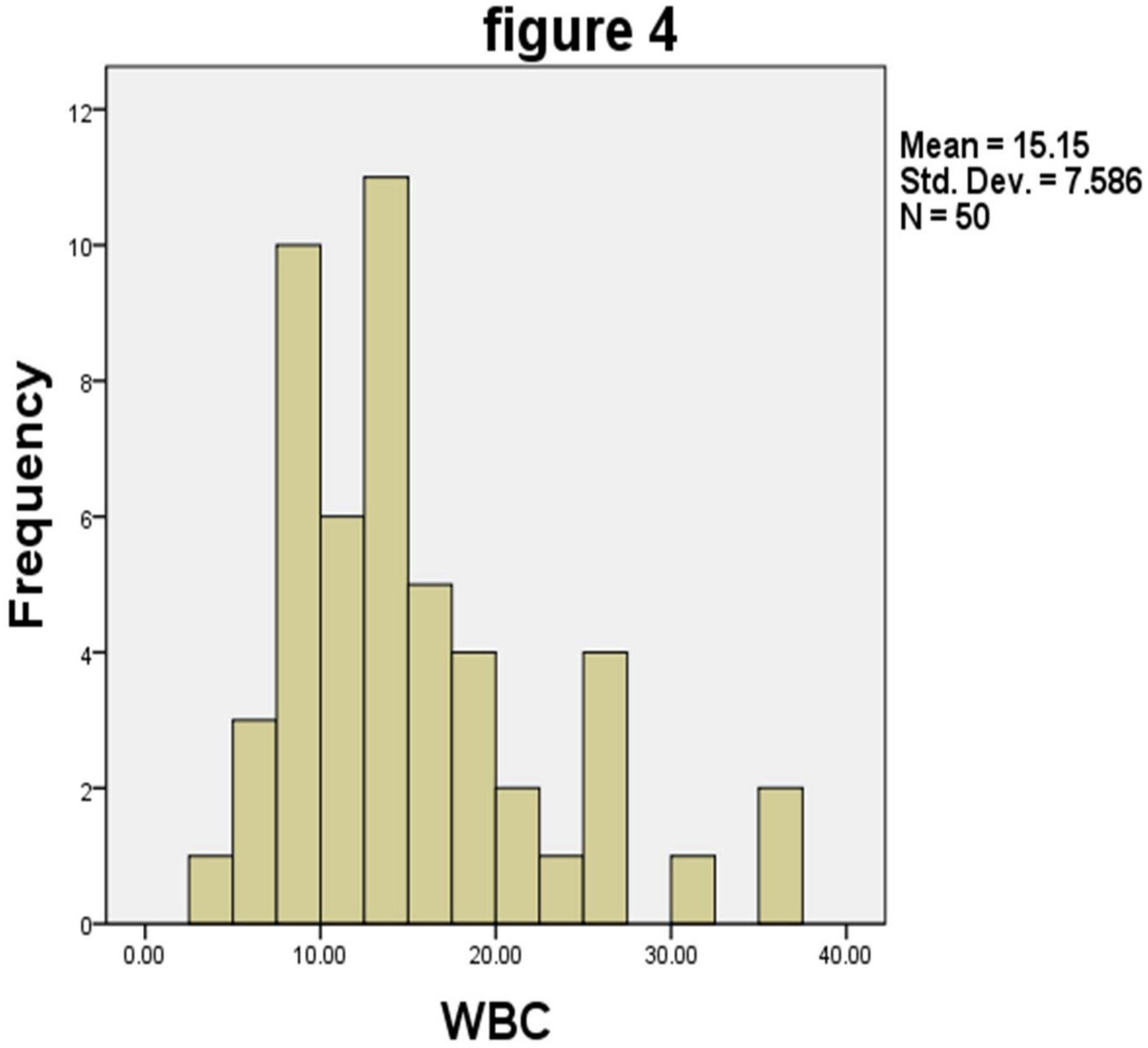

Figure 4 WBC

4-Discussion:

Before interpretation the result of TLC and CRP. We should put in our mind that TLC and CRP can be raised in noninfectious disease.

TLC raised in newborn if the mother with hypertension, or she receive steroid therapy or baby having birth asphyxia. (3)

There is wide range of TLC in first month of life. (2, 4)

CRP also can increase in baby with birth asphyxia, RDS, meconium aspiration and trauma or surgery. (3)

Our study done on 50 newborn infants were diagnosed to have meningitis based on lumber puncture finding, serum CRP was high in 33 patients more than10 mg/L account for 66%, Seventeen of them were between <10mg/L (34%), while TLC count was abnormal in 11 patients, one of them TLC count was low (2% <5000cell/cu.mm) and ten of them were high (20% >2000cell/cu.mm) which account for 22%.

Our findings show that 78% of the patient were having normal TLC count comparing with 66%of them show abnormal CRP (>10 mg/L), indicating that CRP is more reliable than TLC count in patient with meningitis.

In study done in 2019 by De Blauw show that increase in TLC count indicate CNS infection but high CRP and increase CSF protein indicate bacterial meningitis.

Similar conclusion mentioned by Lee and his colleague (2020) CRP has an intrinsic predictor value on diagnosis of meningitis in febrile infant less than 3month.

In another study done in2015 by Zarkesh seated that CRP and IL6 having high predication

value than TLC and ANC in serious bacterial infection in febrile infant.

The CRP is accessible and cut off marker for early diagnosis of serious bacterial infection.

Other researches (2001, 2002) support our finding in which their studies show that CRP has very high predictive value than TLC count or ANC.in patient suspected bacteremia (10.11)

In contrast with our study another study by Goldfinch in 2018 show that both CRP and TLC

Immature to total leucocyte) perform poorly in identify infection with confirmed or probable meningitis. (7)

Also a study carried by Sturgeon in England (2018), He is not agree that CRP alone is cut off

of consideration of an LP, so decision should depend on clinical examination ,microbiology study and blood investigation like CRP.(9)

In 2020 another research done by Durrani found that CRP value has poor power to differentiate weather patient having meningitis or not. (12)

Many researches done on the value of serum CRP in the diagnosis of bacterial meningitis have been published since the 1950s. Now researches focused on the use of CRP for distinguishing bacterial from viral meningitis in children who have ambiguous CSF findings and monitoring response to antibiotic therapy. (14)

Postnatal age and mode of delivery significantly influence CRP values. (16)

CRP levels >10 mg/L suggest the presence of meningitis in febrile infants with greater accuracy. But we should keep in mind that a single laboratory marker indicates only the probability but not the certainty of the presence or absence of meningitis.

The predictive of CRP was poor within 24 hours of birth. In asymptomatic neonates, high CRP in 8–24 hours was indicative of infection. Because of the low positive predict value in first hours after birth we should put in our mind not to overtreatment when using CRP for decision making.

5-Conclusion:

In compare with TLC, C-reactive protein has good predictive value and more reliable in patient with meningitis, but can't be used as single test for diagnosis of meningitis.

TLC count has low predictive value in infection in neonate could be because of wide range of normality.

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