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Evaluation of Red Blood Cell Distribution Width in Newborns with Neonatal Sepsis

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Abstract

Sepsis is a common and serious neonatal problem with high morbidity and mortality particularly in resource limited communities. Broad examination endeavors have yielded numerous biomarkers which are conceivably helpful, for conclusion of sepsis as well as for forecast of its result. to examine the analytic job of RDW in 50 of full term children with sepsis and to assess its job in clinical result of neonatal sepsis. This investigation was completed on 100 youngsters conceded in neonatal emergency unit of Benha University Hospital and Benha Teaching Hospital during the period from (December 2018 to February 2020). Moral Research Committee Approval and composed assents were acquired from guardians of the youngsters 50 neonatal sepsis cases and 50 typical controls. Consideration standards: age from 1-28 days and had discoveries of sepsis either clinical or lab. Youngsters were exposed to: History taking, clinical assessment for signs of sepsis. Complete blood tally, C-receptive protein, Blood culture and affectability and assurance of RDW % were done to all children. Mean RDW % was higher among cases than controls (16.7 ±1.6 and 12.9 ±1.4respectively) ($P < 0.001$), then hemoglobin (HB) was lower in cases than controls P=0.542. WBCs were higher among cases contrasted with control ($P <0.001$). CRP was typical in all controls, and was higher in all cases. RDW % was higher in serious sepsis than mellow (19.2 ± 1.8& 16.4 ± 0.5 separately) ($P < 0. 001$). RDW % can fill in as a symptomatic marker and anticipate sepsis seriousness as a noteworthy distinction was found between its incentive among youngsters with mellow sepsis and extreme sepsis.

Keywords: Neonatal, Sepsis, RDW, Evaluation, Indicator.

1. Introduction

Neonatal sepsis (NS) is an extremely serious condition that causes critical dreariness and mortality. Sepsis murders 2.9 million individuals worldwide consistently, and among these, roughly 25% are children. Also, among survivors, an extraordinary number experience the ill effects of neurological sequelae. As a rule, NS is ordered by the time of beginning. Cases that show up inside the first 3 days in quite a while admitted to the neonatal emergency unit and inside the 7 days of life for term newborn children are characterized as beginning stage sepsis (EOS). NS analyzed past 3 days of life in youngsters saw in the NICU and past 7 days of life in term newborn children are named late beginning sepsis (LOS). In EOS, microbes are transmitted vertically by the mother previously or during conveyance, while LOS is auxiliary to the presentation of the newborn child to natural life forms [16]. Neonatal sepsis is a significant reason for mortality in the creating nations. Be that as it may, with current seriousness scores and lab boundaries, foreseeing results of neonatal sepsis is a genuine test. Red cell circulation width (RDW) is a promptly accessible commonsense intends to foresee results of different comorbidities in grown-ups and kids, without bringing on any extra blood misfortune. In any case, its utility in children stays unexplored. Subsequently, the target of the current examination was to assess the relationship of RDW with neonatal sepsis and its job as a prescient marker for mortality [28].

Red platelet dispersion width (RDW) is a boundary mirroring the heterogeneity of the fringe red blood volume and is generally communicated with RDW-coefficient of variety (RDW-CV) [27].

The RDW might be raised in states of incapable creation, or expanded devastation of red platelets, which normally happen in fiery or irresistible circumstances [24].

2. Aim of the study

To evaluate a new non-traditional value of the red cell distribution width (RDW) in diagnosis and prediction of the clinical outcome of neonatal sepsis.

3. Patients and methods

This planned Case Control study was completed at Neonatal Intensive Care Units of Benha University Hospital and Benha Teaching Hospital during period from December 2018 to February 2020. Educated assents was gotten from all cases and control's gatekeepers remembered for this examination which was endorsed by the neighborhood moral board of trustees of Benha university.Newborns remembered for the investigation were separated into two groups:Cases gathering (bunch A): 50 youngsters (24 guys and 26 females) matured from 1-28 days, who had clinical or research facility discoveries of sepsis, for example, fever, breathing issues, looseness of the bowels, diminished nursing. Consideration models of cases were any full-term youngster from birth to 28 days old enough with demonstrated sepsis (nearness of sepsis clinical signs + disengagement of creatures from body societies) or suspected sepsis (nearness of sepsis clinical signs + at least two positive sepsis screening) was qualified for incorporation in the examination. at that point partitioned into 2 gatherings, gentle sepsis (n= 22) , and extreme sepsis (n=28). Grouping of cases into cut off and mellow depended on both clinical and research center discoveries, clinical discoveries as level of fever, capacity of nursing and breathing, nearness or nonappearance of looseness of the bowels while lab discoveries as CRP, WBCS, HB and PLT . Avoided from this investigation: Neonates with Gestational age under 37 weeks, perinatal asphyxia, youngsters with more than one scene of sepsis, children with conditions in which C - receptive protein has been accounted for to

be raised (immune system illness, medical procedure, meconium desire and late immunization (hepatitis B, BCG&OPV)), children with dangerous inherent irregularities.

While control gathering (bunch B): incorporates 50 evidently sound [24] guys and 26 females) children, coordinated by age and sex with the patients. All youngsters were exposed to the accompanying: Full history taking including pre-birth, natal, postnatal history of side effects and indications of sepsis and intrusive systems that were never really child after conveyance. Full Clinical assessment for ahead of schedule and late side effects and indications of sepsis as: temperature, apnea, precariousness, requirement for oxygen treatment, requirement for ventilation, bradycardia or tachycardia, hypotension with hypo-perfusion, taking care of narrow mindedness and stomach distension.

For the two patients and control gatherings, the accompanying examinations were done: Base line RDW and other routine examinations, including total blood tally (CBC), C-receptive protein (CRP), Blood culture and affectability and afterward dissected considering the clinical information and pee culture and cerebrospinal liquid whenever demonstrated.

3.1 Statistical analysis

Data management and statistical analysis were done using SPSS vs.25. (IBM, Armonk, New York, United states).Numerical data was summarized as means and standard deviations or medians and ranges. Categorical data was summarized as numbers and percentages.Comparisons between both groups were done using independent t test or Mann Whitney U test for normally and non-normally distributed numerical data respectively. Categorical data was compared using Chi-square test or Fisher's exact test if appropriate. ROC analysis was done for using RDW-CV in diagnosing sepsis. Area under Curve (AUC) with 95%, best cutoff point and diagnostic indices were calculated. Logistic regression analysis was done for predictors of sepsis. Odds ratio with 95% confidence interval were calculated .All P values were two sided. P values less than 0.05 were considered significant.

The used tests were

1- Chi-square test For categorical variables, to compare between different groups
2- Student t-test For normally distributed quantitative variables, to compare between two studied groups
3- Mann Whitney test For abnormally distributed quantitative variables, to compare between two studied groups
4- Fisher's exact test Is used when you have two nominal variables. Fisher's exact test is more accurate than the chi-squared test when the expected numbers are small.

4. Results

Table (1) General characteristics in both groups.

			Group A (n = 50)	Group B (n = 50)	P value
Age (day)	Mean ±SD		13 ±6	13 ±6	0.931
Gender	Males	n (%)	24 (48.0)	26 (52.0)	0.689
	Females'	n (%)	26 (52.0)	24 (48.0)	
Birth Weight (Kg)	Mean ±SD		2.71 ±0.56	2.68 ±0.56	0.772
Gestational age (week)	Mean ±SD		38 ±1	38 ±1	1.0
Mode of Delivery	Vaginal	n (%)	23 (46.0)	23 (46.0)	1.0
	CS	n (%)	27 (54.0)	27 (54.0)	

This table shows that no significant differences between both groups as regard all general characteristics including age, gender, birth weight, gestational age and mode of delivery.

Table (2) Maternal risk factors in patients group.

			Patients (n = 50)
PROM	Yes	n (%)	9 (18.0)
UTI	Yes	n (%)	13 (26.0)
Pyrexia	Yes	n (%)	6 (12.0)
Prolonged labor	Yes	n (%)	8 (16.0)
Meconium stained liquor	Yes	n (%)	3 (6.0)

This table demonstrates risk factors among patients group. We found that the most common risk factor is UTI (26%), while the least common risk factor is Meconium stained liquor (6%).

Table (3) Signs of sepsis in patients group.

		Patients (n = 50)
Looks ill	Yes n (%)	32 (64.0)
Apnea	Yes n (%)	13 (26.0)
Tachypnea	Yes n (%)	32 (64.0)
Chest Retraction	Yes n (%)	31 (62.0)
Grunting	Yes n (%)	17 (34.0)
Central Cyanosis	Yes n (%)	7 (14.0)
Refusal to Feed	Yes n (%)	30 (60.0)
prefeed Aspirate	Yes n (%)	34 (68.0)
Abd. Distention	Yes n (%)	34 (68.0)
Abd. Girth by 2cm	Yes n (%)	10 (20.0)
Lethargy	Yes n (%)	33 (66.0)
Seizures	Yes n (%)	15 (30.0)
Hypothermia	Yes n (%)	19 (38.0)
Fever	Yes n (%)	26 (52.0)
Bradycardia	Yes n (%)	22 (44.0)
Tachycardia	Yes n (%)	26 (52.0)

This table shows that the most common clinical manifestation of sepsis is Refusal to Feed (68%) & ↑ prefeed Aspirate (68%). while the least common clinical manifestation is Central Cyanosis (14%).

Table (4) Laboratory findings in both groups.

		Group A (n = 50)	Group B (n = 50)	P value
TLC ($\times 10^3/\mu l$)	Mean ±SD	14.3 ±5.2	9.4 ±3.6	<0.001
PLT ($\times 10^3/\mu l$)	Mean ±SD	279 ±114	324 ±107	0.046
HB (g/dl)	Mean ±SD	13.1 ±3.2	13.4 ±2.3	0.542
RDW-CV (%)	Mean ±SD	16.7 ±1.6	12.9 ±1.4	<0.001
CRP (mg/l)	Median (range)	24 (12 - 192)	0 (0 - 0)	<0.001
Urea (mg/dl)	Median (range)	15 (4 - 38)	17 (6 - 27)	0.904
Creatinine(mg/dl)	Median(range)	0.5 (0.3 - 1.4)	0.6 (0.3 - 0.9)	0.721
AST (U/L)	Mean ±SD	27 ±12	24 ±4	0.444
ALT (U/L)	Mean ±SD	14 ±4	14 ±3	0.713
PT (Sec)	Mean ±SD	15.1 ±2.6	14.9 ±2	0.789
PTT (Sec)	Mean ±SD	39 ±6.9	36.3 ±6.4	0.18
INR	Mean ±SD	1.24 ±0.3	1.2 ±0.31	0.624

This table shows: TLC was significantly higher in cases (14.3) compared to controls (9.4). P value was <0.001,Platelets were significantly lower in cases 279 compared to controls 324. P value was 0.046, RDW-CV was significantly higher in cases (16.7) compared to controls (12.9). P value was <0.001, Median CRP was significantly higher in cases (24) compared to controls (0.0). P value was <0.001, There were no significant differences as regard urea, creatinine, AST, ALT, PT, PTT and INR.

Table (5) RDW and its relationship with degree of severity of sepsis.

RDW-CV %	Mild Sepsis (n=22)	Sever Sepsis (n=28)	P-value
Mean ± SD	16.4 ± 0.5	19.2 ± 1.8	<0. 001

This table shows that RDW-CV % was significantly increased in parallel with the disease severity.

Table (6) Imaging in patients group.

		Group A (n = 50)
CXR	Yes n (%)	27 (54.0)
CT Brain	Yes n (%)	16 (32.0)
Cranial U/S	Yes n (%)	3 (6.0)

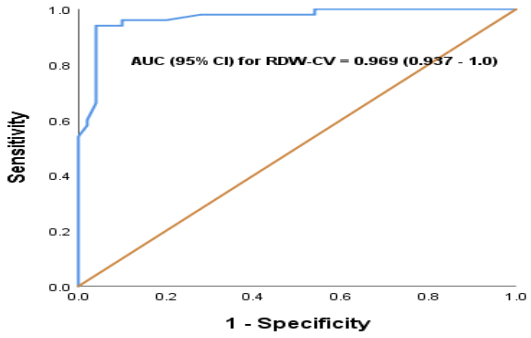
This table shows that the most common findings of sepsis was found in chest x-ray (54%). while the least common findings of sepsis was found in Cranial U/S (6%).

Table (7) Maternal mortality in both groups.

		Group A (n = 50)	Group B (n = 50)	P value
Mortality	Yes n (%)	9 (18.0)	0 (0.0)	0.003

This table demonstrates that Mortality was significantly higher in cases (18.0%) compared to controls (0.0). P value was 0.003

ROC analysis forRDW-CV in diagnosing sepsis .



ROC analysis	
AUC	96.9%
95% C.I.	93.7% - 100.0%
Best cutoff	15.2
Sensitivity	94.0%
Specificity	96.0%
P value	<0.001

ROC analysis was done for RDW-CV in diagnosing sepsis. It had an excellent Area under Curve of 96.9% with 95% confidence interval ranging from 93.7% to 1.0. Best cutoff point was 15.2 with sensitivity and specificity of 94.0% & 96.0% respectively. P value was <0.001.

Table (8) Logistic regression for predictors of sepsis.

	B	S.E.	Wald	OR	95% C.I. for OR	P value
TLC	0.136	0.091	2.223	1.145	0.958 - 1.369	0.136
RDW-CV	1.854	0.419	19.578	6.383	2.808 - 14.508	<0.001

B = Regression coefficient SE = Standard error OR = Odds ratio 95% CI = 95% Confidence interval

Logistic regression analysis was done for prediction of sepsis. It was found that RDW-CV was a significant predictor for sepsis. Odds ratio (OR) = 6.383 with 95% confidence interval ranging from 2.808 to 14.508. P value was <0.001

Table (10) General characteristics according to mortality.

			Mortality		
			Yes (n = 9)	No (n = 41)	P value
Age (day)	Mean ±SD		11 ±6	13 ±5	0.131
Sex	Males	n (%)	4 (44.4)	20 (48.8)	1.0
	Females	n (%)	5 (55.6)	21 (51.2)	
Birth weight (Kg)	Mean ±SD		2.86 ±0.62	2.68 ±0.55	0.318
Gestational age (week)	Mean ±SD		38 ±2	38 ±1	0.176
Mode of Delivery	Vaginal	n (%)	3 (33.3)	20 (48.8)	0.479
	CS	n (%)	6 (66.7)	21 (51.2)	

This table shows that no significant differences as regard all general characteristics between those who died and those who survived.

Table (11) Maternal risk factors according to mortality.

		Mortality		
		Yes (n = 9)	No (n = 41)	P value
PROM	Yes n (%)	2 (22.2)	7 (17.1)	0.716
UTI	Yes n (%)	2 (22.2)	11 (26.8)	0.775
Pyrexia	Yes n (%)	1 (11.1)	5 (12.2)	1.0
Prolonged labor	Yes n (%)	1 (11.1)	7 (17.1)	0.659
Meconium stained liquor	Yes n (%)	2 (22.2)	1 (2.4)	0.08

This table shows that no significant differences as regard all maternal risk factors between those who died and those who survived.

Table (12) Signs of sepsis according to mortality.

		Mortality		
		Yes (n = 9)	No (n = 41)	P value
Looks ill	Yes n (%)	6 (66.7)	26 (63.4)	0.854
Apnea	Yes n (%)	2 (22.2)	11 (26.8)	0.775
Tachypnea	Yes n (%)	6 (66.7)	26 (63.4)	0.854
Chest Retraction	Yes n (%)	7 (77.8)	24 (58.5)	0.282
Grunting	Yes n (%)	5 (55.6)	12 (29.3)	0.132
Central Cyanosis	Yes n (%)	1 (11.1)	6 (14.6)	0.783
Refusal to Feed	Yes n (%)	9 (100.0)	21 (51.2)	0.007
prefeed Aspirate	Yes n (%)	5 (55.6)	29 (70.7)	0.377
Abdomenal Distention	Yes n (%)	6 (66.7)	28 (68.3)	0.925
Abdomenal girth by 2cm	Yes n (%)	3 (33.3)	7 (17.1)	0.269
Lethargy	Yes n (%)	5 (55.6)	28 (68.3)	0.465
Seizures	Yes n (%)	3 (33.3)	12 (29.3)	0.81
Hypothermia	Yes n (%)	4 (44.4)	15 (36.6)	0.66
Fever	Yes n (%)	5 (55.6)	21 (51.2)	1.0
Bradycardia	Yes n (%)	4 (44.4)	18 (43.9)	0.976
Tachycardia	Yes n (%)	5 (55.6)	21 (51.2)	1.0

This table demonstrates that Refusal to feed was significantly higher in those who died (100.0%) compared to those who survived (51.2%). P value was 0.007.There was no significant difference as regard other signs of sepsis between those who died and those who survived.

Table (13) Laboratory findings according to mortality.

		Mortality		
		Yes (n = 9)	No (n = 41)	P value
TLC ($\times 10^3/\mu l$)	Mean ±SD	12.1 ±3.3	14.8 ±5.4	0.211
PLT ($\times 10^3/\mu l$)	Mean ±SD	205 ±99	296 ±111	0.024

Table (13) Continue

HB (g/dl)	Mean ±SD	14.1 ±2.9	12.9 ±3.3	0.397
RDW-CV (%)	Mean ±SD	17.6 ±1.9	16.5 ±1.5	0.091
CRP (mg/l)	Median (range)	48 (24 - 192)	24 (12 - 114)	0.004
Urea (mg/dl)	Median (range)	17 (6 - 38)	15 (4 - 33)	0.505
Creatinine (mg/dl)	Median(range)	0.4 (0.3 - 0.9)	0.6 (0.3 - 1.4)	0.132
AST (U/L)	Mean ±SD	27 ±4	27 ±14	0.469
ALT (U/L)	Mean ±SD	15 ±4	14 ±5	0.596
PT (Sec)	Mean ±SD	15.8 ±2.5	14.9 ±2.6	0.278
PTT (Sec)	Mean ±SD	44.5 ±7.7	37.6 ±6.1	0.02
INR	Mean ±SD	1.42 ±0.37	1.2 ±0.26	0.197

This table shows ;Platelets was significantly lower in those who died (205)±99 compared to those who survived (296) ±111. P value was 0.024.Median CRP was significantly higher (48) in those who died compared to those who survived (24). P value was 0.004.Mean PTT was significantly higher in those who died (44.5) compared to those who survived (37.6). P value was 0.02. There were no significant differences as regard lab results between those who died and those who survived.

5. Discussion

Neonatal sepsis (NS) is a main source of neonatal dreariness and mortality and a significant general medical issue, particularly in creating nations and especially in pre-term babies [14].

The red cell dissemination width (RDW) is a marker, which has been concentrated in neonatal sepsis. The RDW is a proportion of fluctuation of red platelets in size (anisocytosis) and is routinely assessed as a piece of complete blood tally. The RDW might be raised in states of ineffectual creation, or expanded obliteration of red platelets, which ordinarily happen in incendiary or irresistible circumstances [15].

The 100 Neonates were ordered into two gatherings: tolerant gathering incorporating 50 children with demonstrated or suspected clinical sepsis and control bunch incorporating 50 sound youngsters with age and sex coordinated. In our examination the mean gestational age of the contemplated children (cases& controls) was (38 ±1) and the birth weight of cases was (2.71 ±0.56) and that of controls was (2.68 ±0.56).

Low birth weight children were prohibited to keep away from conceivable perplexing impact of weight on RDW which has been recently shown by F.Garofoli [30] who direct their examination on 46 sound full term babies, 41preterm newborn children and 35 Intrauterine development limitation (IUGR) babies, expressed that the mean RDW%(SD) during childbirth in solid full-term infants was 15.65%(1.18), in the preterm bunch it was 17.7% (2.06) and in the IUGR bunch it was 17.45% (1.81). The preterm and IUGR bunches demonstrated a factual distinction in examination with sound full term newborn children however no measurable contrast was accounted for between the preterm and IUGR babies.

A large portion of our patients were females (52%) versus guys (48%) which is steady with H.Medhat [19]. who directed his investigation on 50 children with suspected sepsis and announced that Sepsis was progressively common among female cases (60%) than guys (40%) and the thing that matters was not factually noteworthy. Interestingly, another examination found that among the contemplated children, (56.7%) were guys and (43.3%) were females bringing about a general male to female proportion of 1.3: 1. Be that as it may, no critical contrast was distinguished with respect to sex (P > 0.05) [25].

Our examination demonstrated that cesarean segment was the method of conveyance in (54%) of the cases. This was in concurrence with B.S.Naher [22] who directed his examination on 50 children with suspected sepsis. The creators saw that infants with suspected sepsis are conveyed more by cesarean segment speaking to (56%). This is most likely because of expanded number of high hazard pregnancies bringing about expanded cesarean segment. Be that as it may I.M. Kardana [12] who concentrated on 138 septic case. Seen that infants conceived by vaginal conveyance were bound to sepsis speaking to (63.0%). This might be identified with acceptable sterile and intrapartum chemoprophylaxis which drastically diminishes of sepsis in youngsters conveyed by cesarean area.

The pervasiveness of LOS in our investigation was 78% while that of EOS was 22%. Essentially, an earlier report detailed a higher commonness of LOS of about 68% and ascribed this to certain components like the meaning of EOS as sepsis happening inside 48 hours of conveyance [19]. In differentiation, another investigation found a higher pervasiveness of EOS of about 61% while that of LOS was 39% and credited this to the expansion of frequency of maternal hazard factors for disease in our populace (PROM, UTI, helpless sustenance, low financial … and so forth.) and ill-advised treatment of UTI and genital infections [23].

In the current investigation, we found that maternal hazard factors spoke to (78%) of our cases and UTI was the most widely recognized (26%) trailed by PROM (18%) with other hazard factors like delayed work (16%) , maternal pyrexia (12%) and meconium recolored alcohol (6%). This was in concurrence with (31) who found that out of 239 infants with suspected sepsis, PROM was seen in 146 children, out of them (38.3%) were demonstrated as sepsis. The other significant hazard factors inclining to sepsis were visit vagina assessment (23.25%), maternal fever (33.33%) and history of noxious alcohol (24.72%).

In the current investigation, results demonstrated that taking care of narrow mindedness was the most

widely recognized clinical introduction which speak to (68%), trailed by dormancy (66%), both of wiped out look and tachypnea (64%).However tachypnea (33%) in the examination done by (2), yet helpless taking care of was the most well-known clinical highlights of sepsis speaking to (80%) trailed by fever (72%) and latency (70%).

In our examination we found that there was no huge contrast in hemoglobin levels (HB) between the two gatherings. Which is predictable with [19], who indicated that despite the fact that HB was lower in cases contrasted with the controls, the thing that matters was not measurably noteworthy (p=0.094), this may focuses to the multifactorial reasons for low HB % other than sepsis. This was additionally in concurrence with [4] who directed his examination on 282 cases (232 with sepsis and 50 as control). The creators saw that, there was no factually critical distinction between the two gatherings as respect hemoglobin level. Nonetheless [20] who led his investigation on 100 term newborn children, saw that hemoglobin level was fundamentally lower in full-term septic youngsters than controls.

In this examination, there was measurably noteworthy distinction in absolute leukocyte check (TLC) of the two gatherings which was higher in septic children than controls. What's more, this was in concurrence with (10) who directed his examination on 204 children with sepsis. The creators found that high and low TLC was related with neonatal sepsis. Conversely, the investigation done by [4]. The creators saw that there was no factually critical distinction between the gatherings as respect TLC.

Platelets include was essentially lower in septic patients of our examination than controls. Also, this concurred with S. K.Mondal [21] which was directed his investigation on 62 children with sepsis (38 youngsters as demonstrated cases gathering, 24 as likely septic gathering) and 40 children as control gathering. The creators found that in both demonstrated and likely instances of sepsis, the level of children indicating thrombocytopenia was essentially higher than among controls.

Additionally this was in concurrence with M.Makkar [18] who found that thrombocytopenia was often connected with sepsis. This was believed to be because of expanded platelet annihilation optional to contaminations and disappointment in platelet creation because of diminished megakaryocytes or harming impacts of endotoxin. In our examination Median CRP was altogether higher in cases (24.0 mg/l) contrasted with controls (0.0). P esteem was <0.001. Furthermore, this concurred with [19], who demonstrated that CRP level was ordinary in all controls, and was raised in all cases with factually critical distinction (P < 0.001), this finding was in concurrence with A. A Raza [26], who found that mean CRP level was fundamentally higher in patients with sepsis than controls, likewise in concurrence with A.C.Buch [3], who detailed that CRP has high affectability and explicitness for setting up the determination of neonatal sepsis which is practically identical to that of blood culture results. In our examination we found that the degree of RDW-CV was altogether high in sepsis bunch with mean (16.7% ±1.6) in contrast with control gathering (12.9% ±1.4). P esteem was <0.001.

A review concentrate in China done by Jianping Chen [5], who led their investigation on 97 sepsis infants isolated by the seriousness of the sickness into (sepsis, extreme sepsis and septic stun gathering), indicated that 59.79% of cases had critical increment in RDW and the degree of RDW increment with increment the seriousness of the malady. This was likewise in concurrence with M.Singh [27], who found that the mean RDW level was essentially high in neonatal sepsis cases (21.31% ±3.08) as analyzed controls (16.23% ±1.16).

H.Medhat (19) announced comparative discoveries in which mean RDW was altogether higher in cases contrasted with controls (18.35% ±1.79 and 12.95% ±2.23 separately) (P < 0.001), and this finding was in concurrence with (5) who detailed that RDW estimation of sepsis gathering (19.61% ±1.48) was considerably more higher than that of typical benchmark group (16.04% ±1.25), and there was a huge distinction (F=15.6, P=0.0001).

In our examination we found that that RDW-CV % was fundamentally expanded in corresponding with the illness seriousness, as RDW% essentially expanded from 16.4 % in mellow degree to 19.2% in extreme degree (P= 0.001). This finding is in concurrence with A.Kader [11] which detailed that frequency of RDW increment in neonatal sepsis and expanded with expanding seriousness of the malady. He likewise expressed that mean RDW esteem in less serious patients were 16.04 %± 0.7 and mean RDW esteem in increasingly extreme patients were 19.75%± 1.9. This mean RDW contrast in the two gatherings was factually noteworthy (P<0.001) which focuses to the way that raised RDW is related with expanding seriousness of neonatal sepsis.

Jianping Chen [5] found a comparable wonder in full term children where RDW in sepsis, serious sepsis and septic stun sub-bunches were 16.59%, 18.88% and 19.71% separately. Alternately, another investigation, led on 122 septic patients with and without stun, distinguished that RDW isn't related with microcirculatory changes or forecast in septic patients [8].

Our outcomes demonstrated that 9 cases out of 50 septic case kicked the bucket with death rate was (18%) and on contemplating the prognostic estimation of RDW, we found that RDW was higher in non survivors with mean (17.6% ±1.9) than endure cases with mean (16.5% ±1.5) with no huge distinction. P esteem was (0.091). This was in concurrence with T.Devina [7] who found that RDW esteems are not related with mortality in pediatric sepsis patients. The creators directed their examination on 40 pediatric patients with sepsis and found that the raised RDW bunch had a higher death rate contrasted with the typical RDW gathering (45% versus 40%, individually), yet this distinction was not critical.

Likewise [1] indicated that RDW esteems with death rates didn't contrast. Moreover, a planned investigation of youngsters with serious sepsis and septic stun

announced no critical connection between RDW worth and mortality.

6. Conclusion

RDW is a modest, promptly accessible boundary which can be helpful for foreseeing mortality in full term youngsters with sepsis whenever estimated at affirmation.

RDW can be utilized to anticipate sepsis seriousness as a noteworthy distinction was found between its incentive among youngsters with gentle sepsis and extreme sepsis.

References

[1] A.Abbasoglu, U.Tugcu, D.A.Ince .PO-0514 Assessment of red cell distrubution width in neonatal sepsis as a prognostic factor. Archives of Disease in Childhood.Vol.99(Suppl 2), PP. A417,2014.

[2] S.A.Arif, A.Ehsan, M.Arif. Early diagnosis of neonatal sepsis through hametological and biochemical markers. Gomal Journal of Medical Sciences, Vol.11, PP.(2), 2013.

[3] A.C.Buch, V. Srivastava, H. Kumar. Evaluation of haematologicalprofiles in early diagnosis of clinically suspectedcases of neonatal sepsis. International Journal ofBasic and Applied Medical Sciences, Vol. 1, PP. 1-6,2011.

[4] I.H.Celik, F.G. Demirel, N.Uras. What are the cut-off levels for IL-6 and CRP in neonatal sepsis?. Journal of clinical laboratory analysis./Vol.24(6), PP.407-412,2010.

[5] J.Chen, L. Jin , T.Yang. Clinical study of RDW and prognosis in sepsis newborns. Biomedical Research, Vol. 25 (4), PP. 576- 579,2015.

[6] S.T.Abdullah, A. N.Moustafa, A.Mohsen Anwar. Prognostic validity of red cell distribution width in neonatal sepsis. International Journal of Pediatrics.Vol. 6(11),PP. 8579-8586, 2018.

[7] T.Devina, M.Lubis, E.Mutiara. Red cell distribution width and mortality in pediatric sepsis. Paediatrica Indonesiana, Vol. 56(6), PP. 320-4,2016.

[8] V.Fontana, S.Spadaro, O.Bond . No relationship between red blood cell distribution width and microcirculatory alterations in septic patients. Clin Hemorheol Microcirc, Vol.66(2), PP.131-141,2017.

[9] Y.Gao, Y. Li, T. Sun, The impact of various platelet indices as prognostic markers of septic shock. PLoS One., Vol.9(8),PP. e103761,2014.

[10] C. P.Hornik, D. K.Benjamin, K. C.Becker. Use of the complete blood cell count in early-onset neonatal sepsis. The Pediatric infectious disease journal.Vol.31(8),PP. 799,2012.

[11] A.Kader, M.S.Islam, S.Ferdoushi, Evaluation of Red Cell Width in Critically Ill Patients Admitted in Intensive Care Unit. Dinajpur Med Col J. Vol. (1), PP.67-73, 2015.

[12] I.M. Kardana. Incidence and factors associated with mortality of neonatal sepsis. Paediatrica Indonesiana.Vol. 51(3), PP. 144-8, 2011.

[13] Y.Koma, O.Nao, Y.Naoya. Increased Red Blood Cell Distribution Width Associates with Cancer Stage and Prognosis in Patients with Lung Cancer. Plos one J., ,2013.

[14] Z. A.El-Kabbany, O. G.El-Farghali, S.M.Khafagy. Melatonin as an adjuvant therapy in preterm infants with neonatal sepsis, randomized trial. Egyptian Pediatric Association Gazette,Vol. 68(1), PP. 1-5, 2020.

[15] D.M.Ellahony, M. S.El-Mekkawy. A study of red cell distribution width in neonatal sepsis. Pediatric Emergency Care, 2020.

[16] S.Esposito, N.Principi. Adjunctive therapy to treat neonatal sepsis. Expert Review of Clinical Pharmacology, Vol.13(1), PP. 65-73, 2020.

[17] Y.H.Jo, K.Kim , J.H.Lee. Red cell distribution width is a prognostic factor in severe sepsis and septic shock. Am J Emerg Med , Vol.31(3) ,PP.545-8, 2013.

[18] M.Makkar, C.Gupta, R.Pathak. Performance evaluation of hematologic scoring system in early diagnosis of neonatal sepsis. J., clinical neonatology.Vol.2(1),PP. 25,2013.

[19] H.Medhat, K.Abdelmoneim, E.Mohamed. Incidence of Neonatal Infection in South Sinai, Egypt. Int J Infect, Vol. 4(1), PP. e36615, 2017.

[20] M.S.Mostafa, Z.M.Mounir, H.Waheed . Serum amyloid A an early diagnostic marker for neonatal sepsis. LIFE SCIENCE JOURNAL-ACTA ZHENGZHOU UNIVERSITY OVERSEAS EDITION. Vol.8 (3), PP. 271-277.2011.

[21] S. K.Mondal, D.R.Nag, R.Bandyopadhyay. Neonatal sepsis: role of a battery of immunohematological tests in early diagnosis. International Journal of Applied and Basic Medical Research, Vol. 2(1), PP. 43, 2012.

[22] B.S.Naher, M.A.Mannan, K.Noor. Role of serum procalcitonin and C-reactive protein in the diagnosis of neonatal sepsis. Bangladesh Medical Research Council Bulletin, Vol. 37(2) , PP. 40-46, 2011.

[23] K.Pal, K.Arnab , S,Ritesh. A comparative study of early onset versus late onset neonatal sepsis with special reference to bacteriological, demographic and clinical profile. Int J Cur Re Rev, Vol. 06, PP. (03), 2014.

[24] M.A.Saleh, Y.T.Kasem, H.H. Amin. Evaluation of neonatal sepsis and assessment of its severity by Red Cell Distribution Width indicator. *Egy J Community Med*, Vol.*35*(3), PP. 21-30, 2017.

[25] E.R.Shehab El-Din, M.M.El-Sokkary, M.R.Bassiouny . Epidemiology of Neonatal Sepsis and Implicated Pathogens: A Study from Egypt. Biomed Res Int, Vol. 509, PP.484, 2015.

[26] Sidra Younis, M.A.S., A. A Raza. Diagnostic Accuracy of C-Reactive Protein in Neonatal Sepsis. J. Bioresource Manage.Vol. 1(1), PP. 33-42, 2014.

[27] M.Singh, S.Sitaraman, R.Choudhary. Red Blood Cell Distribution Width as a Marker of Early Onset Neonatal Sepsis: A Hospital Based Analytical Study, 2019.

[28] Snehal L. Martin, Saumil Desai, Ruchi Nanavati. Red cell distribution width and its association with mortality in neonatal sepsis, The Journal of Maternal-Fetal & Neonatal Medicine.Vol.32, PP.12, 1925-1930, 2019.

[29] J.Punekar, N.Jain , V.Yawalkar. Role of red cell distribution width as a prognostic marker in patients with severe sepsis and septic shock. J Evolution Med Dent Sci, Vol. 5 (21), PP.1111- 1115, 2016.

[30] F.Garofoli, L.Ciardelli, I. K.Pal, K.Arnab , S,Ritesh. A comparative study of early onset versus Mazzucchelli. The red cell distribution width (RDW): value and role in preterm, IUGR (intrauterine growth restricted), full-term infants. Hematology,Vol.19(6), PP. 365-369, 2014.

[31] P.Verma, P. K.Berwal, N.Nagaraj. Neonatal sepsis: epidemiology, clinical spectrum, recent antimicrobial agents and their antibiotic susceptibility pattern. Int J Contemp Pediatr, Vol. 2(3), PP. 176-80, 2015.