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Progranulin in the Umbilical Cord Blood as Predictor of Early Onset Sepsis in Premature Infants With Premature Rupture of Membrane

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Abstract

Background: In A high rate of death and long-term morbidity are still linked with early-life sepsis caused by bacterial, viral, or fungal infections, despite advancements in newborn care and maternal antibiotic prophylaxis for GBS. Early onset neonatal sepsis (EOS) is a major contributor to sickness and death in the first seventy-two hours of a baby's life. In cases of neonatal septicemia, the C-reactive protein (CRP) test seems to be useful. Progranulin (PGRN) is an autocrine growth factor of 593 amino acids that regulates the crucial TNF/TNFR pathway and is expressed in many mammalian organs. It is a multifunctional immunoregulatory protein. The fields of infectious and inflammatory disorders have conducted much research on it. Methods: Fifty newborns were randomly assigned to the following groups for the research, which took place in a neonatal intensive care unit (NICU): Group I (cases): includes newborns hospitalised to the neonatal intensive care unit due to early onset neonatal sepsis. Apparent healthy newborns made comprised Group II (control). Umbilical cord blood was tested for progranulin levels. Results: Cases and controls did not differ substantially in terms of TLC. Compared to controls (3), cases had a higher median CRP (P=0.001). Patients' progranulin (PGRN) levels were substantially higher than controls' (P=0.001). Conclusion Neonatal sepsis may be indicated by PGRN.

Key words: Early onset newborn, sepsis biomarker, diagnosis using PGRN-C-reactive protein.

1.Introduction:

Despite infant mortality and long-term morbidity in the US is still mostly attributed to neonatal sepsis, which may be caused by bacteria, viruses, or fungi, despite recent advances in the field. Newborn sepsis is still rather common in the US, with 1-4 cases per 1,000 live births with death and long-term damage rates surpassing 40%. This is despite improvements in neonatal therapy and maternal antibiotic prophylaxis for group B streptococcus. [1].

A significant cause of sickness and death among very low birth weight (VLBW) preterm newborns is early onset neonatal sepsis (EOS), which often occurs during the first 72 hours of life. [2].

It is challenging to make a reliable diagnosis of early onset neonatal sepsis (EOS). The high rate of false-negative results makes blood culture, which has been considered the gold standard for quite some time, a problematic tool for diagnosing EOS [3].

Progranulin (PGRN) is a 593-amino-acid autocrine growth factor that regulates the essential TNF/TNFR pathway and is found in many mammalian tissues. It is a multifunctional immunoregulatory protein. Infectious and inflammatory disorders have conducted much research on it [4].

The importance of PGRN as an immunomodulatory cytokine with both immunostimulatory and immunosuppressive properties has recently been shown. The exact role of PGRN in the immune response to bacterial infections needs more research, however [5].

2.Patient and methods

Inclusion criteria:

Both both males and females

The gestational age of preterm newborns was determined by first-trimester ultrasonography, which typically occurs between 24 and 36 weeks into the pregnancy.

Leakage of amniotic fluid before labour begins, before 37 weeks of gestation, was the clinical diagnosis of preeclampsia.

Disqualifying factors:

Maternal age more than 37 weeks

Having more than one child

Mutations in the DNA code

Very serious abnormalities present at birth

There is antepartum bleeding or clinical chorioamnionitis.

Benha University hospitals served as the site for the research.

Following these procedures will be used to all situations under study:

Thoroughly documenting medical history:

My mother's background: Demographics (age, sex, place of residence, and socioeconomic status) Status, history of fever, history of corticosteroids use.

Current events:

Information pertaining to the pregnancy, including:

Obstetric risk factors for mothers, such as Trauma, polyhydraminous, early membrane rupture, polyhydraminous infection, substance misuse, or chronic medical ailment

Causes of foetal distress, erythroblastosis fetalis, and repeated pregnancies are examples of foetal risk factors.

Detailed information on the mother and her health, including her past pregnancies, labour problems, delivery method, gender, birth weight, gestational age, and Apgar score.

postnatally: amniotic fluid culture, fever, apnea, respiratory distress, lethargy, poor feeding, abdominal distension, breathing difficulties, convulsions, vomiting, and other symptoms that might indicate EONS and when they first appeared.

Family history: History of consanguinity

Examination

General examination:

- Including: alert and vital signs such as respiration rate, temperature, blood pressure, capillary filling time, and pulse; evaluation of gestational age using the Ballard score; and comprehensive physical examination from head to toe.
- A comprehensive analysis of the place.
- The first is the cardiovascular system, which is responsible for identifying irregular heartbeats and murmurs.
- Detecting aberrant breath sounds, adventitious noises, and respiratory distress is the 2-respiratory system's job.
- 3-Abdominal and Gastrointestinal Tract (GIT): Ascites or organomegaly.
- Four-The CNS and the musculoskeletal system Evaluation of the motor system, including tone, reflexes, and power; assessment of the Glasgow coma score; evaluation of the pupillary response.
- Investigations:
- Prior to placenta delivery, blood samples will be taken from clamped umbilical cords in order to assess progranulin and C-reactive protein.
- Mothers who participated in the study had their blood tested for CRP and complete blood count (CBC).
- Amniotic fluid culture: for the purpose of identifying the presence of bacteria.

A Upon admission to the neonatal intensive care unit (NICU), a peripheral vein was punctured to obtain blood samples from each baby.

Section Three: Data Analysis

Data management and statistical analysis made use of it (IBM, Armonk, New York, United States). To establish whether the data was normally distributed, we used the Kolmogorov-Smirnov test in conjunction with direct data visualisation. Means, standard deviations, medians, and ranges were used to summarise numerical data. In order to summarise the categorical data, percentages and numbers were used. The numerical variables that were compared between the study groups were tested for normality and non-normality using these tests. Category data from two sets were compared using the Chi-square test. The I/T ratio, serum PRGN, and CRP were employed in ROC analysis to identify early-onset sepsis. Test indices, an ideal cut-off point, and the area under the curve (AUC) with a 95% confidence interval were calculated. The correlations utilising Spearman's correlation. The tests were all bi-valent. We considered a P-value of less than 0.05 to be statistically significant.

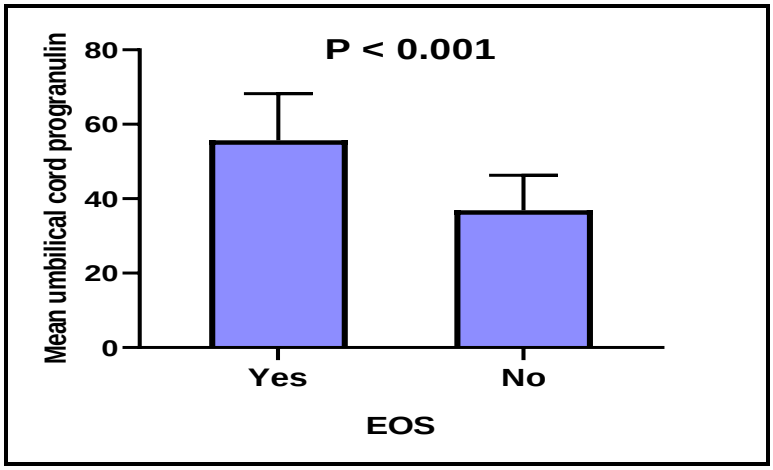
3.Results

A much higher percentage of women in the cases group had risk factors (P 0.001) compared to the control group. There was also no statistically significant difference between the two groups with respect to any other broad characteristics.

A P-value of less than 0.001 indicates that the I/T ratio was significantly higher in cases (0.21) than in controls (0.16). The platelet count was significantly lower in the cases (178) compared to the controls (250), with a p-value of 0.001. There was a statistically significant difference between the two groups, with patients having a median CRP that was seventeen times higher than controls (P = 0.001). In addition, there was a statistically significant difference between the two groups, with patients having significantly higher Progranulin levels (773 vs. 129; P = 0.001). When comparing the two groups' TLC and neutrophil counts, no statistically significant changes were observed.

The data from the lab were shown in table (2); the cases had a substantially greater I/T ratio (0.21) than the controls (0.16); the p-value was less than 0.001. With a p-value of less than 0.001, the platelet count was noticeably lower in the cases than in the controls. There was a statistically significant difference between the patients and controls in terms of median CRP, with a p-value of 0.001. Additionally, patients' (773) Progranulin levels were significantly greater than controls' (129) levels (P = 0.001, figure) [1]. Regarding TLC and neutrophils, no statistically significant changes were detected between the two groups.

Although progranulin did not correlate significantly with any of the other variables, it did exhibit a negative connection with age at admission (r = -0.282 & P-value = 0.047).



Fig(1): Early onset sepsis and umbilical cord progranulin

Table(1) Results for the newborn based on the severity of early-onset sepsis.

		EOS		
		Yes (n = 22)	**No (n = 28)**	**P-value**
Length of hospital stay (days)	Median (range)	20 (4 - 68)	18 (5 - 63)	0.883
Mortality	n (%)	13 (50)	2 (4.5)	**<0.001***
Necrotizing Enterocolitis	n (%)	2 (7.1)	1 (4.5)	1.0
Intraventricular Hemorrhage	n (%)	1 (3.6)	1 (4.5)	1.0
Respiratory Distress Syndrome	n (%)	12 (42.9)	5 (22.7)	0.136

*Significant at P < 0.05

4.Discussion

The The purpose of this research was to determine how well progranulin and C-reactive protein work as early indicators of newborn sepsis.

This research set out to quantify Progranulin in umbilical cord blood in an effort to foretell EONS in cases of preterm labour characterised by early membrane rupture (PROM).

Fifty newborns were included in the research; 28 of them were hospitalised to the neonatal intensive care unit (NICU) as instances of early-onset neonatal sepsis. Bald 22 infants were delivered to mothers in Group II (control).

This study found no statistically significant difference in TLC between the control group and the patients. Moreover, the findings are consistent with those of Mehta et al. [6].

A greater prevalence of prenatal risk factors was seen in the EOS group (75% vs. 45.5%, P = 0.033) than in the non-EOS group. In addition, compared to their non-EOS peers, neonates impacted by EOS had a noticeably lower weight (1534 ± 636 grammes) (P = 0.003). Yang et al. [8] found a significantly higher duration of hospital stay (11.25 vs. 6.5 days, median; P < 0.001), which is in contrast to the findings of Abd Almonaem et al. [7].

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