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Research Article

Measures of Diagnostic Accuracy Parameters of C-Reactive Protein (CRP) for Chorioamnionitis

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Abstract

Background: Chorioamnionitis continues a significant reason of maternal and neonatal morbidity, mainly in low-and middle-income countries like Bangladesh and round the Indian subcontinent, where diagnostic challenges frequently interval timely interfering. Universally, the exploration for consistent, available biomarkers such as CRP is important for advancing initial diagnosis and clinical outcomes in settings with controlled resources.

Aim: To measure the level of diagnostic accuracy parameters (sensitivity, specificity, PPV, NPV) of CRP for the diagnosis of chorio-amnionitis.

Methods: An experimental study was conducted at Bangladesh Medical University (BMU) from October 2022 to September 2023. A total of 125 pregnant women aged 18–40 years with preterm premature rupture of membranes (PPROM) and singleton pregnancies were registered with suitability sampling. Women with inflammatory terms, obstetric difficulties, or fetal anomalies were excluded. CRP levels were considered, and diagnostic exactness was calculated versus clinical diagnosis of chorioamnionitis. Data was analyzed with SPSS version 26, ensuing ethical consent and informed permission.

Results: Out of 125 contributors, 66.4% were clinically diagnosed with chorioamnionitis. Higher CRP levels (10-30 mg/L) were detected in 62.4% of cases. The diagnostic correctness of CRP for chorioamnionitis confirmed a sensitivity of 91.2%, specificity of 100%, positive prognostic value of 91.2%, and negative predictive value of 100%, representing that CRP is an extremely sensitive and exact marker for diagnosing chorioamnionitis in pregnant women.

Conclusion: CRP confirmed high sensitivity and specificity for diagnosing chorioamnionitis in women with PPROM, assisting its practice as a consistent and available biomarker, especially in source-restricted settings.

Keywords: Chorioamnionitis; C-Reactive Protein; CRP; Diagnostic Accuracy; Sensitivity; Specificity; PPROM; Biomarker; Maternal Infection; Neonatal Outcome

Introduction

Chorioamnionitis, an inflammation of the fetal membranes (amnion and chorion), poses a major risk together maternal and neonatal health [1]. This circumstance, repeatedly developing from rise in polymicrobial infection, can indicate bad outcomes such as preterm birth, neonatal sepsis, and constant maternal mortality [1,15]. Speedy and exact diagnosis of chorioamnionitis is hence essential for timely intervention and better outcomes. Clinical diagnosis, trusting on maternal fever, tachycardia, uterine tenderness, and foul-smelling vaginal discharge, can be particular and may not have sensitivity, mostly in basic or subclinical infections [2]. This needs the searching of consistent biomarkers to aid in the diagnosis and danger delamination of chorioamnionitis.

CRP, an acute-phase reactant synthesized by the liver in response to inflammation, has been significantly examined as a potential investigative marker for diverse infectious and inflammatory illnesses, incorporating those in pregnancy [3,14,17]. Eminent maternal serum CRP levels have been correlated with an enhanced risk of maternal and fetal infection in cases of PPROM and threatened preterm labor [4,5,16]. Some studies have assessed the accurateness of CRP in guessing chorioamnionitis, specifically in women with PPROM [6-9,11,18]. During which approximately results indicate CRP as an effective tool in this setting [8,19], others focus for careful clarification due to its incomplete specificity and possible for promotion in non-infectious inflammatory situations [2,17]. Moreover, the ideal CRP cut-off value for diagnosing chorioamnionitis continues a focus of review, with differences stated across several studies [6].

In the perspective of PPROM, wherever the risk of association infection is improved, the initial documentation of chorioamnionitis is very essential for conducting clinical controlling and reducing bad sequelae [1]. Research have explored the efficiency of CRP only or in grouping with more markers, such as white blood cell count and procalcitonin, to increase diagnostic accurateness [11,19]. Moreover, research has examined the association of CRP with exact microorganisms, like Ureaplasma urealyticum, in expecting chorioamnionitis and preterm delivery [10,19]. Whilst additional potential biomarkers, such as matrix metalloproteinase-8 and lipopolysaccharide-binding protein, have also been explored [12,13], CRP remains a widely accessible and frequently utilized marker in clinical practice.

Methodology

An experimental study was conducted at the Department of Obstetrics and Gynecology, BMU, from October 2022 to September 2023. A total of 125 pregnant women aged 18 to 40 years with a diagnosis of PPROM and singleton pregnancies were involved with convenience sampling. Women with illnesses that could lift CRP levels, congenital fetal anomalies, multiple pregnancies, placental complications, or obstetric difficulties involving direct delivery were excluded.

Participants undertook clinical assessment and laboratory examining, incorporating CRP and White Blood Cell (WBC) counts. Chorioamnionitis was classified clinically by the existence obstetrician. Diagnostic accurateness of CRP was assessed by evaluating sensitivity, specificity, positive predictive value, and negative prognostic value. Data was analyzed using IBM SPSS Statistics version 26.0. Ethical approval was acquired from the Institutional Review Board of BMU, and informed consent was secured from all participants. Privacy and secrecy were firmly kept.

Results

An experimental study was conducted to measure the level of diagnostic accuracy parameters of CRP for the diagnosis of chorioamnionitis among 125 pregnant women aged 18-40 years at BMU from October 2022 to September 2023.

Table 1 shows that most of the participants were multigravida 62.4% and had a parity of two 62.4%.

Figure 1 indicates 66.4% were clinically diagnosed with chorioamnionitis by the presence obstetrician, while 33.6% were not.

Variables	Frequency	Percent
Gravida		
Primigravida	47	37.6
Multigravida	78	62.4
Parity		
1	47	37.6
2	78	62.4
Total	125	100.0

Table 1: Distribution of Respondents by Gravida and Parity Status.

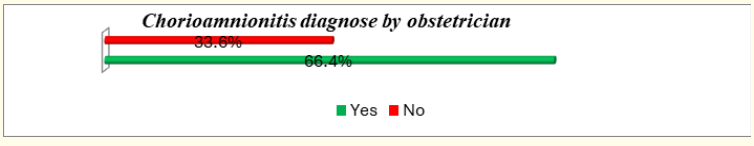

Figure 1: Distribution of the respondents by Chorioamnionitis diagnose by obstetrician.

Variables	Frequency	Percent
Fever		
Yes	39	31.2
No	86	68.8
Foul-smelling vaginal discharge		
Yes	13	10.4
No	112	89.6
Uterine tenderness		
Yes	53	42.4
No	72	57.6
Tachycardia		
Yes	67	53.6
No	58	46.4
Duration of symptoms		
Less than 12 hours	17	13.6
12-24 hours	65	52.0
More than 24 hours	43	34.4
Premature rupture of membrane		
Yes	43	34.4
No	82	65.6
Total	125	100.0

Table 2: Distribution of Maternal Clinical Symptoms Among Respondents.

Table 2 illustrates the most common symptoms observed were tachycardia 53.6% and uterine tenderness 42.4%. Fever was reported by 31.2% of respondents, while only 10.4% had foul-smelling vaginal discharge. About 34.4% of the women experienced symptoms for 12–24 hours and had PROM.

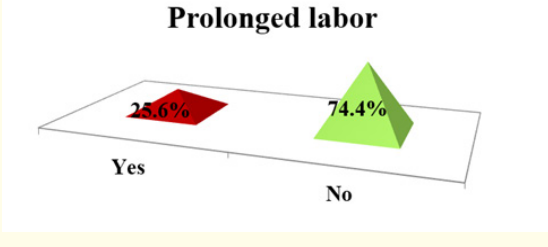

Figure 2: Distribution of the respondents by prolonged labor.

Figure 2 explains that 25.6% experienced prolonged labor, while 74.4% did not.

Table 3 explores that majority of (62.4%) respondents had elevated CRP levels between 10–30 mg/L. Among them 58.4% had a WBC count between 10,000–15,000 cells/mm^3, with inflammatory response patterns. Notably, meconium-stained amniotic fluid

CRP level (mg/L)	Frequency	Percent
<10	19	15.2
10-30	78	62.4
>30	28	22.4
WBC count (cells/mm^3):		
<10,000	18	14.4
10,000-15,000	73	58.4
>15,000	34	27.2
Amniotic fluid characteristics		
Clear	28	22.4
Meconium stained	58	46.4
Foul-smelling	17	13.6
Purulent	8	6.4
Not examined	14	11.2

Table 3: Distribution of Laboratory and Amniotic Fluid Findings of Respondents.

was observed in 46.4% of cases, with 13.6% showing foul-smelling fluid-suggestive of intrauterine infection.

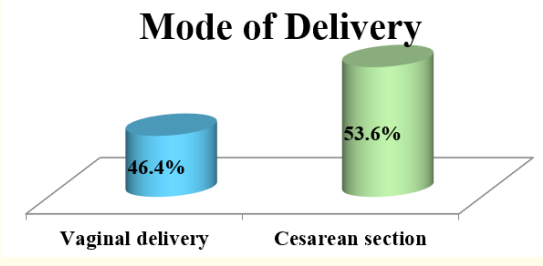

Figure 3: Distribution of the respondents by mode of delivery.

Figure 3 shows that 53.6% of the respondents underwent the Cesarean section, while 46.4% had a vaginal delivery.

Neonatal outcome	Frequency	Percent
Healthy	74	59.2
Admitted to NICU	30	24.0
Neonatal sepsis suspected/ confirmed	21	16.8
Tachycardia		
Yes	103	82.4
No	22	17.6
Total	125	100.0

Table 4: Distribution of the respondents by neonatal outcome.

Table 4 reveals that 59.2% neonates were born healthy. However, 24.0% required NICU admission, and 16.8% had suspected or confirmed neonatal sepsis. Tachycardia was a common neonatal finding among 82.4%.

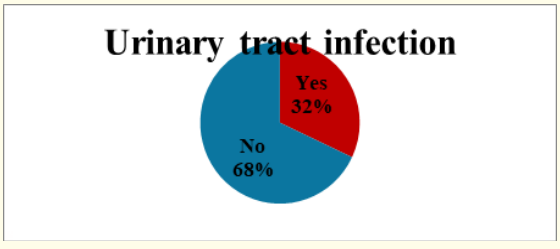

Figure 4: Distribution of the respondents by urinary tract infection.

Figure 4 illustrates, 32% had urinary tract infection, while 68% did not.

Diagnosis of chorioamnionitis	Diagnostic test	
	Positive	Negative
Positive	91.2%	0.0%
Negative	8.8%	100.0%
Total	100.0%	100.0%

Table 5: Association between diagnostic accuracy and diagnosis of chorioamnionitis.

Table 5 shows the sensitivity =91.2%, Specificity=100%, PPV=0 % and NPV=0.088 %. It indicates that the test result is highly sensitive as well as highly specific.

Urinary tractinfection	Uterine tenderness		OR	95% Confidence Interval		*p*-value
	Yes	No		Lower	Upper	
Yes	40	0	6.538	3.965	10.783	0.000
No	13	72				
Total	53	72	125			

Table 6: Association between urinary tract infection and uterine tenderness.

Table 6 shows that there was significant association between urinary tract infection and uterine tenderness (p = 0.000), OR = 6.538 indicates that urinary tract infection is 6.538 times higher risk to develop uterine tenderness among the participants.

Discussion

The results of this study disclose that CRP confirmed above average diagnostic exactness for chorioamnionitis, displaying a sensitivity of 91.2%, specificity of 100%, PPV of 0 %, and NPV of 0.088 % in the study population. These findings imply that CRP is a promising biomarker for both finding and ruling out chorioamnionitis in this clinical setting. The high sensitivity implies that CRP successfully finds the presence of chorioamnionitis, while the perfec specificity suggests a lack of false positives, thus decreasing excessive interventions. Besides, the high PPV suggests that a positive CRP outcome is greatly expected to point out true chorioamnionitis. These results are apparently stronger than some prior reports that stated changing levels of sensitivity and specificity for CRP in the prediction of chorioamnionitis, specifically in the context of PPROM [6,7,11,19]. For example, systematic reviews have emphasized the heterogeneity in the diagnostic accuracy of CRP within different studies and populations [6,7]. But, the study findings have similarity from a cohort where a substantial proportion 66.4% was clinically diagnosed with chorioamnionitis, specify a solid correlation between elevated CRP levels (62.4% had CRP between 10–30 mg/L) and the clinical diagnosis.

The demographic characteristics of the study population, with a predominance of multigravid women and a high rate of clinical chorioamnionitis, might have guided the monitored diagnostic correctness of CRP. The prevalence of chorioamnionitis in a study cohort can significantly impact the PPV and NPV of a diagnostic test. The outstanding association between UTI and uterine tenderness (p < 0.001, OR 6.538) detected in the study suggests a potential interplay between local maternal infections and intrauterine inflammatory replies, which could promote improved CRP levels. While UTI itself may improve CRP, the sharp association with a key clinical sign of chorioamnionitis may well justify, in part, the high diagnostic accurateness of CRP observed. Nevertheless, it is valuable to acknowledge that CRP is a non-specific marker of inflammation and can be elevated in several circumstances outside chorioamnionitis [2,17]. In spite of this characteristic restriction, the high specificity detected in the study suggests that in definite population and clinical context, extra inflammatory conditions might not have significantly confounded the association between CRP elevation and chorioamnionitis.

The neonatal outcomes in the study, counting a significant comparison of newborns needing NICU admission and being diagnosed with suspected or confirmed neonatal sepsis; emphasize the clinical significance of accurate chorioamnionitis diagnosis. The high rate of neonatal tachycardia 82.4% may suggest the fetal inflammatory reply to intrauterine infection, additional importance the must for regular diagnostic markers like CRP. While the results are hopeful, it is crucial to consider the limits of a single-center study and the potential for selection bias. Further research in larger, multi-center studies with diverse populations is warranted to validate these decisions and to agree the optimal CRP cut-off values for diagnosing chorioamnionitis in various clinical scenarios. Moreover, future studies could search the utility of CRP in mixture with other biomarkers, such as procalcitonin or specific interleukins, to possibly improve the diagnostic accuracy for chorioamnionitis and recover the prediction of adverse maternal and neonatal outcomes [11].

Conclusion

The results of this study emphasize the diagnostic value of CRP as a consistent and available biomarker for the early detection of chorioamnionitis in PPROM. With a high sensitivity of 91.2% and exact specificity of 100%, CRP establishes powerful diagnostic exactness, specifically in low-resource settings where timely clinical decision-making is essential. The outstanding negative predictive value recommends that CRP can successfully rule out chorioamnionitis when levels are not lifted, decreasing pointless interventions. While CRP may not substitute clinical assessment or histopathology, it approaches significant validation in controlling diagnosis and managing. Extra multi-centered and larger-scale studies are advised to justify these results throughout diverse populations and clinical settings.

Conflict of Interest

The authors proclaim that there is no conflict of interest involving the publication of this manuscript.

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Authors Contributions

Prof. Dr. Tripti Rani Das and Dr. Sabiha Islam conceptualized the study and designed the methodology. Dr. Dipika Majumder and Farah Noor contributed data management and statistical analysis. Dr. Shah Noor Sharmin, Dr. Jinat Fatema and Dr. Bidisha Chakma assisted in manuscript drafting and critical revisions. Prof. Dr. Tripti Rani Das and Dr. Tanzina Iveen Chowdhury supervised the research and provided final manuscript approval. All authors reviewed and approved the final version.

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