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Maternal Serum Alpha-Fetoprotein as a Predictor of Placenta Previa: A Case-Control Study

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A B S T R A C T

Background: Placenta previa is a major cause of maternal and fetal morbidity. Early prediction could improve management. Maternal serum alpha-fetoprotein (MSAFP), mainly produced by the fetal liver, may be elevated in abnormal placentation. This study examined the association between MSAFP levels and placenta previa.
Objectives: Estimation of maternal serum AFP in maternal serum presenting with or without placenta previa and to find the correlation between the maternal serum AFP and placenta previa.
Methods: A prospective case–control study was conducted at Gauhati Medical College and Hospital among 120 pregnant women (>28 weeks): 60 with placenta previa and 60 controls. MSAFP was measured; >150 IU/mL was considered elevated. Placenta previa was graded by ultrasound. Data were analyzed using chi-square tests; $p<0.05$ was significant.
Results: Elevated MSAFP was found in 75% of placenta previa cases vs. 3% of controls ($p<0.0001$). Higher MSAFP levels correlated with more severe grades (IIIA–IV). The previa group also had higher rates of emergency caesarean, maternal complications, and adverse neonatal outcomes.
Discussion: MSAFP levels were significantly higher in women with placenta previa, especially severe forms. MSAFP may serve as a simple, non-invasive marker to identify high-risk pregnancies and guide management. Larger studies are needed to validate these findings.

Keywords: Maternal Serum Alpha-Fetoprotein, Placenta Previa, Biomaker.

INTRODUCTION

Placenta previa, defined by placental implantation in the lower uterine segment, complicates approximately 0.3-1.8% of pregnancies [1,2]. Risk factors include previous cesarean section, uterine surgeries, multiple gestation, advanced maternal age, and in vitro fertilization [3,4]. One-third of antepartum hemorrhages are attributed to placenta previa [5]. Alpha-fetoprotein (AFP), a fetal glycoprotein, has shown potential as a biomarker for various fetal and placental pathologies, including open neural tube defects and placental injuries [6,7].

Elevated MSAFP has been associated with disrupted placental integrity, potentially due to thin decidual layers, abnormal vascularization, or direct trauma [8,9]. Berkeley (1983) and Kupferminc (1993) noted elevated AFP in placenta previa and abnormal placental invasion [10,11]. Despite advancements in imaging, biochemical markers such as MSAFP offer complementary value, particularly in resource-limited settings. This study aims to correlate MSAFP levels with placenta previa and assess associated obstetric outcomes.

MATERIALS AND METHODS

A prospective, observational, case-control study was carried out at the Department of Obstetrics and Gynaecology, GMCH, from October 2023 to September 2024. Ethical clearance was obtained from the Institutional Ethics Committee (No. 190/2007/Pt-11/Oct.2023/26).

Inclusion Criteria:

- Singleton pregnancies beyond 28 weeks.
  Diagnosed cases of placenta previa by ultrasonography.

Exclusion Criteria:

- Multiple pregnancies, IUFD, fetal anomalies, gestation <28 weeks, or lack of consent.

Sample Size: 120 (60 placenta previa cases and 60 controls).
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Data Collection: Maternal history, clinical examinations, ultrasound findings, MSAFP levels, delivery outcomes.

Statistical Analysis: SPSS v26; chi-square test and Welch's t-test applied. $p<0.05$ was considered significant.

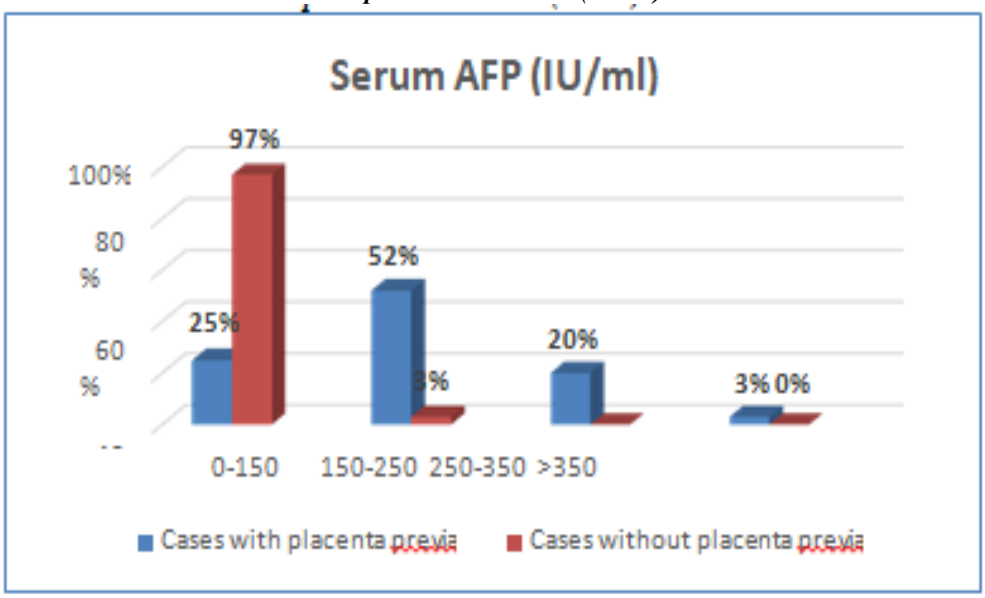
RESULTS

A total of 120 pregnant women were included in this study, divided into two groups: 60 diagnosed with placenta previa and 60 controls without placenta previa. Demographic characteristics, including maternal age, parity, gestational age at the time of sampling, and obstetric history, were statistically matched to minimize confounding variables.
The focus of this analysis was to evaluate serum alpha-fetoprotein (AFP) levels in these two groups. The distribution of AFP values revealed a marked elevation in the placenta previa group compared to the controls.

Table 1 SERUM ALPHA FETOPRPOTEIN (AFP) [IU/ml] IN PLACENTA PREVIA CASES

Table 1					
Sl No	Level of Serum AFP (IU/ml)	Frequency of cases	Percentage	Mean	SD
1	0-150	15	25%	209.05	75.9
2	150-250	31	52%		
3	250-350	12	20%		
4	>350	2	3%		

Graph 01: Serum AFP (IU/ml)



Graph 01: Comparison of Serum AFP levels among patients with and without placenta previa.

The majority of placenta previa cases (75%) had serum AFP levels exceeding 150 IU/ml. A significant portion (20%) had values between 250 and 350 IU/ml, and a small percentage (3%) showed extremely high levels above 350 IU/ml. Only 25% had AFP levels within the 0–150 IU/ml range, suggesting that elevated AFP may be a useful indicator for identifying potential previa cases.

Table 2 SERUM ALPHA FETOPRPOTEIN (AFP) [IU/ml] WITHOUT PLACENTA PREVIA CASES

Table 2					
Sl No	**Level of Serum AFP (IU/ml)**	**Frequency of control**	**Percentage**	**Mean**	**SD**
1	0-150	58	97%	82.70	37.58
2	150-250	2	3%		
3	250-350	0	0%		
4	>350	0	0%		

In the control group, nearly all participants (97%) exhibited AFP levels below 150 IU/ml. Only two individuals had slightly elevated AFP between 150–250 IU/ml. None of the controls exhibited levels above 250 IU/ml, further supporting the significant contrast between the two groups. (Refer Table 2 & Graph 1)

Table 3. CORRELATION BETWEEN THE MATERNAL SERUM ALPHA- FETOPROTEIN AND PLACENTA PREVIA.

Table 3					
Placenta Previa	**Frequency**	**MSAFP**	**Frequency**	**t value**	**P value**
Yes	60	0-150	15	**11.55**	**<0.0001**
		>150	45		
No	60	0-150	58		
		>150	2		

The comparison of categorical data indicated that 75% of women with placenta previa had AFP levels above 150 IU/ml compared to only 3.3% of controls. The statistical difference between the two distributions was profound, with a t-value of 11.55 and a p-value <0.0001, confirming a significant association between elevated MSAFP and placenta previa.

Table 4. Welch's t-test (for unequal variances) to compare each **Placenta Previa type vs. the Nil group.**

Sl No	Type	Mean AFP	SD	t-value	p-value
1	IA	146.1	12.09	11.33	**0.002***
2	IB	229.0	15.13	9.59	NaN
3	IIA	189.91	13.78	21.25	**0.001***
4	IIB	178.15	13.35	23.51	**0.001***
5	IIIA	338.54	18.40	30.69	**0.001***
6	IIIB	232.5	15.25	31.41	**0.002***
7	IV	207.7	14.41	34.57	**0.002***

*Significant

Further stratification of AFP levels based on types of placenta previa indicated a clear linear increase in AFP with increasing grade severity. The mean AFP in type IIIA cases reached an exceptionally high 338.54 IU/ml. The Welch's t-test across subtypes showed all comparisons to controls were statistically significant, especially for higher-grade previa.
Overall, the findings of this study suggest that elevated maternal serum AFP, especially values exceeding 150 IU/ml, is not only associated with the presence of placenta previa but also reflects its severity. The results provide compelling evidence for its utility as a predictive biomarker in clinical obstetrics.

DISCUSSION

The results of our study demonstrate a clear and statistically significant association between elevated maternal serum alpha-fetoprotein (MSAFP) levels and placenta previa. The mean AFP value in the placenta previa group was markedly higher than in controls (209.05 vs. 82.70 IU/ml), consistent with earlier reports [10,11]. Moreover, the stratified data showed a strong correlation between increasing AFP levels and the severity of previa.

Our findings support the observations by Berkley [10], who first reported elevated AFP in association with abnormal placental implantation. Similarly, Kupferminc et al. [11] demonstrated that MSAFP levels rise in cases involving deeper placental invasion and damage to the decidual interface. Elevated MSAFP is believed to result from increased permeability of the maternal-fetal interface or microhemorrhages allowing fetal proteins to leak into maternal circulation.

Our results are also comparable to those of El Koster et al. [12], who reported that AFP levels above 1 MoM were predictive of persistent placenta previa, and Ragab Salem et al. [13], who linked higher AFP with morbidly adherent placenta. In our cohort, 75% of placenta previa patients had serum AFP above 150 IU/ml, a clinically relevant threshold. The highest AFP levels were recorded in types IIIA and IIIB, which correspond to more severe grades of previa.

Pooja Verma et al. [14] and Williams et al. [15] noted that elevated AFP in the second trimester is associated with adverse perinatal outcomes such as preterm labor, low birth weight, and increased maternal transfusion requirements. Our study reinforces these findings, and although we did not include perinatal outcome data in this analysis, the association between higher grades of previa and elevated AFP suggests a shared pathophysiological mechanism involving abnormal placentation.

Additionally, Dashe et al. [16] found elevated MSAFP in pregnancies without fetal anomalies to be a marker of placental dysfunction, underscoring the broader relevance of AFP beyond congenital malformations. Our data confirm the utility of MSAFP as a screening tool for placenta previa, particularly in low-resource environments where access to imaging may be limited.

Nevertheless, limitations of our study include the lack of long-term neonatal follow-up and potential sampling bias due to the single-center design. Future multicentric studies with larger cohorts and incorporation of placental pathology and Doppler studies are recommended.

CONCLUSION

Maternal serum AFP is significantly elevated in placenta previa, particularly in higher grades. It correlates with adverse obstetric outcomes and may serve as an early predictor, enabling timely intervention. Routine screening for MSAFP during antenatal care may help in early identification and effective management of high-risk pregnancies.

REFERENCES

1. ACOG Practice Bulletin No. 192. Placenta previa. *Obstet Gynecol*. 2018.
2. RCOG Green-top Guideline No. 27a. Placenta praevia and placenta accreta. 2018.
3. Ananth CV, Demissie K, Smulian JC, et al. Placenta previa in singleton and twin births in the United States, 1989 through 1998: a comparison of risk factor profiles and associated conditions. Am J Obstet Gynecol. 2003;188(1):275–281. doi: 10.1067/mob.2003.10.
4. Zhou, W., Wang, T., Huang, Y., Li, S., Li, X., & Zhang, L. Advanced Maternal Age and Placenta Previa: A Meta-Analysis. BMC Pregnancy and Childbirth;20: article 491
5. Cunningham FG, Leveno KJ, Bloom SL, Spong CY, Dashe JS, Hoffman BL, Sheffield JS. *Williams Obstetrics*. 25th ed.
6. .Moise KJ Jr. Clin Perinatol. 1994;21(3):549-565.
7. Hobbins JC. Prenat Diagn. 2003;23(11):885-894.
8. Rao KP. Belogolovkin V, Yankowitz J, Spinnato JA 2nd. Abnormal placentation: evidence-based diagnosis and management of placenta previa, placenta accreta, and vasa previa. Obstet Gynecol Surv. 2012; 67(8):503-19.
9. Silver RM , Landon MB , Rouse DJ , Leveno KJ , Spong CY , Thom EA , et al . Maternal morbidity associated with multiple repeat caesarean deliveries. National Institute of Child Health and Human Development Maternal-Fetal Medicine Units Network . Obstet Gynecol 2006 ; 107 : 1226 – 32 .
10. Berkeley AS, Killackey MA, Cederqvist LL. Elevated Maternal serum alpha-fetoprotein levels associated with breakdown in fetal-maternal-placental barrier. Am J Obstet Gynecol.1983;146:85.
11. Kupfermine MJ, Tamura RK, Wington TR, Glassenber R, Socol ML. Placenta accreta is associated with elevated maternal serum alpha-fetoprotein. Obstet Gynecol 1993;82(2); 266-269.
12. El Koster T, et al. The value of maternal serum AFP and beta-hCG in predicting placenta previa. *J Matern Fetal Neonatal Med*. 2009;22(1):33–37.
13. Ragab Salem et al. Role of maternal serum alpha-fetoprotein in prediction of placenta previa. *Asian Res J Gynecol Obstet*. 2020;3(2):14–20.
14. Verma P, Gupta S, Gandhi G. Maternal serum alpha-fetoprotein as a predictor of adverse pregnancy outcome. *J Obstet Gynaecol India*. 2016;66(1):50–54.
15. Williams MA et al. Am J Obstet Gynecol. 1998; 178(3): 546-551.
16. Dashe JS, Ramus RM, Santos-Ramos R, Twickler DM. Second-trimester maternal serum alpha-fetoprotein elevation and subsequent placental complications. *Am J Obstet Gynecol*. 2002;187(5):1326–1330.