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Original article

Maternal Plasma Lipid Profile as a Potential Risk Factor for Spontaneous Preterm Labor

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Abstract
This study seeks to assess whether the maternal plasma lipid profile acts as a risk factor for spontaneous preterm labor. In this hospital-based retrospective case-control research, 70 pregnant women were included in 35 cases of spontaneous preterm labor and 35 cases of term pregnancy who had labor pain and were admitted to the Maternity and Children Hospital (MCH) for delivery between January 2023 to January 2024. We used the logistic regression method to determine the plasma lipid profile for risk factors of spontaneous preterm labor. The case group had significantly higher plasma levels of low-density lipoprotein, triglycerides, and total cholesterol, 31.4%, 45.7%, and 17.1% than the control group, respectively. All the potentially risk factors with their p-value ≤0.05 were taken for logistic regression. linear regression the elevated levels of triglyceride, total cholesterol, and low-density lipoprotein was detected to be associated with 2.92-fold (1.62-3.24,95% CI, p < 0.001), 3.31-fold (1.30-4.99,95% CI, p = 0.001) and 2.88-fold (1.75-3.19,95% CI, p = 0.002) higher risk of premature labor, respectively. A higher risk of spontaneous preterm labor may be associated with elevated serum levels of triglycerides, total cholesterol, and low-density lipoprotein, which could be regarded as a risk factor for this pregnancy issue.
Keywords. *Spontaneous Preterm Labor, Term Pregnancy, Lipid Profile.*

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Introduction

Preterm labor is an obstetric emergency that poses a risk to one's health. One of the leading causes of neonatal mortality is preterm labor (PTL). A gestational week of less than 37 is considered preterm labor and accounts for over 75% of newborn deaths [1]. However, preterm labor causes high neonatal mortality and morbidity that including impairment of neurodevelopment, retinopathy, in addition to bronchopulmonary dysplasia [2]. There may be early or preterm birth types because the most typical delivery course occurs between weeks 32 and 36 of pregnancy [3]. Numerous studies highlight the roughly 9.2% rate of spontaneous preterm labor [4].

It has been established that risk factors for PTL include having a history of abortion, being pregnant frequently without a break in time, and having multiple pregnancies [5,6]. While the previous two decades have seen the PTL rate in some countries because of unseen risk factors or pathogenesis [7,8]. Nonetheless, PTL's courses are largely unknown. Lipid profile research is lacking, but some studies have found that varying levels of lipid profiles, including total cholesterol (TC), triglycerides (TG), low density lipoprotein cholesterol (LDL C), and high-density lipoprotein cholesterol (HDL C), are linked to the onset of the maternal or fetal hypothalamic-pituitary adrenal axis (HPA), decidual hemorrhage, infection and pathological uterine distention and inflammation. Therefore, the goal of the current study is to determine the relationship between the variable maternal lipid profile among PTL pregnant women and compare it with term pregnancy.

Methods

Study design

This is a hospital-based retrospective case control study that was conducted at Maternity and Children Hospital (MCH), Sakaka, Aljouf, Saudi Arabia in between January 2023 to January 2024 to estimate whether the maternal plasma lipid Profile is a risk factor for spontaneous preterm labor. All participants have symptoms of labor pain and are admitted for delivery. This study was approved by the Research Ethics Committee of Jouf University, Saudi Arabia.

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Participants

A total of 70 participants enrolled and were divided into two groups such as case (n=35) and control (n=35). The case group included spontaneous preterm labor (PTL) and gestational weeks less than 37. While 35 pregnant women were served as controls, with gestational weeks ranging from full 37 to 41 weeks. The inclusion criteria included detailed age, body mass index, and number of pregnancies in both groups. vaginal or cervical infection, history of polyhydramnios, previous history of fetal death, history of infertility, history of hypertension was excluded from this study.

Calculation of the sample

In the present study, we calculate the number of participants by using the formula: N = deff u2 *P*(1-P) /d2, where deff is the design effect; N, the sample capacity; u, 1.96 when the confidence coefficient is 95%; P, the probability value. Based on this formula, our study attains a sample size of 70.

Sampling technique and method

We gathered all participants' relevant data from hospital computerized record files that included ultrasound reports for knowing the gestational weeks and fetal well-being, lipid profiles, age, BMI, gravida, parity, history of abortion and as well as information on all participants' inclusion criteria.

Statistical analysis

SPSS version 21 was used to analyze the data that was collected (SPSS Inc., Chicago, IL, USA). Additionally, the normality of the data allocation was examined using the Kolmogorov-Smirnov test. Furthermore, qualitative variables were subjected to the chi-square test. The hypothesis's second stage was examined using conditional logistic regression and simple linear regression tests. P values below 0.05 were regarded as statistically significant.

Results

Demography of participants

Table 1 represents the demographics of participants among the case and control groups. the gestational weeks among case groups were 22.8%, 34.2%, and 42.8% between 29 to 36 weeks, respectively, and a significant comparison between them (p <0.001). Besides control group had 11.4%,64.7%, and 25,7% between 38-40 weeks (p <0.001). The maternal ages of PTL participants 27.25 ±4.12) and 26.60±4.90 are term participants, and significant difference between them (p <0.001). The delivery approach of Cesarean section is more common in the PTL group than the term pregnancy group (p=>0.001). No significant difference was found regarding the BMI of the two groups.

Table1. Demographics were characterized among the study groups.

Factors	**Preterm labor (n=35) %**	**Term labor (n=35) %**	**P value**
Pregnancy weeks			
29-31	8 (22.8)	--	<0.001
32-34	12 (34.2)	-	
35-36	15(42.8)		
37	-	4(11.4)	
38-39	-	22(64.7)	
40	-	9(25.7)	
Factors	Mean ±(SD)	Mean ±(SD)	P value
Pregnancy weeks	31.38 (1.72)	39.14 (1.2)	0.001
Maternal age	27.25 (4.12)	26.60 (4.90)	0.742
Body Mass Index	23.80 (1.40)	24.0 (1.5)	0.342
Factors	Frequency (%)	Frequency (%)	P value
Normal vaginal delivery	11 (31.4)	26 (74.2)	0.001
Cesarean section	24 (68.5)	9 (25.7)	

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Study of lipid profiles among case and control groups

Increased cholesterol and Triglyceride levels were found in the preterm labor group, such as 31.4% and 45.7%, which compared to term participants, 11.4% and 14.2% respectively (p=>0.001). While HDL levels decreased in the preterm group and no significant found between them. Comparatively increased LDL is significantly found in the PTL group than the term pregnancy group (p=>0.005). All the above data are represented in Table 2.

Table 2. Difference of maternal lipid profiles between case and control groups.

Factors	Preterm labor (n=35) %	Term labor (n=35) %	P value
Total cholesterol increased	11(31.4)	4 (11.4)	0.001
The triglyceride level increased	16 (45.7)	5 (14.2)	0.00
High-density cholesterol lipoprotein (HDL) decreased	2 (5.7)	4(11.4)	0.005
Low-density cholesterol lipoprotein (HDL) decreased (LDL) increased	6 (17.1)	1(2.8)	0.001

Linear relationship

The linear relationship detected that the total cholesterol and triglycerides were significantly higher in PTL (p <0.001), which is displayed in Table 3.

Table 3. A linear relationship exists between levels of plasma lipid profiles with gestational age among study groups.

Plasma lipid profiles	B	95% CI	p
Total cholesterol	-0.041	0.025 -0.053	0.001
Triglyceride(mg/dL)	-0.038	0.029 -0.048	0.001
High-density cholesterol lipoprotein (mg/dL)	-0.073	0.009 -0.143	0.077
Low-density cholesterol lipoprotein (mg/dL)	-0.038	0.007 to -0.066	0.009

Logistic regression

This study determined the odds ratio found from the analyzed data; all the potentially risk factors with their p-value ≤0.05 were taken for logistic regression. The related risk factors for PTL participants such as increased total cholesterol, increased triglycerides, increased HDL, and decreased LDL.

Table 4. Logistic regression for plasma lipid profiles adjusted with age and BMI among the cases group.

Plasma lipid profiles	Odds ratio	95% CI	P-value
Total cholesterol (TC)	3.31	1.30-4.99	0.001
Triglyceride(mg/dL)	2.92	1.62-3.24	0.001
High-density cholesterol lipoprotein (mg/dL)	3.36	1.34-4.88	0.001
Low-density cholesterol lipoprotein (mg/dL)	2.88	1.75-3.19	0.002

Discussion

To our knowledge, our study is the first hospital-based retrospective case-control study on preterm labor pregnant women in Sakaka, Aljouf Saudi Arabia. 70 pregnant women were gathered using the convenient approach, and they were split into two groups: the case group and the control group. In this study, term labor serves as the control, and preterm labor as the case. We assessed the maternal lipid profiles, including low-density lipoprotein (LDL), high-density lipoprotein (HDL), triglycerides (TG), and total cholesterol (TC). Compared to term pregnant women, spontaneous preterm labor women in the current study had substantially higher plasma total cholesterol (TC) levels (0.001). 3000 preterm labor (PTL) women were the subject of earlier research, which produced similar findings to the current study [9]. While the same research was performed on two hundred pregnant women in India for evaluation of maternal TG, and showed a significant increase with spontaneous preterm labor pregnant women.[10]. Additionally, our findings showed elevated maternal TG levels. Nonetheless, a comparable study conducted in the US discovered a strong

correlation between TG and spontaneous premature labor [11,12]. LDL was found to be higher in pregnant women who were in spontaneous preterm labor in the current investigation, while similar results were found in different studies [10,13]. Additionally, although not statistically significant, our results showed lower HDL in pregnant PTL women, suggesting that lower HDL may not be linked to spontaneous PTL. Our research suggested that spontaneous preterm labor is caused by varied alterations in the mother's plasma lipid profile. In the meantime, our research demonstrated that the plasma lipid profile is a risk factor for spontaneous PTL.

Conclusion

According to our research, elevated TC, TG, and LDL may be a risk factor for pregnant women to experience spontaneous preterm labor. The minimal number of samples included in this study is a drawback; therefore, future research should focus on a larger number of samples.

Conflict of interest. Nill

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