Lipid Profile in Prediction of Pre-Eclamptic Pregnant Women in Tikrit-Iraq

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ABSTRACT
This study is a prospective case control study involved 50 pre-eclamptic and 50 healthy pregnant women at the Tikrit Teaching Hospital, from November 2022 to June 2023. The two groups were controlled for age, parity, and gestational age. Fasting serum total cholesterol, Triglyceride, High density lipoprotein-cholesterol, Low density lipoprotein-cholesterol and Very low density lipoprotein were assayed using standard methods. An interview will carried out with these patients using questionnaire form including their demographic characteristics, age, body weight, height, blood pressure and edema & maternal body mass index. A proper obstetric, abdominal & medical examination, ultrasonography, and laboratory investigations done. The mean ± SD of the total cholesterol (230.54±40.3), triglycerides (191.14±47.3), low-density lipoprotein (125.6±26.3), VLDL (42.44 ± 13.4) were higher in preeclampsia than control group (165.06± 24.02), (153.3± 31.6), (105.3±13.7), & (35.3±8.3) respectively. The mean ± SD of the High -density lipoprotein (37.58±7.6), was lower among preeclampsia group than control group (42.18± 8.3). The mean ± SD of the total cholesterol (257.5± 31.02), triglycerides (209.1 ± 40.41), high-density lipoprotein (37.1± 5.8), low-density lipoprotein (141.7 ± 23.6), very low-density lipoprotein (44.5± 9.3) were higher in sever preeclampsia group than mild preeclampsia group (195.1±17.05), (174.2±24.7), (39.35±5.4), (123.2 ±20.3), (39.3±7.6), respectively, and control group (165.06± 24.02), (153.3± 31.6), (42.18±8.3), (105.3±13.7), (35.3±8.3), respectively. The serum lipid levels were significantly raised among pre-eclamptic pregnant women when compared to the healthy pregnant women. The raised serum lipid level was higher among severe preeclampsia in comparison to those with mild pre-eclampsia.

INTRODUCTION

Preeclampsia is a hypertensive disorder in pregnancy related to 2% to 8% of pregnancy-related complications worldwide. It results in 9% to 26% of maternal deaths in low-income countries and 16% in high-income countries. Preeclampsia is defined as new-onset hypertension. The parameters for initial identification of preeclampsia are specifically defined as a systolic blood pressure of 140 mm Hg or more or diastolic blood pressure of 90 mm Hg or more on two occasions at least 4 hours apart; or shorter interval timing of systolic blood pressure of 160 mm Hg or more or diastolic blood pressure of 110 mm Hg or more, all of which must be identified after 20 weeks of gestation. [1–2] it lead to fetal and maternal motility and morbidity around 5–10%. [3] The lack of trophoblastic invasion in the spiral arteries that causes uterine arteries more vascular resistance and related with decreased placental perfusion is the main etiology of Preeclampsia . [4–5] In the preeclamptic women, their circulation carries the placental products which induce the dysfunction of endothelium, so it may lead to the development of cardiovascular diseases. [6]   On the contrary, changed lipid profile is hardly related with preeclampsia women because of endothelial dysfunction. It has been well authenticated, that elevated total cholesterol, triglyceride and low-density lipoprotein and decrease high-density lipoprotein has direct link to preeclampsia. [7–8] Therefore, the aim of this study to investigate the serum total cholesterol, triglyceride, low-density lipoprotein and high-density lipoprotein for the relationship between preeclampsia and normal pregnancy in Iraqi women.

MATERIAL

This study is a prospective case control study involving 50 pre-eclamptic and 50 healthy normotensive pregnant women (control group) who were selected by convenient sampling method and according to the patients' symptoms and signs, investigations and admitted to obstetric ward for evaluation, and carried out in the Tikrit Teaching Hospital, from November 2022 to June 2023.

The patients included in the study according to the followings: pregnancy with singleton, the gestational age from 20-40 weeks, pregnancy in the second (13-26 weeks) & third trimester diagnosed as Pre-eclampsia with no other associated complications. The criteria of diagnosing preeclampsia as new onset hypertension (systolic blood pressure sustained at ≥140 mm Hg or diastolic blood pressure sustained at ≥90 mm Hg, or both) in at least two readings 4 hr. apart or one measurement 160/110 or more, with proteinuria, [9–10] The exclusion criteria were the followings: multiple pregnancy, systemic disorders including: essential hypertension, DM, kidney disease, liver disease, epilepsy,

hematological disorders, dyslipidemia, thyroid diseases, any medications except vitamins and minerals, smoking, alcohol abuse, labour contractions, thyrotoxicosis, and molar pregnancy. Data collected by direct interview with the pregnant women, taking information about socio-demographic variables, obstetrical history, medical history, and severity of the PE. Careful general clinical examination including body weight, height, blood pressure and edema. Maternal body mass index (BMI) was calculated using the earliest available body weight (the weight in kilograms divided by the square of the height in meters. Abdominal examination for assessment of estimated fetal weight, fetal movement. Ultrasonography to confirm gestational age, to exclude Intra uterine growth retardation, congenital fetal malformation and twin pregnancy. Apart from routine investigations, a serum lipid profile including total cholesterol (TC), Triglyceride (TG), low-density lipoprotein (LDL), high-density lipoprotein (HDL) and very low-density lipoprotein (VLDL), was performed for all cases and control group. The blood pressure were measured in 2 occasions 4 hours apart in both groups and Pre-eclampsia was diagnosed when the BP ≥140/90 mmHg and urine albumin +1 (By dipstick method). Blood pressure recorded by mercury sphygmomanometer in sitting position with suitable cuff for large and small arms. Korrotkoff phase 5 (k5) used to detect diastolic pressure which is now recommended for diagnosing diastolic hypertension. The lipid profile of the samples were determined using a semiautomated analyzer.

RESULTS

The commonest age group among PE group was 20-29 years 24(48%), and ≥ 30 years 24(48%),in comparison to control group the commonest age group was 20-29 years 37(74%), this relation was statistically significant (P value < 0.05). The commonest educational level among PE group and control group was Read and write 34 (68%), and 29 (58%) respectively, this relation was statistically not significant (P value > 0.05), as shown in table 1.

Higher proportion of previous history of PE found among PE group 10(20%) than control group 0(0%), this relation was statistically significant (P value < 0.05). Positive family history of preeclampsia found among 5(10%) of the PE group and 0(0%) of the control group, this relation was statistically significant (P< 0.05), as shown in table 2.

Regarding symptoms; headache found among 30(60%) of the PE group. Epigastric pain found among 22(44%) of the PE group. Nausea and vomiting found among 35(70 %) of the PE group. Right hypochondrial pain found among 5(10%) of the PE group . New onset visual disturbance found among 4 (8%) of the PE group . Regarding the signs of

PE; Systolic blood pressure mean ± SD among PE group (149.38± 7.07) was higher than control group (114±4.35), this relation was statistically significant (P value < 0.05), as shown in table 3. Preeclampsia cases was distributed according to severity as; Mild PE 20(40%), and sever PE 30 (60%).

Table 1. The general characteristics of study groups

General Characteristics		Control Group		PE Group		P value
		No.	%	No.	%	
Age	< 20years	10	20%	2	4%	0.001*
	20-29 years	37	74%	24	48%	
	≥30 years	3	6%	24	48%	
Educational level	Illiterate	9	18%	2	4%	0.9
	Read and write	29	58%	34	68%	
	Secondary education	6	12%	10	20%	
	University education	6	12%	4	8%	
Occupation	Student	3	6%	4	8%	0.57
	Housewife	35	70%	30	60%	
	Employer	12	24%	16	32%	
Residence	Urban	33	66%	38	76%	0.27
	Rural	17	34%	12	24%	
Total		50	100%	50	100%	

Table 2. Distribution of study groups according to the obstetrical history

		Control		PE		P value
		No.	%	No.	%	
Parity	Nulliparous	44	88%	38	76%	
	Primiparous	4	8%	6	12%	0.25
	Multiparous	2	4%	6	12%	
Miscarriage	0	31	62%	23	46%	
	1	7	14%	7	14%	
	2	6	12%	12	24%	0.32
	≥3	6	12%	8	16%	
Gestational age mean ± SD		29.28± 3.3		29.36±2.5		0.89
Previous history preeclampsia	Yes	0	0%	10	20%	0.01
	No	50	100%	40	80%	
Family history of preeclampsia	Yes	0	0%	5	10%	0.028
	No	50	100%	45	90%	
Total		50	100%	50	100	

Nulliparous (Nulliparous are women who have never given birth) Primiparous (an individual bearing a first offspring)

Table 3. The main symptoms and signs of PE among study groups

		Control Group		PE Group		P value
		No.	%	No.	%	
Symptoms						
Headache	Yes	0	0	30	60 %	
	No	0	0	20	40 %	
Epigastric pain	Yes	0	0	22	44 %	
	No	0	0	28	56 %	
Nausea and vomiting	Yes	0	0	35	70 %	
	No	0	0	15	30 %	
Right hypochondrial pain	Yes	0	0	5	10 %	
	No	0	0	45	90 %	
New onset visual disturbance	Yes	0	0	4	8 %	
	No	0	0	46	92 %	
Signs						
Systolic blood pressure mean ±SD		114±4.35		149.38± 7.07		0.0001
Diastolic blood pressure mean ±SD		70.1±4.17		97.14±5.86		0.0001
Edema	Yes	0	0	39	78 %	
	No	0	0	11	22 %	NA
Proteinuria	-ve	48	96 %	0	0 %	0.001
	+ ve	2	4 %	50	100 %	
Total		50	100.00%	50	100.00%	

NA (not applicable)

High Protein urea found among sever PE cases 2+protein urea 14(46.7%), 3+proteinurea 12(40%), and 4+ protein urea found among 4(13%) of the sever PE cases in comparison to 7(35%), 4(20%) and 0(0%) among mild PE cases respectively, and 0(0%) of the control (normotensive women), this relation was statistically significant as shown in figure (1).
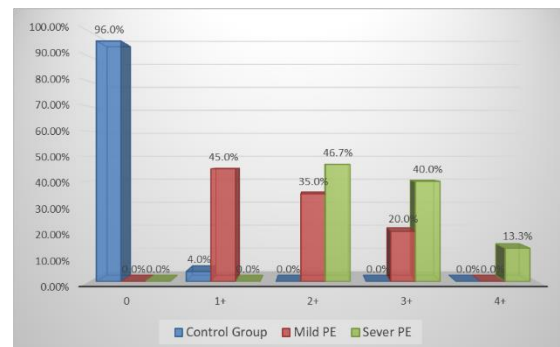

Figure 1. The proteinuria according to severity of PE

The mean ± SD of the body mass index was higher among PE group

(31.53 ± 4.2) than control group (29.4± 3.7), this relation was statistically significant (P value< 0.05). The mean ± SD of the high-density lipoprotein was lower among PE group (37.58± 7.6) than control group (42.18± 8.3), this relation was statistically significant (P value <

0.05). The mean ± SD of the low-density lipoprotein was higher among PE group (125.6± 26.3) than control group (105.3 ± 13.7), this relation was statistically significant (P value < 0.05), as shown in table 4.

Table 4 . The mean of BMI, and lipid profile among study groups

	Control Group1		PE Group		P value
	Mean	SD	Mean	SD	
BMI	29.4	3.7	31.53	4.2	0.012*
Total Cholesterol mg/dl	165.06	24.02	230.54	40.3	0.001*
TG mg/dl	153.3	31.6	191.14	47.3	0.001*
HDL mg/dl	42.18	8.3	37.58	7.6	0.005*
LDL mg/dl	105.3	13.7	125.6	26.3	0.001*
VLDL mg/dl	35.3	8.3	42.44	13.4	0.002*

*;significant, SD; Standard Deviation, BMI; body mass index, TG; triglycerides; HDL; high-density lipoprotein; LDL, low-density lipoprotein; VLDL; very low-density lipoprotein, PE, pre-eclampsia

Table 5. The distribution of study groups according to the mean lipid profile level in reference to the severity of pre-eclampsia

	Normotensive		Mild pre-eclampsia		Sever pre-eclampsia		p value
	Mean	Std. Deviation	Mean	Std. Deviation	Mean	Std. Deviation	
BMI	29.4	3.7	31.16	4.1	31.8	4.3	0.026*
Total Cholesterol mg/dl	165.06	24.02	195.1	17.05	257.5	31.02	0.0001*
Triglycerides mg/dl	153.3	31.6	174.2	24.7	209.1	40.41	0.0001**
HDL mg/dl	42.18	8.3	39.35	5.4	37.1	5.8	0.009*
LDL mg/dl	105.3	13.7	123.2	20.3	141.7	23.6	0.0001*
VLDL mg/dl	35.3	8.3	39.3	7.6	44.5	9.3	0.0001*

*;significant, SD; Standard Deviation, BMI; body mass index, TG; triglycerides; HDL; high-density lipoprotein, LDL; low-density lipoprotein, PE, pre-eclampsia

The mean ± SD of the body mass index was higher among sever PE group (31.8 ± 4.3) than mild PE group (31.16± 4.1), and control group (29.4± 3.7) this relation was statistically significant (P value < 0.05). The mean ± SD of the

total cholesterol was higher among sever PE group (257.5 ± 31.02) than mild PE group (195.1 ± 17.05), and control group (165.06± 24.02) this relation was statistically significant (P value < 0.05). The mean ± SD of triglycerides was

higher among sever PE group (209.1 ± 40.41) than mild PE group (174.2 ± 24.7), and control group (153.3± 31.6), this relation was statistically significant (P value < 0.05). The mean ± SD of high-density lipoprotein was lower among sever PE group (37.1 ± 5.8) than mild PE group (39.35 ± 5.4), and control group (42.18± 8.3), this relation was statistically significant (P value < 0.05), as shown in table 5.

DISCUSSION

Regarding the affected age groups, the results of the current study goes with Majeed B. A et al in Iraq 2020 who found that older mean age in PE than non-PE women (29.47 ± 6.32 years and 28.14 ± 6.85 years, respectively). [11].

Masturzo B et al 2019 in Italy found that maternal age was significantly higher among [12] PE group (34.5±4.15), than non PE (32.3±4.62), while Kim Y et al 2021 in south Korea found non-significant difference in maternal age among PE (32.86 ± 3.19)and control group(33.80 ± 3.07) [13] The current study revealed that most of the PE group, were nulliparous 38 (76%), this goes with Abed MH, Yaqoub 2021 in Iraq [14] found that most participants were nulliparous (96.0). Panaitescu AM et al 2020 in Romania found higher incidence of nulliparity among PE group versus non PE group (77.9 % vs. 60.1%,). [15]

Regarding the positive family history of preeclampsia, the results of

the current study goes with Masturzo B et al 2019 in Italy [12] who found that family history of PE, was higher among PE group(3.7%) than control group (3.6%). Pre-eclampsia heritability is estimated at ~55%, with both maternal and fetal genetic contributions to risk (30–35% and 20%, respectively) [16]

The current study revealed that the mean body mass index was significantly higher among PE group (31.53 ± 6.63). this goes with Abed MH, Yaqoub 2021 in Iraq [13] found that highest percentage was in obese smoker pregnant women were 3.92 times more to develop preeclampsia than those who were not smoker.

The current study revealed that the Systolic blood pressure among PE group (149.38± 7.07)was significantly higher than control group, this goes with Melekoğlu R et al 2022 in Turkey found that median SBP among PE group (140) was significantly higher than control group (110).).[17].

Anuradha R. Durga T 2016 in India found that SBP among PE group (122.5±8.5) was significantly higher than control group (108.25±3.62) In this study the Diastolic blood pressure (DBP) among PE group (97.14±5.86) was significantly higher than the control group. This goes with Melekoğlu R et al 2022 in Turkey found that median DBP among PE group (90) was significantly higher than control group. [17] Anuradha R. Durga T 2016 in India found that DBP among PE group

(102.21±6.42) was significantly higher than control group (81.13±1.46) [18]

The present study revealed that the mean TC, TG, LDL, VLDL significantly higher among PE group than the mild PE and control group, and their mean increased positively with severity of PE. Also revealed that the mean HDL was significantly lower among PE group than the mild PE and control group, HDL mean decreased inversely with severity of PE. This agree with Niran Kamel et al in 2020 revealed that TC, TG, LDL level in severe and VLDL-C level of severe Preeclampsia group were higher than among mild Preeclampsia group & both were higher than the control group. And also found a significantly negative correlation between proteinuria and HDL-C levels. [19]

Gohil JT in 2011 revealed that the Dyslipidemia in the form of significantly decreased HDL concentration and significantly increased total cholesterol, LDL, VLDL & Triglycerides concentration is conspicuously evident in subjects of preeclampsia as compared to non-pregnant, normotensive pregnant and postpartum subjects.[20] This also agree with Tesfa E, et al in 2020 revealed that the mean TG, TC, LDL and very low density lipoprotein- cholesterol (VLDL-c) were significantly higher in pre-eclamptic women as compared with normotensive pregnant women (TG= 229.61±88.27 and 147.00 ± 40.47, TC = 221.46 ± 45.90 and 189.67 ± 39.18, LDL = 133.92 ± 38.77 and 112.41 ± 36.08, VLDL = 41.44 ± 19.68 and 26.64 ± 7.87), respectively. And also agree with the current study in that the serum high density lipoprotein cholesterol (HDL-c) level was lower, but it is not statistically significant (HDL-c = 51.02 ± 16.01 and 61.80 ± 25.63) in pre-eclamptic women as compared with controls.[21] The current study revealed that the mean ± SD of BMI was higher among sever PE group than mild PE group, and control group. This agree with Tesfa E, in 2020 revealed that the mean BMI, systolic and diastolic blood pressure measurements were significantly different among pre-eclamptic and normotensive pregnant women.[21].

CONCLUSION

The mean TC, TG, LDL, VLDL significantly higher among PE group than the mild PE and control group, and their mean increased positively with severity of PE. The mean HDL was significantly lower among PE group than the mild PE and control group, HDL mean decreased inversely with severity of PE.

CONFLICT OF INTEREST
No conflict of interest

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