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Research Article

Lipid Profile of Pregnant Women Attending Antenatal Care in Health Facilities of Gamo Zone, SNNPR

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Abstract

Background: Pregnancy is a state of high metabolic demand due to the differing condition of the fetus, due to this fact there is a biochemical change in the mothers. Among this the lipid profile is changed considerably throughout the pregnancy period.

Methods: Facility based cross sectional study was conducted from January - March 2018. Interviewer based questionnaire was used to collect data from study participants. 5 ml of blood was collected from each participant and the lipid profile test was conducted in Ethiopian public health institute. The data was analyzed using SPSS 21.

Result: In the current study the percentage of pregnant women with low level of high-density lipoprotein was considerably higher than those with normal level, while the level of low-density lipoprotein, triacylglycerol and total cholesterols mean value was high in most of the pregnant mothers. Level of low-density lipoprotein was significantly associated with vitamin intake, while age category was significantly associated with level of triacylglycerol.

Conclusion: The study showed derailment of lipid profile in pregnant women and there are various factors that could affect level of the different lipids and lipoproteins during pregnancy and we recommend further studies by considering additional factors and lipid profile screening should be a component of antenatal care follow as abnormally high or low levels of lipids can have a catastrophic effect on both the mother and the fetus.

Keywords: *Pregnancy; Lipid Profile; Antenatal Care; Number of Pregnancies; Trimester*

Abbreviations

BMI: Body Mass Index; HDL: High Density Lipoprotein; IL- Interleukin; LDL: Low Density Lipoprotein; RPM: Revolution Per Minute; SNNPR: South Nation Nationalities and Peoples Region; TC: Total Cholesterol; TG: Triacylglycerol; TNF: Tumor Necrosis Factor

Introduction

During pregnancy, the additional energy needed for the normal development of fetus is provided by increased demand of carbohydrates and lipids. Maternal circulating cholesterols and free fatty acids are important substrates for both mother and the fetus. Throughout pregnancy metabolic processes like metabolism of lipids and lipoproteins are altered in addition to the changes in other systems like cardiovascular and respiratory. The accumulated lipid in the early stage of pregnancy can be used as a source of energy for the mothers

as pregnant women require an additional 300 kcal/day compared with the non-pregnant women, while the lipolysis of the accumulated fat can help in the development of fetus. The energy provided by lipid is used in cellular proliferation of uterus, blood volume expansion of mother, implantation of fetus in uterus, uteroplacental, and fetal development. The body may fail to balance the constant changes and the lipid profiles can be altered to the level distorted from the normal level, but if the pregnancy is without any complications most of the biochemical changes are reversible after delivery [1-3].

Normal pregnancy is associated with increased insulin resistance. Decline in maternal insulin sensitivity is reported to be mediated by increase in the levels of estrogen, progesterone, human placental lactogen (hPL), human placental growth hormone (hPGH), cortisol, TNFα, ILs etc. Due to insulin resistance in mothers, there is more utilization of fats than carbohydrates for energy by mother and carbohydrates are spared for fetus. Thus, it serves as a physiological adaptation of the mother to ensure adequate carbohydrate supply for the rapidly growing fetus [3].

Maternal cholesterol is a rich source of cholesterol for the fetus development during early gestation and minimal during late pregnancy which is due to the higher capacity of fetal tissues to synthesize cholesterol. Maternal hypertriglyceridemia is a characteristic feature during pregnancy and corresponds to the accumulation of triglycerides in low (LDL-C) and high-density lipoprotein (HDL-C). The maternal lipid profile values during pregnancy differ with trimester. It has been observed that the concentration of serum total cholesterol, serum triglyceride, high density lipoprotein cholesterol and low-density lipoprotein cholesterol in pregnant women increased with increased gestational age [4].

The increase of the lipid and lipoprotein metabolism reaches the level of cardiovascular risk during the second trimester. Especially, the second and third trimester of human pregnancy are characterized by 2-3-fold increases in plasma triglycerides and lesser increases in total cholesterol, HDL-C and LDL-C. Analytically, the average serum LDL-C concentration increases by about 0.80 mmol/L in the second trimester compared with the first trimester and 0.69 mmol/L in the third trimester compared with the second trimester. The major increase of the serum cholesterol concentration occurs in the second trimester (25 - 50%). The serum triglyceride concentration increases more intensively than the others and its major increase occurs during the third trimester (about 200 - 300%). Serum HDL-C concentration increases during the second trimester but decreases during the third trimester. Just after delivery the values of all lipid indexes decrease (still remaining above the non-pregnant values) except the LDL-C values which remain constant [5].

Materials and Methods

Cross sectional study was conducted in Arba Minch General hospital, Chencha primary hospital, Lante health center, Gerese health center and Shelle health center located in Gamo zone, SNNPR, Ethiopia. 206 pregnant women following antenatal care in the respective health facilities were enrolled in the study. This sample size was proportionally allocated to the different health facilities. The questionnaire data was collected by trained nurses and midwives, while 5 ml of blood was collected from participants by trained medical laboratory technicians in the fasting state. After the sample was collected the blood sample was transported to Arba Minch university, college of medicine and health sciences, biochemistry laboratory by using an ice bag. The sample was centrifuged at 3000 RPM for five minutes, then the isolated serum was transferred to nunc tube and then then separated sample was stored at -4°C until it was transported to Ethiopian public health institute where the lipid profile test (HDL, TG and TC) was conducted using Cobas 400 clinical chemistry machine. Low density lipoprotein cholesterol (LDL-c) was calculated using:

Friedwald equation (LDL-c = Total cholesterol - [HDL-C + (TG/5)].

Statistical analysis

After collecting the data and testing the samples data was entered and analysis was done using SPSS 21. Frequencies were computed for the sociodemographic variables. Analysis of variance and cross tabulation was done to show the association between variables and the lipid profile.

Results and Discussion

Socio demography

Most of the study participants are young as evidenced by the mean age of the study participants which is 25.44 with minimum age of 16 and the maximum age of 36. 44.7 percent of study participants were housewives, while only 3.4% are farmers. The geographical location of the pregnant mothers showed that 86.4 percent resided in town.

Variable		Frequency	Percentage
Occupation	Housewife	92	44.7
	Civil servant	44	21.4
	Farmer	7	3.4
	Student	23	11.2
	Other	40	19.4
Residence	Town	178	86.4
	Rural	28	13.6
Number of pregnancies	1	89	43.2
	2	66	32.0
	3	25	12.1
	4	13	6.3
	5	13	6.3
Monthly income	< 500	110	53.4
	501 - 1000	15	7.3
	1001 - 2000	32	15.5
	> 2000	49	23.8
Trimester	First	28	13.6
	Second	101	49.0
	Third	77	37.4
Alcohol drinking	Yes	41	19.9
	No	165	80.1
Fruit intake	Yes	202	98.1
	No	4	1.9
Vegetable intake	Yes	68	33
	No	138	67

Table 1: *Socio-demographic characteristics of study participants.*

Lipid profile

The lipid profiles of the study participants are indicated in the table below. As indicated, it can be shown that high percentage of the pregnant participants have high level of low-density lipoprotein, triacylglycerol and total cholesterol, while the level of high-density lipoprotein is low.

Lipid profile	Category	Frequency	Percentage	95% CI	Mean ± SD
HDL	< 40 mg/dl	197	95.6	(19.97-22.57)	21.3 ± 9.5
	> 40 mg/dl	9	4.4		
LDL	< 100 mg/dl	57	27.7	(116.16 - 127.49)	121.8 ± 41.2
	> 100 mg/dl	149	72.3		
TG	< 150 mg/dl	47	22.8	(187.18 - 206.72)	196.9 ± 71.1
	> 150 mg/dl	159	77.2		
TC	< 200 mg/dl	150	72.8	(175.72 - 187.66)	181.7 ± 43.4
	> 200 mg/dl	56	27.2		

Table 2: *Lipid profile of study participants.*

As depicted in the table above high percentage of the pregnant study participants have high amount of low-density lipoprotein, Triacylglycerol and total cholesterol, while high density lipoprotein concentration in more than 95% of the sampled participants is lower than the normal level.

There was statistically significant association between vitamin intake and level of low-density lipoprotein (sig 0.014) (Table 3), but statistically significantly association was not seen between vitamin intake and HDL (sig 0.135), vitamin intake and TG (sig 0.240) and vitamin intake and TC (sig 0.091).

< 100 mg/dl > 100 mg/dl			LDL category		Total	Sig
Vitamin intake	Yes	Frequency	26	42	68	0.014
		% within LDL category	45.6%	28.2%	33.0%	
	No	Frequency	31	107	138	
		% within LDL category	54.4%	71.8%	67.0%	
Total		Frequency	57	149	206	
% within LDL category		100.0%	100.0%	100.0%		

Table 3: *Vitamin intake and LDL category.*

Number of pregnancies and lipid profile

In the current study the highest percentage of respondents reported that it was their first pregnancy 89 (43.2%), while only 6.3% reported that it was their 5th pregnancy. ANOVA showed that there was no statistically significant difference between number of pregnancy

and each of the lipid profiles (Table 4). The highest mean of TG and HDL was recorded in participants with their fifth pregnancy, while for TC and LDL the mean was highest in participants that reported the current pregnancy to be their fourth.

Statistically significant association was seen between age category and TG, while the other lipid profiles were not significantly associated with the three age categories as the sig value of 0.944, 0.769 and 0.759 showed for TC, HDL and LDL respectively.

Lipid profile	Age category	Number	Mean ± SD	Sig
TC	16 - 25	117	182.5 ± 44.9	0.944
	26 - 30	77	180.9 ± 42.7	
	> 30	12	178.8 ± 35.4	
	Total	206	181.7 ± 43.4	
TG	16 - 25	117	189.3 ± 54.6	0.024
	26 - 30	77	200.8 ± 67.3	
	> 30	12	246.4 ± 167.9	
	Total	206	196.9 ± 71.1	
HDL	16 - 25	117	20.9 ± 8.7	0.769
	26 - 30	77	21.5 ± 10.7	
	> 30	12	22.8 ± 8.9	
	Total	206	21.3 ± 9.5	
LDL	16 - 25	117	123.7 ± 43.2	0.759
	26 - 30	77	119.2 ± 39.9	
	> 30	12	120.4 ± 30.2	
	Total	206	121.8 ± 41.2	

Table 5: *Lipid profile and age category.*

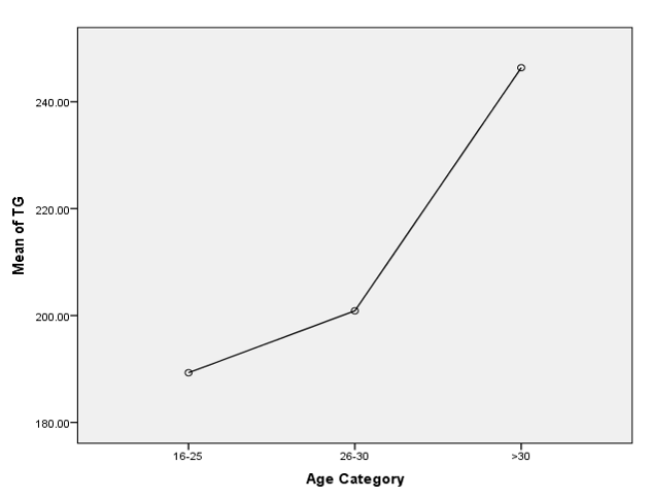

Figure 1: *Age category and mean of triacylglycerol.*

Trimester and lipid profile

The four serum lipids show difference in the three trimesters as level of serum low density lipoprotein and total cholesterol means show an increment from the first to the third trimester with the highest mean value recorded in the third trimester for both. For triacylglycerol the highest mean value was that of the third trimester. In contrast to LDL and TC the mean value of HDL decreased from the first to the third trimester.

Lipid profile	Trimester	Number	Mean ± SD	Sig
TG	First	28	195.1 ± 59.4	0.572
	Second	101	192.3 ± 85	
	Third	77	203.6 ± 52.9	
HDL	First	28	22.6 ± 8.8	0.717
	Second	101	21.1 ± 9.6	
	Third	77	21.0 ± 9.6	
LDL	First	28	110.9 ± 41.6	0.291
	Second	101	122.3 ± 44.2	
	Third	77	125.1 ± 36.6	
TC	First	28	172.5 ± 44.2	0.297
	Second	101	180.3 ± 46.8	
	Third	77	186.8 ± 38.2	

Table 6: *Lipid profile and trimester.*

Discussion

This study conducted to assess level of lipid profile in pregnant mothers and factors that could affect the circulatory level of HDL,LDL, Triacylglycerol and total cholesterol indicated that pregnant mothers tested for high amount of TG, TC and LDL compared with the standard for each, while level of HDL was below recommended level in most of the tested sample. HDL is needed for reverse cholesterol transport and it`s low level can be a risk factor for developing metabolic disorders. A similar finding was reported in study conducted in Gondar hospital, Ethiopia whereby level of TG, TC and LDL were significantly higher in pregnant mothers compared with non-pregnant women and level of HDL was significantly lower in pregnant women than the non-pregnant ones [6]. Similar findings were also observed in other previous studies [7,8]. This fact can be attributable to the hormone changes that occur throughout pregnancy. These hormones namely cortisol, progesterone and estrogen activate lipid synthesis and high amount of cholesterol is a risk factor for cardiovascular disease which can be fatal for both the mother and the fetus [1].

The mean value of HDL and TG increased as age of the pregnant women increased and the association of the age groups were found to be statistically significant with mean of TG. This finding is in line with a research by Maria de carma., *et al*. which reported the presence of metabolic syndrome at gestational age of sixteen weeks for a pregnant woman with age of 31.5 ± 8.4 compared with the pregnant women with an average age of 25.4 ± 5.7 without metabolic syndrome [9]. Another study in Amsterdam, Netherlands [10] showed that the mean level of TG increased in three increasing age categories which was also seen in our study, but level of TC also increased as the age advance which contradicts our finding which showed a decrease in TC from the first age category to the third.

Even though statistically non-significant level of lipid profile in the three trimesters differed among the pregnant women and there was an increment of LDL and TC from the first to the third trimester with the highest mean for both recorded in the third trimester. For

TG the highest mean was recorded in the third trimester. Another study by Neboh., *et al*. [11] showed a steady increase in the mean value of TG and TC and the difference was statistically significant. Other studies showed a double increase in level of TG which was not seen in our research [12,13]. In contrast to our study Mankuta., *et al*. [13] study showed an increase in level of HDL in the second trimester. A study conducted among pregnant and non-pregnant women in Nepal [1] reported an increase in level of TG, LDL and TC from the first to the third trimester, while level of HDL was reverse whereby the highest mean value was seen in the first trimester and decreased in the second and third trimester.

The association between number of pregnancy and mean level difference of lipid profiles is inconsistent.

Our study has several limitations as some factors like BMI, breast feeding, all nutritional factors which could affect lipid profiles were not considered. In addition, the study failed to show the difference between lipid profile between pregnant and non-pregnant women.

Conclusion

In conclusion we recommend further study in the area to know more about the factors and screening of lipid profile should be included in antenatal care as dyslipidemia can be a cause for life threatening for the mother and the fetus.

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Conflict of Interest

The authors declare they have no conflict of interest.

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