EFFECT OF LIPID PARAMETERS ON FETAL GROWTH IN TYPE 2 DIABETES MELLITUS AND GESTATIONAL DIABETES MELLITUS PREGNANCIES

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INTRODUCTION

Dyslipidaemia increases the risk of large for gestational age (LGA) newborns equally as postprandial glycaemia. In short term this increased neonatal mortality and morbidity, and in the long term may include obesity and increased cardiovascular risk [1-4].

AIM of the study: to determine the contribution of maternal lipids in predicting LGA newborns born to women with type 2 D.M and gestational diabetes mellitus (GDM).

DESIGN: Retrospective study.

SETTING: University Clinic of Endocrinology, Diabetes and Metabolic Disorders.

POPULATION: 43 women with type 2 D.M. and 200 women with GDM were analyzed.

METHODS

Patients suspected of GDM underwent a 2-hour 75 g. oral glucose tolerance test (normal values: fasting level < 5,1, 1-h level < 10,0, 2-h level < 8,5 mmol/l). In the third trimester of pregnancy maternal fasting serum triglycerides, total cholesterol (TCh), high-density lipoprotein (HDL-C), and low-density lipoprotein cholesterol (LDL-C) levels were determined. Maternal HbA1c in first, second and third trimester of pregnancy were measured.

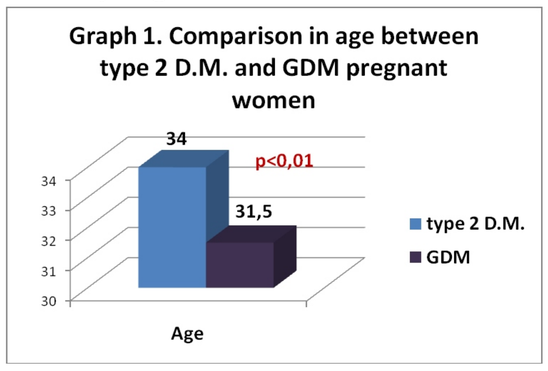
Statistical analysis were performed using SAS software for Windows, version 14.0. For analysis, t-test, Chi-square test, correlation, and linear multiple regression were used.

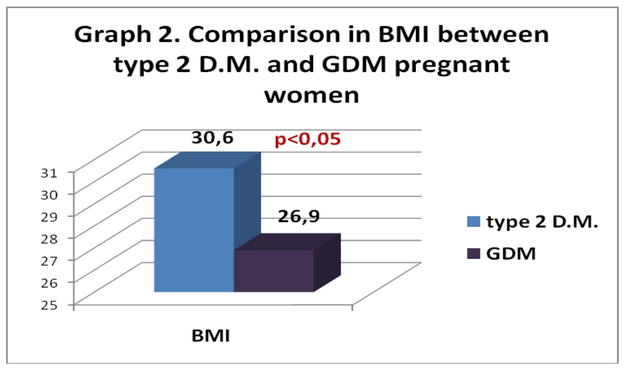
RESULTS

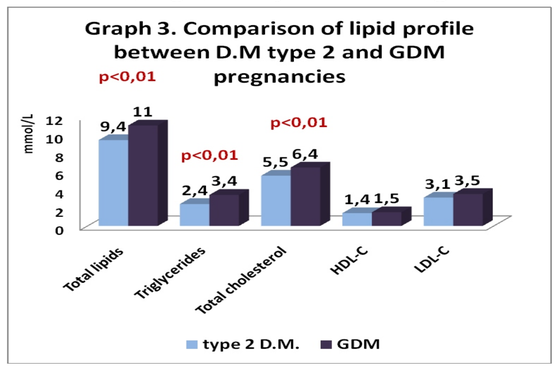
Women with type 2 D.M. and GDM group were statistically significant different in the following variables: total lipids, triglycerides, TCh, BMI, age, baby birth weight, and incidence of SGA (Table 1, Graphic 1-6).

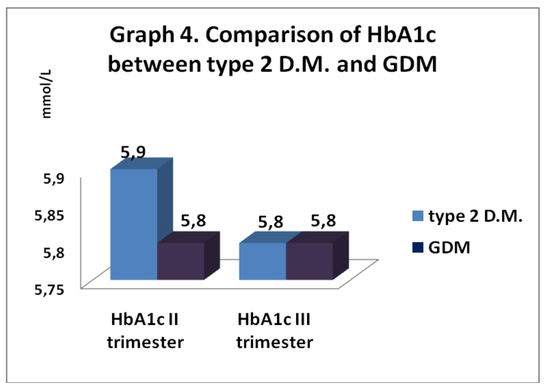
Table 1. Comparison of analyzed variables between the pregnant women with type 2 D.M. and GDM

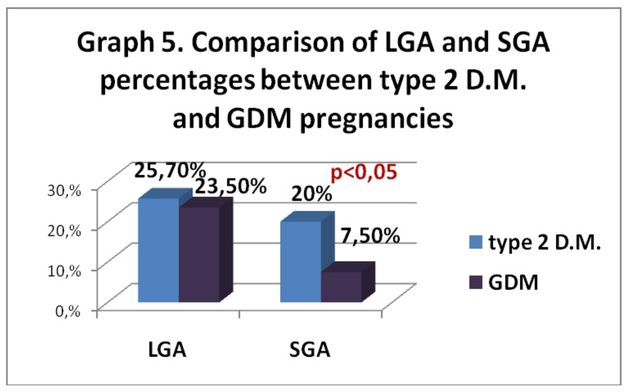
	type 2 D.M.	GDM	p value
	n=43	n=200	
Age (years)	34±7,8	31,5±5,6	<0,05
BMI (kg/m^2)	30,6±5,4	26,9±5,2	<0,05
Total lipids (mmol/L)	9,4±2,3	11,0±2,3	<0,01
Triglycerides (mmol/L)	2,4±1,4	3,4±1,6	<0,01
TCh (mmol/L)	5,5±1,2	6,4±1,4	<0,01
HDL-C (mmol/L)	1,4±0,3	1,5±0,4	0,056
LDL-C (mmol/L)	3,1±1,0	3,5±1,2	0,069
HbA1c I trimester (%)	6,6±1,5	-	-
HbA1c II trimester (%)	5,9±1,1	5,8±0,9	NS
HbA1c III trimester (%)	5,8±1,0	5,8±1,0	NS
Baby weight (grams)	3183±972	3533±699	<0,05
Preeclampsia	5/42 (11,9%)	8/155 (5,2%)	NS
LGA	9/35 (25,7%)	44/187 (23,5%)	NS
SGA	7/35(20%)	14/187 (7,5%)	<0,05

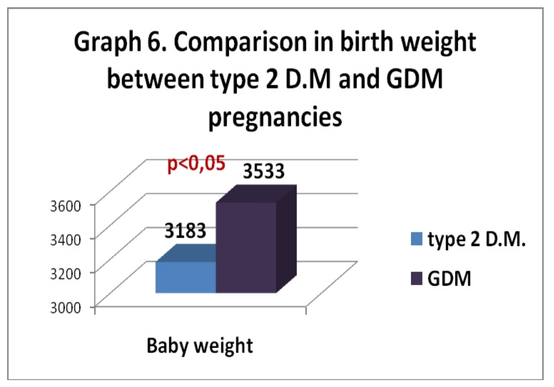












Statistically significant correlations (Table 2) were found between HDL-C and HbA1c in second trimester (r=-0,36, p<0,05, Graph 7), HbA1c in third trimester (r=-0,286, p<0,01, Graph 8), and baby birth weight (r=-0,204, p<0,05, Graph 9) in women with GDM. Also, HbA1c in second trimester statistically significant correlated with small for gestational age (r=0,392, p<0,01), BMI with LGA (r=0,156, p<0,05), and BMI with preeclampsia (r=0,207, p<0,05) in GDM pregnancies.

Table 2. Correlation between analyzed parameters in women with GDM

	TL	TG	TCh	HDL-C	LDL-C	Hba1cII	Hba1cIII	BabyW	LGA	SGA	Preecla	BMI	Age
TL	1	,695(**)	,741(**)	,197(*)	,730(**)	-0,114	-0,135	0,014	-0,031	-0,009	-0,153	0,109	-0,007
TG	,695(**)	1	,190(*)	-0,162	0,004	0,092	0,06	0,072	0,07	0,005	-0,061	0,132	0,107
TCh	,741(**)	,190(*)	1	,333(**)	,852(**)	-0,264	,203(*)	-0,03	-0,147	-0,028	-0,114	-0,021	-0,003
HDL-C	,197(*)	-0,162	,333(**)	1	0,209	-,360(*)	-,286(**)	-,215(*)	-,204(*)	-0,015	-0,062	0,023	-0,04
LDL-C	,730(**)	0,004	,852(**)	0,209	1	-0,288	-0,158	-0,015	-0,095	0,052	-0,097	-0,097	-0,144
Hba1cII	-0,114	0,092	-0,264	-,360(*)	-0,288	1	,673(**)	-0,002	0,142	,392(**)	-0,183	-0,019	0,087
Hba1cIII	-0,135	0,06	-,203(*)	-,286(**)	-0,158	,673(**)	1	0,121	0,099	0,071	-0,038	0,038	0,117
BabyW	0,014	0,072	-0,03	-,215(*)	-0,015	-0,002	0,121	1	,710(**)	-,486(**)	-0,113	0,047	-0,076
LGA	-0,031	0,07	-0,147	-,204(*)	-0,095	0,142	0,099	,710(**)	1	-,159(*)	0,003	,156(*)	-0,068
SGA	-0,009	0,005	-0,028	-0,015	0,052	,392(**)	0,071	-,486(**)	-,159(*)	1	-0,072	-0,11	0,081
Preecla	-0,153	-0,061	-0,114	-0,062	-0,097	-0,183	-0,038	-0,113	0,003	-0,072	1	,207(*)	0,096
BMI	0,109	0,132	-0,021	0,023	-0,097	-0,019	0,038	0,047	,156(*)	-0,11	,207(*)	1	,149(*)
Age	-0,007	0,107	-0,003	-0,04	-0,144	0,087	0,117	-0,076	-0,068	0,081	0,096	,149(*)	1

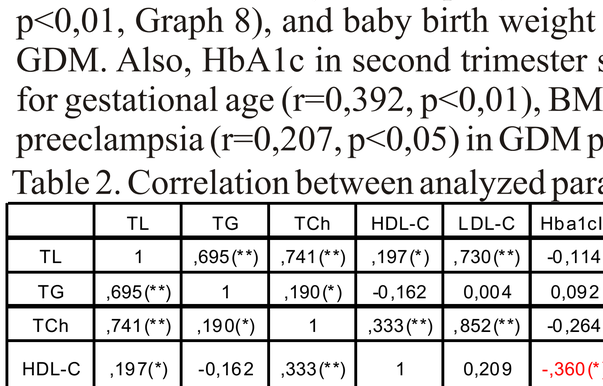
* significant at level p<0,05
** significant at level P<0,01

Statistically significant correlations (Table 3) were found between triglycerides and HbA1c in second trimester (r=0,354, p<0,05, Graph 10), HbA1c in third trimester (r=0,460, p<0,01, Graph 11), and preeclampsia (r=0,339, p<0,05) in type 2 D.M pregnancies.

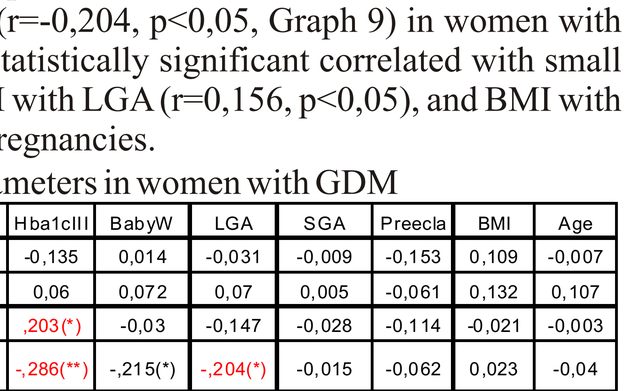
Table 3. Correlation between analyzed parameters in women with type 2 D.M.

	TL	TG	TCh	HDL-C	LDL-C	Hba1cII	Hba1cIII	BabyW	LGA	SGA	Preecla	BMI	Age
TL	1	,758(**)	,762(**)	-0,214	,507(**)	0,298	0,313	0,071	0,145	0,066	0,228	0,21	-0,15
TG	,758(**)	1	0,253	-,395(*)	-0,065	,354(*)	,460(**)	0,054	0,216	0,163	,339(*)	0,269	-0,206
TCh	,762(**)	0,253	1	0,116	,821(**)	0,052	0,061	0,034	0,013	-0,121	0,07	0,166	0,038
HDL-C	-0,214	-,395(*)	0,116	1	-0,033	-0,029	-0,047	-0,104	-0,122	-0,109	-0,258	-0,324	0,106
LDL-C	,507(**)	-0,065	,821(**)	-0,033	1	-0,078	-0,203	0,287	0,192	-0,262	0,093	0,161	0,018
Hba1cII	0,298	,354(*)	0,052	-0,029	-0,078	1	,509(**)	-0,049	0,139	0,144	0,049	-0,199	-0,087
Hba1cIII	0,313	,460(**)	0,061	-0,047	-0,203	,509(**)	1	-0,066	-0,06	0,152	0,287	-0,063	0,003
BabyW	0,071	0,054	0,034	-0,104	0,287	-0,049	-0,066	1	,649(**)	-,702(**)	0,041	-0,034	-0,209
LGA	0,145	0,216	0,013	-0,122	0,192	0,139	-0,06	,649(**)	1	-0,294	0,127	0,194	-0,169
SGA	0,066	0,163	-0,121	-0,109	-0,262	0,144	0,152	-,702(**)	-0,294	1	0,199	0,103	-0,086
Perecla	0,228	,339(*)	0,07	-0,258	0,093	0,049	0,287	0,041	0,127	0,199	1	0,316	-0,165
BMI	0,21	0,269	0,166	-0,324	0,161	-0,199	-0,063	-0,034	0,194	0,103	0,316	1	-0,036
Age	-0,15	-0,206	0,038	0,106	0,018	-0,087	0,003	-0,209	-0,169	-0,086	-0,165	-0,036	1

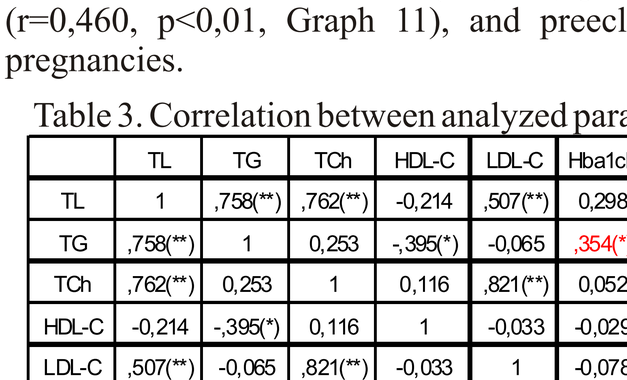
* significant at level p<0,05
** significant at level P<0,01



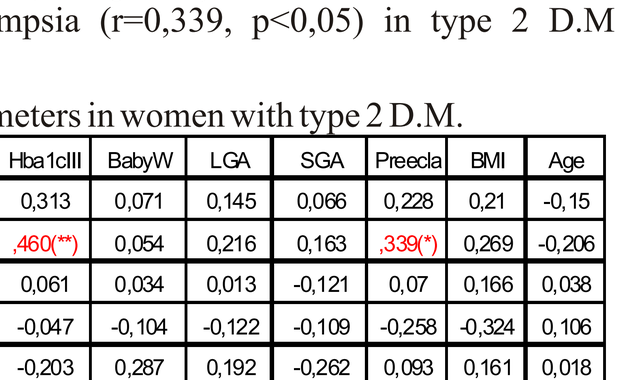
Graph 7. Correlation between HDL-C and HbA1c in second trimester in GDM pregnancies



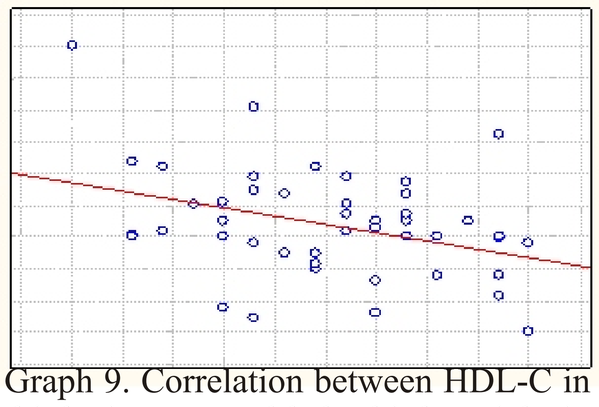
Graph 8. Correlation between HDL-C and HbA1c in third trimester in GDM pregnancies



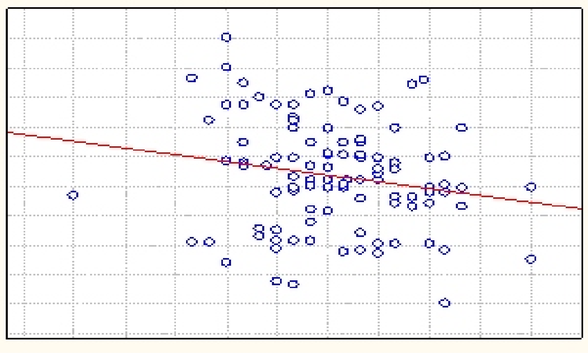
Graph 10. Correlation between triglycerides and HbA1c in second trimester in type 2 D.M pregnancies



Graph 11. Correlation between triglycerides and HbA1c in third trimester in type 2 D.M pregnancies



Graph 9. Correlation between HDL-C in third trimester and baby birth weight in GDM pregnancies



CONCLUSIONS

Triglycerides and LDL-C, independed of age, BMI and glycaemic control, are predictors for macrosomia in type 2 D.M and GDM pregnancies. Thus, with good regulation of lipid profile we can avoid LGA newborns from type 2 D.M and GDM pregnancies. In type 2 D.M. pregnancies, determining maternal serum triglycerides and in GDM pregnancies, determining HDL in mid pregnancy may help identify women likely to give birth to LGA newborns. Summary effect of hyperglycemia, insulin resistance, and dyslipidaemia significantly will increase the incidence of macrosomia in type 2 D.M. and GDM pregnancies.

[1] Horosz E et al. Effects ofmaternal lipids on the fetal growth in gestational diabetes. Neuro Endocrinol Lett 2009;30:6526. [2] Schaefer-Graf U.M, et al. Differences in the implications of maternal lipids on fetal metabolism and growth between gestational diabetes mellitus and control pregnancies. Diabet Med2011;28:10539. [3] Son GH, et al. Maternal serum triglycerides as predictivefactors for large-for-gestational age newborns with gestational diabetes mellitus.Acta Obstet Gynecol Scand 2010;89:7004.

Table 4. Triglycerides, LDL-C, and TCh independent predictors of LGA

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	-0,072	1,019		-0,071	0,944
TG	**0,253**	**0,119**	**0,608**	**2,133**	**0,043**
TCh	**-0,428**	**0,186**	**-1,161**	**-2,298**	**0,031**
LDL-C	**0,538**	**0,215**	**1,184**	**2,509**	**0,019**
HDL-C	0,047	0,299	0,033	0,156	0,877
BMI	0,007	0,019	0,068	0,348	0,731
Hba1cI	-0,073	0,059	-0,278	-1,238	0,228
Hba1cII	0,118	0,156	0,2	0,754	0,458
Hba1cIII	0,007	0,137	0,013	0,053	0,958
Preecl.	-0,26	0,253	-0,197	-1,027	0,315

Dependent variable: LGA