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Assessment of Lipid Profile Parameters among Sudanese Pregnant Diabetic Patients

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Abstract:

Background: *The aim of this study was to determine serum lipid profile parameters of pregnant diabetic and non-diabetic patients in Sudan.* ***Materials and Methods:*** *Prospective case-control study from September 2014 to March 2015, serum lipid profile parameters were estimated in 100 diabetic pregnant women (Cases), and other 100 non-diabetic pregnant women (Controls).* ***Results:*** *Lipid parameters were found significantly higher in cases, TC was 84(84%), TG was 96(96%), HDL was 18(18%) and VLDL was 96(96%) versus none in controls. LDL was high in 93(93%) of the cases versus 23(23%) in controls. Mean values (cases vs controls in mg/dL) of TCHOL (202.2±16.7 vs 134.2±23.9, p=0.000), TG (179.6±14.5 vs 90.2+17, p=0.000), HDL (53.1±9.8 vs 43.4±7.5 p=0.000), LDL (114.4±17.0 vs 73.2+ 20.9 p=0.000), and VLDL (37.4±14.7 vs 18±3.4 p=0.000) respectively, were significantly higher in cases.* ***Conclusion:***

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According to the current findings, lipid profile parameters were significantly increased among diabetic pregnant women.

Key words: Lipid Profile, Diabetes, Sudan, pregnant Women

INTRODUCTION

Diabetes is a metabolic condition in which the body fails to produce enough insulin[1]. Diabetes mellitus (DM) is a chronic disorder of glucose metabolism with serious clinical consequences. The prevalence of diabetes has been rising in the recent decades due to the global changes in lifestyle [2].Globally, it is estimated that 382 million persons suffer from diabetes for a prevalence of 8.3%. North America and the Caribbean is the region with the higher prevalence, 36,755 people with diabetes (11%) followed by the Middle East and North Africa with 34,571 people with diabetes (9.2%). Western Pacific regions, with 138,195 people with diabetes, is the region with higher number of people with diabetes, however its prevalence is 8.6%, close to the prevalence of the World [3].

In many areas around the globe including the West as well as many developing and Middle Eastern countries, diabetes has become a major health burden affecting young adults and women in their reproductive age [4,5].

Diabetes is a common medical complication during pregnancy and abnormal maternal glucose regulation occurs in 3–10% of pregnancies and the prevalence is increasing [6].

Insulin resistance emerges in the second trimester of pregnancy, and may progresses thereafter to levels seen in non-pregnant patients with Type 2 diabetes. Hormonal changes during pregnancy such as increased levels of progesterone, cortisol, oestrodiol and human chorionic somatomammotropin (HCS) mediate insulin resistance [7]. In normal women, high maternal insulin in early pregnancy promotes gestational

weight gain and weight retention postpartum increasing the risk of gestational DM (GDM) and later development of Type 2 DM [8]. Obesity has been identified among others, as a risk factor for GDM [9].

Infants of mothers with preexisting diabetes mellitus experience double the risk of serious injury at birth, triple the likelihood of cesarean delivery, and quadruple the incidence of newborn intensive care unit (NICU) admission.

Risk factors for developing GDM include a previous diagnosis of gestational or pre-diabetes, impaired fasting glycaemia, a family history revealing a first degree relative with type 2 diabetes, maternal age, ethnic background, being overweight and a history of previous pregnancy which resulted in a child with a high birth weight>4gk [9].

Pregnancy and diabetes have additive effect on the development of an atherogenic lipid profile. Lipid abnormalities associated with insulin resistance affect all lipid fractions [10], leading to elevated triglycerides and low density lipoprotein (LDL) cholesterol with low high DL (HDL) cholesterol. Although this pattern correlates strongly with cardiovascular risk [11].

Pregnancy is a physiological condition characterized by a progressive, weeks of gestation dependent increase in maternal triglycerides (hypertriglyceridemia) and total cholesterol (hypercholesterolemia) [12]. In some cases a mis-adaptation occurs and these levels increase over a physiological range and dyslipidemia is recognized [13]. GDM is widely associated with endothelial dysfunction of the placenta mainly triggered by hyperinsulinemia, hyperglycemia, and changes in nucleoside extracellular concentration and dyslipidemia associated with this pathology could play a role in this phenomenon since dyslipidemia is a risk factor to develop endothelial dysfunction and atherosclerosis [14]. In several pregnant diabetic cases, lipid profile assessment was ignored which might have harmful

consequences on patients health. Therefore, the aim of the present study was to evaluate the burden of lipid violation among diabetic pregnant ladies in Sudan.

MATERIALS AND METHODS

This is a prospective, case-control hospital-based study carried out in Omdurman Maternity Hospital and Omdurman Military Hospital in Khartoum State of Sudan. The study conducted during the period from September 2014 to March 2015. Of all pregnant women attended the study centers, 100 patients with post-diagnosed DM were served as case group, and 100 healthy pregnant women with normal glucose tolerance, after they were universally screened with non-fasting 2hour 75gm glucose tolerance test (GTT) (<140mg/dl), were served as control group. Pregnant women with GDM diagnosed 2hour 75gm GTT was ≥140mg/dl were advised for medical supervision. Pregnant women with previous history of other medical illness like anemia, smoking, alcoholism, human immunodeficiency virus (HIV), cardiac, renal disease, other chronic diseases and medical treatment that may affect the lipid profile were excluded. Adolescents and those over age 45 were also excluded because pregnancy in those age groups is considered to be high risk.

Blood was drawn from the diabetic and health pregnant women (HPW) after overnight fasting (8hrs). 5ml of fasting venous blood was collected from the antecubital vein, through routine method applied under aseptic precaution and tourniquet for a short time as needed, from each subject into plain bottles. So blood was then centrifuged after clotted blood has retracted by the centrifugation machine at 4000 rpm for 5 minutes and the serum removed and stored at 4°C pending assay for lipid profile with other samples as batches – total cholesterol, triglycerides, HDL- cholesterol, LDL-cholesterol

and very LDL (VLDL)-cholesterol. Biochemical assays on the serum were performed with BioSystems BTS -305 analyzer.

Statistical analysis

Data was collected by using pre-designed questionnaire, selection of participants was randomly by choosing the first ladies who satisfied the desired sample size. Data analyzed by using the computerized program; statistical package for social science, SPSS (version 16) and the Microsoft Excel Office 2007 presenting the findings into tables and figure, correlation was assessed considering the confidence interval (CI = 95%), with calculating significance in the level of P value < 0.05.

Ethical consent

Informed written consent was taken from all women who were willing to participate. The study was approved by the Khartoum Ministry of Health ethics committee dated 09/08/2014.

RESULTS

Out of 200 pregnant ladies included in this study, 100 were diabetic and considered as case group, and 100 were non-diabetic and considered as control group. Their ages ranging from 40 to 18 years with a mean age of 28 years. The proportions of cases and controls among different age groups were as follow: 36(36%) and 29(29%) for age of 31 years or more, 31(31%) and 41(41%) for age of 26-30 years, 31(31%) and 22(22%) for age of 21-25 years and 2(2%) and 8(8%) for age of 20 years or less, as shown in Fig 1.

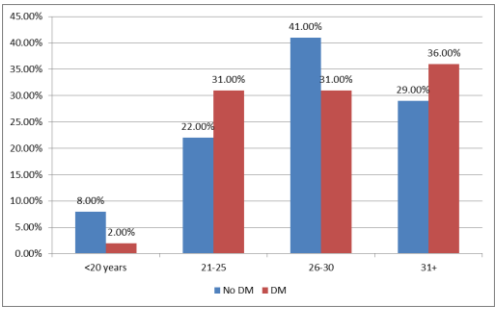

Figure (1): Description of study population by age

With regard to educational levels, cases and controls were categorized as follows: 51(51%) and 51(51%) were university graduates, 33(33%) and 36(36%) were high school graduates and 16(16%) and 13(13%) were primary school graduates, as shown in Fig 2.

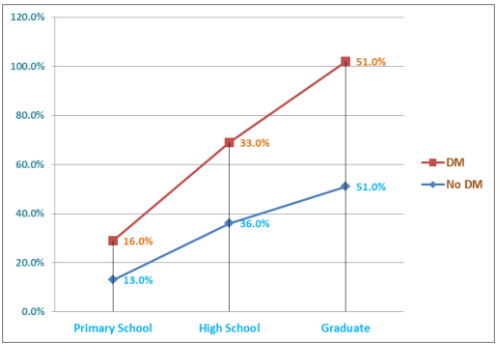

Figure (2): Description of study population by educational level

For occupations of the study subjects cases and controls were grouped as follows: 72(72%), 82(82%) were housewives, 24(24%), 15(15%) were employees, whereas 2(2%) were labors in cases and2 (2%) were in medical field among controls.

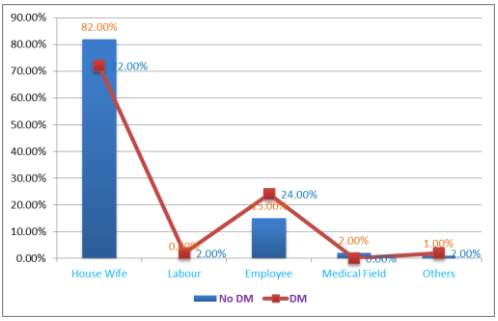

Figure (3): Description of study population by occupation

According to the residence cases and controls were grouped as follows: 55(55%), 50(50%) reside in Omdurman, 35(35%), 47(47%) reside in Bahry, 9(9%), 2(2%) reside in Khartoum.

Total cholesterol was high in 84(84%) of the cases with mean concentration of (202.2±16.7mg/dl) versus none in control group, triglyceride was high in 96(96%) of the cases with mean concentration (179.6±14.5mg/dl) versus none in control group, HDL was high in 18(18%) of the cases with mean concentration of (53.1±9.8mg/dl) versus none in control group, LDL was high in 93(93%) of the cases with mean concentration (114.4±17.0mg/dl) versus 23(23%) of the controls and VLDL was high in 96(96%) of the cases with mean concentration of (37.4±14.7mg/dl) versus none in control group. All lipid profile parameters have shown statistically significant differences (P value = 0.000), indicating lipids as risk factors during pregnancy.

Table (1): Distribution of the cases and controls according to frequency of the hyperlipidemia

Hyperlipidemia		Pregnant		Total	PV
		No DM	DM		
Total Cholesterol	Normal total cholesterol	100 (100.0%)	16 (16.0%)	116 (58.0%)	0.000
	High	0 (0.0%)	84 (84.0%)	84 (42.0%)	
Triglyceride	Normal triglycerides	100 (100.0%)	4 (4.0%)	104 (52.0%)	0.000
	high	0 (0.0%)	96 (96.0%)	96 (48.0%)	

HDL	Normal HDL	100 (100.0%)	82 (82.0%)	182 (91.0%)	0.000
	high	0 (0.0%)	18 (18.0%)	18 (9.0%)	
LDL	Normal LDL	77 (77.0%)	7 (7.0%)	84 (42.0%)	0.000
	High	23 (23.0%)	93 (93.0%)	116 (58.0%)	
VLDL	Normal LDL	100 (100.0%)	4 (4.0%)	104 (52.0%)	0.000
	High	0 (0.0%)	96 (96.0%)	96 (48.0%)	

Table (2): Distribution of the cases and controls according to mean of the hyperlipidemia

Hyperlipidemia	Mean		SD		PV
	No DM	DM	No DM	DM	
Total Cholesterol	134.2	202.2	23.9	16.7	0.0
Triglycerides	90.2	179.6	17.0	14.5	0.0
Lipoprotein Choles HDL.C	43.4	53.1	7.5	9.8	0.0
Lipoprotein Choles LDL.C	73.2	114.4	20.9	17.0	0.0
Lipoprotein Choles VLDL.C	18.0	37.4	3.4	14.7	0.0

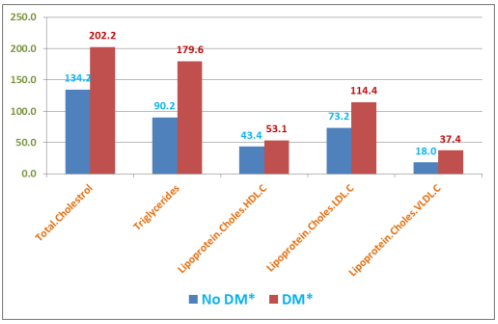

Figure (4): Distribution of the cases and controls according to mean of the hyperlipidemia

DISCUSSION

Pregnancy is accompanied by significant variations in maternal lipid metabolism. Several reports have revealed conflicting observations on normal and abnormal pregnancies [15].

The current study has investigated 100 diabetic pregnant women (Case group) and other 100 non-diabetic pregnant women (Control group), to assess lipid profile among diabetic pregnant women.

Distribution of the case and controls according to age showed slight variation in the mean age; the mean age of the cases was higher representing 28.6 years while the mean age of control group was 28.2 years. The most frequent age among cases was 31 years or more with percentage of 36%, while the most frequent age among control group was 26-30 years with percentage of 41%. It was reported that the age was significantly associated with GDM in comparison to control (pregnant non diabetic) (P value = 0.013), and this disagrees with the current study (P value = 0.064)[16].

The education level between the two groups showed predomination of educated women; 51% were university graduates in both groups, while primary schools graduates were less representing 16% and 13% in the cases and controls respectively. Yet, most mothers in the cases and controls were housewives with percentages of 72% and 82% respectively, followed by employees who represented 24% and 15% respectively. Educated patients were more likely to have positive attitude and practice towards the disease and its management.

Distribution of the study population according to residence showed that participants were mostly from Omdurman in both case and control groups (55% and 50% respectively), followed by those who reside in Bahry (47 and 35 respectively). Also, parity among most of them ranged from 1-3 representing 76% in the case group and 80% in control group.

When compared to normal pregnant women (control group), diabetic pregnant women (case group) showed significant increase in lipid profile parameters (P value = 0.000); total cholesterol was high in 84% of case group, Triglyceride was high in 96%, HDL was high in 18%, LDL was high in 93% and VLDL was high in 96%. This was confirmed by the mean of all these parameters [Total Cholesterol, Triglycerides, Lipoprotein Choles HDL.C, Lipoprotein Choles, LDL.C and Lipoprotein

Choles VLDL.C] which were found higher in the case group and found statistically significant (P value < 0.05).

Results of our study agrees with the study by Asare –Anane, et al., who found that generally lipid parameters TG (2.29± 0.07 vs 1.75±0.08, p<0.001), T.Cholesterol (7.26±0.16 vs 5.85±1.65, p<0.001), LDL (4.71 ± 0.17 vs 3.83±0.16,p<0.001), and VLDL (1.12±0.03 vs 0.80±0.04, p<0.001) were significantly higher in GDMs compared with controls (pregnant women without GDM). However, HDL (1.2±0.07 vs 1.46±0.08 p=0.023) was significantly higher in controls compared with GDM, and this is not compatible with our study, in which HDL found significantly higher in diabetic pregnant women (case group).[17] Another study conducted by Karthiga Prabhu, found among the lipid parameters, there was significant increase in Triglycerides (p=0.0008) and decrease in HDL cholesterol (p=0.01) in GDM women when compared to controls (normal pregnant women). This agrees with our study in Triglycerides disagree in HDL cholesterol[18].

Another study found that, there was highly significant difference in case diabetic groups (Gestational diabetes, type 1 & type 2) in comparison to control group (Healthy pregnant women), the mean level of total cholesterol (TC), triglycerides (TG) , high density lipoprotein (HDL), low density lipoprotein (LDL), very low density lipoprotein (VLDL) between the two groups (p. value were = 0. 004, 0.0001, 0.002, 0.0001, 0.0001 respectively). Which agrees with our results regarding lipid parameters [19].

However, a study by Rubina Aziz and Tabassum Mahboob found that the mean of cholesterol was [216.60±5.87 vs. 166.38±3.19 mg/dl], mean triglycerides [189.36±6.76 vs. 106.28±2.85 mg/dl], LDL-cholesterol [131.08±4.73 vs. 102.48±2.18 mg/dl] and total lipids [825.24±16.92 vs. 653.96±15.40 mg/dl] were higher in GDM groups as compared to normal controls (p<0.01). Mean HDL-cholesterol [41.24±0.65

vs. 48.34±0.66 mg/dl] showed significantly lower concentration in GDM group as compared to controls ($p<0.01$).These findings support our findings in all parameters except the HDL-cholesterol, which was higher in GDM [20].

Helkin et al., found that dyslipidemia, more specifically, high-serum low-density lipoproteins (LDL) and low-serum high density lipoproteins (HDL), are known risk factors for cardiovascular disease[21].

CONCLUSION:

Diabetes often associated with a significant increase in lipid profile parameters among pregnant diabetic women, which need more care during the pregnancy.

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