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RESEARCH ARTICLE

Association of Insulin Resistance and lipids Profile with Gestational Diabetes Central Sudan

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Abstract

Amis: The aim of this study is evaluate different insulin resistance parameters and lipids profiles in Sudanese women with GDM with specific to determine fast serum insulin levels and calculate the insulin resistant markers which include Glucose/insulin ratio, HOMA-IR, Log (HOMA-IR) and Fasting insulin resistance index (FIRI). Study design: Across-sectional case-control study was conducted. Place and Duration of Study: the study take place at the Wed Medani, Teaching Hospital of Obstetrics and Gynecology, Gezira State, Central of Sudan. from March to November 2021.Methodology: One hundred Sudanese women diagnosed with GDM as cases and same number normal pregnant women as controls according to the oral-glucose-tolerance test based on the WHO endorsed, there age means range 29.23±0.497 (Mean±SD) for patients and 27.360±0.519 (Mean±SD) for control. 4 ml venous fasting blood samples were collected from each participant. Blood glucose and lipids profile were determining by using automated analyzer. The Oral Glucose Tolerance Test was done. The data were analyzed by using SPSS version 20. Results: the results of cholesterol TG and LDL presented significantly higher levels in the case group compared to the control, but HDL presented increased without significant in case compared to control. The results of fasting insulin, fasting insulin resistance index and Homeostasis assessment of insulin resistance presented significant increase in case group compared to control group. Conclusion: The study concluded that GDM had significantly higher fasting blood glucose, insulin resistance markers, TG and LDL-C compared to matched normal pregnancy.

Keywords: Diabetes; GDM; Hyperglycemia; insulin resistance; Lipids profile; Pregnancy

Introduction

Gestational diabetes mellitus (GDM), defined as glucose intolerance first diagnosed during pregnancy, is the most common metabolic condition during pregnan Federation. (IDF) in 2019 there were an estimated 223 million women (20-79 years) living with diabetes. This number is projected to increase to 343 million by 2045. However, the normal range of insulin levels in pregnant women without GDM have been seldom reported [3]. The imbalance between insulin resistance and insulin secretion leading to maternal hyperglycemia, normal lipids metabolism. An estimated (84%) were due to gestational diabetes one in each six births was affected by gestational diabetes. The vast majority of cases of hyperglycemia in pregnancy were in low and middle-income countries, where access to maternal care is often limited [4]. These risk factors are also associated with the development of cardiovascular disease and type-2 diabetes mellitus postpartum, and the metabolic syndrome has been demonstrated to increase the risk of both [5, 6]. GDM is a part of insulin resistance syndrome. Change in insulin and lipids are increased in women with GDM, which may be due to underlying metabolic dysfunction which temporarily manifests during pregnancy [7]. Women with an insulin-sensitivity defect had higher complication rate at delivery suggesting other fuels may contribute to macrosomia and related birth complications [8]. However, it is unknown if lipids differ among GDM physiologic sub types. Thus, GDM has serious short-term and long-term adverse effects on pregnant women and fetuses, which not only causes pre-eclampsia, excessive amniotic fluid, dystocia and postpartum hemorrhage in pregnant women, but also causes neonatal hypoglycemia, malformation, cardiac insufficiency and hypocalcemia in neo-notes [9]. Therefore, the studies of GDM have been highly valued by researchers globally in recent years [7]. Although there is strong evidence linking triglyceride to high density lipoprotein cholesterol (TG/HDL-C) ratio to insulin resistance and diabetes mellitus, its clinical importance in pregnant women has not been well determined. Introduction Hyperglycemia in pregnancy is categorized as diabetes combined with pregnancy (pregestational diabetes mellitus, PGDM), newly discovered overt diabetes, and gestational diabetes mellitus (GDM). GDM refers to a class of diseases in which carbohydrate intolerance is first discovered during second trimester or the third trimester of pregnancy [10]. Due to the special clinical status and abnormal function of maternal glucose and lipid metabolism [11]. Researched showed that during gestation, the effect of progesterone and glucocorticoids on insulin sensitivity have been suggested to be relative for the increase of insulin resistance [12]. Meanwhile, on the contrary of normal pregnancy, when β-cell secretion is no longer sufficient to compensate for insulin compensate, it will lead to carbohydrate intolerance. Both insulin resistance and insulin insufficiency will lead to the increase of maternal glucose, amino acids and lipids, thus forming GDM [13]. Hyperglycemia in pregnancy is categorized as diabetes combined with pregnancy (pregestational diabetes mellitus, PGDM), newly discovered overt diabetes, and gestational diabetes mellitus (GDM). GDM refers to a class of diseases in which carbohydrate intolerance is first discovered during second trimester or the third trimester of pregnancy [14]. Due to the special clinical status and abnormal function of maternal glucose and lipid metabolism [15]. Researched showed that during gestation, the effect of progesterone and glucocorticoids on insulin sensitivity have been suggested to be relative for the increase of insulin resistance [16]. Meanwhile, on the contrary of normal pregnancy, when β-cell secretion is no longer sufficient to compensate for insulin compensate, it will lead to carbohydrate intolerance. Both insulin resistance and insulin insufficiency will lead to the increase of maternal glucose, amino acids and lipids, thus forming GDM [17].

Material and Methods

Study Design and Area

The study was across-sectional case-control study, conducted at the *Wed Medan*i, Teaching Hospital of Obstetrics and Gynecology, Gezira State, Central Sudan from March to November 2021.

Ethical Approval

This study was approved by the Ethics Committee of Ministry of Health Gezira State.

Sample Size

The study included one hundred Sudanese women diagnosed with GDM as cases, and same number of normal pregnant as control according to the oral-glucose-tolerance test based on the WHO endorsed the modified International Association of Diabetes and Pregnancy Study Groups (IADPSG) criteria by 2013. The diagnosis of GDM was performed at 24–28 weeks of gestation, if one or more of the following abnormality are met, fasting plasma glucose 5.1–6.9 mmol/L (92–126 mg/ld.), one hour plasma glucose 10.0 mmol/L (180 mg/ld.), 2-hour glucose 8.5–11 mmol/l (153–199 mg/dL) after overnight fasting with 75 g glucose load (WHO, 2013).

Inclusion Criteria

Pregnancy women aging younger 40 years, with single viable pregnancies.

Exclusion Criteria

1. Pregnancy women aging 40 years and above.

2. Pregnancy women with twins or multiple fetuses pregnant.

3. Pregnancy women with previously known medical complications during pregnancy such as type-1 or type-2 .

Blood Samples Collection

Participants had been asked to attend their appointment after an overnight fast a minimum of 8-10 hours, four ml venous fasting blood samples were collected from each participant, 2 ml was placed in fluoride labeled vacutainers for analysis of plasma glucose, and 2 ml was put in a plain container for biochemical parameters analysis.

The Oral Glucose Tolerance Test

The OGTT involved participants drinking 75 g of glucose powder dissolved in approximately 250 ml of water. The drink was consumed within five minutes and the participants remained seated throughout the process. Venous blood samples were drawn a one hour and two hours' post-glucose load.

Biochemical Measurements

The biochemical parameters including glucose and lipids parameters were measured by an A15 automated analyzer manufactured Bio systems company (Bio systems, Barcelona, Spain) which was optimized for working with Bio system consumables and reagents.

Statistical Analysis

Statistical analysis was performed using SPSS version 20. Data were presented in form of (Means±SD), *P valu*e less than (0.05) was considered statistically significant.

Results and Discussion

The results of cholesterol, TG and LDL presented significantly higher level which were (202.630 ±4.141,179.530±62.930 and 143.750±43.198 Means±SD mg/dL) respectively in GDM group compared to control which were (182.850±4.440,159.690±5.997 and 130.320±4.30 Means±SD mg/dL) respectively Table 1, but HDL presented (33.880±1.40 mg/dl) decreased in case group GDM compared to control groups which were (35.170±7.3 Means±SD mg/dL). These results in accordance with some studies [10], [8]. who studied data, Found that insulin resistant was a common causative factor in metabolic lipids disorders, including hyper triglyceridaemia. The results of fasting insulin and fasting insulin resistance index, Homeostasis assessment of insulin resistance presented significantly increase in case group which were (9.37±0.52, 0.78±0.05, 2.214±0.168, 2.467±0.185 and 0.307±.0.026 Means±SD) respectively compared to control group which were (8.840±.0.246, 0.56 ± 0.019, 1.61±0.04, 1.792±0.514 and 0.232±0.014 Means±SD) respectively Table (2), but FIRI and HOMA-IR presented increased without significant which were (2.214±0.168, 2.467±0.185 Means±SD) compared to control group which were (1.61±0.04, 1.792±0.514 Means±SD) respectively. AL thought fasting insulin level concentration in GDM group (9.37±0.52 Means±SD μU/ml) was higher than control (8.840 ±.0.246 Means±SD μU/ml) so no significant different found between two groups. Results from the present study exposed significantly higher TG and TC levels, , LDL-C and insulin resistant indices in the GDM group, and also demonstrated that , LDL-C and TG levels were positively correlated with IR in this group. ;layton et al., who studied data , Found that insulin resistant was a common causative factor in metabolic lipid disorders, including hyper triglyceridaemia [18].

Table 1: The lipids levels changes between the two groups (Mean ± SME)

Lipids profile mg/dL	GDM (n = 100) (Means±SD)	Control (n = 100) (Means ± D)	P value
Cholesterol	**202.630 ±4.141**	**182.850 ±4.440**	**0. 001**
TG	**179.530±62.930**	**159.690 ±5.997**	**0 .024**
HDL	**33.880 ±1.404**	**35.170 ±7.348**	**0. 417^{NS}**
LDL	**143.750 ±43.198**	**130.320±4.30**	**0. 029**

Cholesterol, TG triglycerol, HDL high density lipoprotein, LDL low density lipoprotein, NS no significant

Table 2: Fasting insulin and insulin resistance markers in normal pregnancy and in GDM group

Parameters	GDM (n = 100) (Means±SD)	Control (n = 100) (Means ± D)	P value
FI μU/ml	**9.37±0.52**	**8.840 ±.0.246**	**0.359^{NS}**
FIRI	**2.214±0.168**	**1.61±0.04**	**0.001***
Homa IR	**2.467±0.185**	**1.792±0.514**	**0.001***
HOMA-IR	**0.307±.0.026**	**0.232±0.014**	**0 .014***

FI: Fasting insulin, G/I: Glucose/insulin ratio, FIRI: Fasting insulin resistance index HOMA-IR: Homeostasis model assessment of insulin resistance. NA: not significant, *: *P* value < 0.05 is significant.

Conclusion

The study concluded that GDM had significantly higher fasting blood glucose, insulin resistance markers, TG and LDL-C compared to matched normal pregnancy.

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Competing Interests

We declaration that that no competing interests exist.

Authors' Contributions

The contributions of authors as following Dr. Mohamed wrote the manuscript draft, and Ms Mshare done the data analysis.

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