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Risk factors of Gestational diabetes mellitus among pregnant women in Karbala city

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ABSTRACT— To determine the risk factor of gestational diabetes mellitus among pregnant women and compare them with the control group. The sample was gathered using (non-probability-convenient-sampling) and the sample size was 200 in Karbala city (Al-Hyndia hospital and The typical health center in Al-hyndia) (with 100 GDM patients and 100 non-GDM controls). The study started on 1 September 2019 to 1 April 2020. The data was gathered through a direct interview with a special questionnaire that included (age, education, occupation, parity, gravidity, diabetes mellitus history, etc.). According to the findings, the majority of cases of were (24.5 percent) for the age group (20-29) years. It was discovered that various essential characteristics, such as age, education level, and family history of diabetes mellitus, are connected with gestational diabetes mellitus. However, one factor that is not associated with gestational diabetes mellitus is smoking habit. The factors showed significant association with GDM are age, previous history of gestational diabetes, family history of diabetes mellitus, gravidity, parity, previous history of abortion, previous history of stillbirth, previous history of macrosomia, polycystic ovarian, type of previous delivery and previous history of hypertension. And factor not have significant associated with GDM is previous history of hypertension and smoking habit. All pregnant women should visit the hospital/clinic health post for antenatal check - ups and Screening for GDM must be performed compulsory to all pregnant mothers.

KEYWORDS: Gestational diabetes mellitus, Factors, pregnant women, Karbala, city

1. INTRODUCTION

During the tremendous metabolic stress of pregnancy, gestational diabetes mellitus (GDM) is defined as a failure to maintain normal glucose tolerance. This condition, which is defined as any degree of glucose intolerance that begins or is first recognized during pregnancy, can be dangerous to both the mother and the fetus [1]. Women with GDM had a higher risk of prenatal morbidity, impaired glucose tolerance, and type 2 diabetes in the years after giving birth [2].

Symptoms of gestational diabetes normally go away after childbirth, and whether or not they do is unrelated to the diagnosis [3]. The exact mechanisms that cause gestational diabetes remain a mystery. Increased insulin resistance is a characteristic of GDM.

Preeclampsia, hyperglycemia crisis, urinary tract infections that can lead to pyelonephritis, the need for cesarean sections, morbidity from operative delivery, an increased risk of developing overt diabetes, and possibly cardiovascular complications later in life, such as hyperlipidemia and hypertension, are all examples of maternal complications.

For the next 20 years after their diagnosis of GDM, mothers with GDM had a 50% probability of developing type 2 diabetes mellitus (T2DM). Increased glucose supply to the fetus due to maternal hyperglycemia causes fetal hyperinsulinemia and increased fetal development. Birth trauma, an increase in cesarean deliveries, and long-term risk of glucose intolerance and obesity are all repercussions of abnormal fetal growth. Hypoglycemia, hyperbilirubinemia, respiratory distress syndrome, cardiomyopathy, and hypocalcaemia are some of the other early prenatal complications [4- 7].

GDM is one of the most prevalent pregnancy problems in the United States, affecting roughly 7% of all pregnancies (more than 200 000 every year) [8]. Despite several studies in American and European populations on risk factors for gestational diabetes, there have been few investigations in Iran [18]. Given the disease's numerous and significant sequelae, a lack of adequate prevention, management, and treatment methods results in a slew of limitations and issues for those at risk [9]. Obesity, maternal age, previous GDM, family history of diabetes, polycystic ovary syndrome, persistent glycosuria, pregnancy–included hypertension, history of recurrent miscarriage, unexplained fetal death history, macrosomia are all risk factors [10].

Diabetes has spread throughout the world, affecting people in nations such as India and China [11- 13]. According to a recent study, the global prevalence of diabetes was 2.8 percent in 2000, resulting in 171 million people with diabetes, and is expected to rise to 4.4 percent in 2030, resulting in 366 million people with diabetes globally [13].

2. Material and Method

Case-control study was conducted in Karbala city (Al-Hyndia hospital and The typical health center in Al-Hyndia), (Appropriate non-probability sampling) was the method used for sampling) and sample size (200) involved GDM and 100 with control with non GDM. The study started from 1 September 2019 to 1 April 2020. Cases were defined as a pregnant women infected with diabetes mellitus

Controls were define as a pregnant women non infected with diabetes mellitus

1. Inclusion criteria: pregnant women whose gestation ages were between 24-28 weeks gestation and were receiving antenatal care at antenatal clinic.
2. Exclusion criteria: those who were excluded included know pregnant diabetes, pregnant women whose gestation ages were less than 24 weeks or greater than 28 weeks, pregnant women who were not able to complete the OGT due to vomiting, refusal to continue the test eating food during the test or other reasons, pregnant women who were ill and who took salbutamol or other medications they may influence glucose tolerance.

The data was collected through a direct interview with a special questionnaire that included (age, education, occupation, parity, gravidity, previous history of diabetes mellitus, etc.). SPSS version 18 was used for the purpose of data analysis, due to the significance of p value < 0.005, the x^2 . Test was used A significant odds ratio with a 95% confidence interval was considered to estimate the effect of a variation variable on GDM pregnancy risk.

3. Results

Table (1): Age sample distribution by case and control:

Age	Groups				Total		P-value
	Cases		Controls				
	No	%	No	%	No	%	

< 20	26	13.0	7	3.5	33	16.5	0.000 HS
20 – 29	49	24.5	37	18.5	86	43.0	
30 – 39	20	10.0	43	21.5	63	31.5	
> = 40	5	2.5	13	6.5	18	9.0	
Total	100	50.0	100	50.0	200	100.0	
Mean Std. Deviation	**25.56 ± 7.755**						

This table shows that the age range (20-29) had the highest proportion (24.5%) of cases, while the age group (30-39) had the highest percentage (21.5%) of controls. This was a statistically significant difference (p-value = 0.000).

Table (2) Distribution of the demographic characteristics:

-S(significant) -NS(Non-significant)

Demographic characteristics	Cases		Controls		Total		Test
	No	%	No	%	No	%	
Educational level							
Illiterate	3	1.5	4	2.0	7	3.5	**P-value= 0.03 S**
Read and Write	11	5.5	19	9.5	30	15.0	
Primary school	42	21.0	30	15.0	72	36.0	
Intermediate School	15	7.5	19	9.5	34	17.0	
Secondary school	0	0.0	6	3.0	6	3.0	
College and above	29	14.5	22	11.0	51	25.5	
Total	100	50.0	100	50.0	200	100.0	
Occupational status							
House wife	86	43.0	87	43.5	173	86.5	**P-value =0.11 NS**
Employed	8	4.0	12	6.0	20	10.0	
Student	6	3.0	1	0.5	7	3.5	
Total	100	50.0	100	50.0	200	100.0	

From the table it is clear that the percentage of cases at the educational level in the primary stage increased (21.0%), and a percentage (15.0%) was obtained as the highest percentage of control in the primary stage, the difference statically significant (p-value)=(0.001), While the percentage of the housewife was (43.0%) in the cases and (43.5%) in the control, which is considered the highest percentage of sample occupation in this study, and the difference was not statistically significant (p- value > 0.05).

Table (3) Sample distribution based on previous history of hypertension and family history of hypertension:

History of hypertension	Cases	Controls	Total	OR	95%CI	P-value

	No	%	No	%	No	%			
Previous history of hypertension									
Yes	13	6.5	31	15.5	44	22.0	0.333	0.162-0.684	**0.002 HS**
No	87	43.5	69	34.5	156	78	-	-	
Total	100	50.0	100	50.0	200	100.0	-	-	
Family history of hypertension									
Yes	33	15.5	42	21.0	75	37.5	0.68	0.382-1.21	**0.19 NS**
No	67	33.5	58	29.0	125	62.5	-	-	
Total	100	50.0	100	50.0	200	100.0	-	-	

The difference between the percentage of women without a previous history of hypertension in cases (43.5%) and controls (34.5%) was statistically significant (p-value=0.002), as seen in this table. Because the higher number of women without a family history of hypertension in cases (33.5%) and the higher percentage of women without a family history of hypertension in controls (29%), the difference was not statistically significant (p-value>0.05).

Table (4) samples distribution according to prior history of gestational diabetes:

Previous history of gestational diabetes mellitus	**Cases**		**Controls**		**Total**		**OR**	**95%CI**	**P-value**
	No	**%**	**No**	**%**	**No**	**%**			
Yes	4	2.0	65	32.5	69	34.5	0.022	0.008-0.066	0.000 HS
No	96	48.0	35	17.5	131	65.5	-	-	
Total	100	50.0	100	50.0	200	100.0	-	-	

The larger percentage of pregnant women with no previous history of gestational diabetes mellitus in cases (48%) is explained in table above. The majority of pregnant women do not have a history of diabetes mellitus under control (17.5 %). This distinction was statistically significant (p=0.000).

Table (5) Sample distribution based on family history of diabetes mellitus:

Family history of diabetes mellitus	**Cases**		**Controls**		**Total**		**OR**	**95%CI**	**P-value**
	No	**%**	**No**	**%**	**No**	**%**			

Yes	20	10.0	42	21.0	62	31.0	0.345	0.184-0.649	0.001 HS
No	80	40.0	58	29.0	138	69.0	-	-	
Total	100	50.0	100	50.0	200	100.0	-	-	

This table reveals that the highest percentage of pregnant women without a family history of diabetes mellitus (40%) in cases, while the maximum percentage of pregnant women without a family history of diabetes mellitus (29%) in controls, with statistical significance (P = 0.001).

Table (6) Gravidity distribution according to cases and controls:

Gravidity	**Cases**		**Controls**		**Total**		**OR**	**95%CI**	**P-value**
	No	**%**	**No**	**%**	**No**	**%**			
First pregnant	37	18.5	20	10.0	57	28.5	-	-	0.02 S
1-2	27	13.5	34	17.0	61	30.5	2.329	1.108-4.894	
>= 3	36	18.5	46	23.0	82	41.0	1.751	0.904-3.389	
Total	100	50.0	100	50.0	200	100	-	-	

The greatest percentage of the sample of cases in the group > = 3 was 18.5 %, as shown in the table, whereas the highest percentage in the control group (23%) was statistically significant (p-value=0.02).

Table (7) Parity-based distribution of the study sample:

Parity	**Cases**		**Controls**		**Total**		**OR**	**95%CI**	**P-value**
	No	**%**	**No**	**%**	**No**	**%**			
Non-delivery	41	20.5	27	13.5	68	34.0	-	-	0.04 S
1 – 2	32	16.0	32	16.0	64	32.0	1.518	3.027-0. 761	
>= 3	27	13.5	41	20.5	68	34.0	2.305	4.583-0.16	
Total	100	50.0	100	50.0	200	100	-	-	

- Reference (Non-delivery)

The difference between the greatest percentage in non-delivery (20.5 %) and the highest percentage in control (20.5 %) in the group >=3 was statistically significant (p-value 0.04).

Table (8) The study sample was divided based on previous abortion history:

Previous abortion history	**Cases**		**Controls**		**Total**		**OR**	**95%CI**	**P-value**
	No	**%**	**No**	**%**	**No**	**%**			

Yes	16	8.0	46	23.0	62	31.0	0.223	0.115-0.434	0.000 HS
No	84	42.0	54	27.0	138	69.0	-	-	
Total	100	50.0	100	50.0	200	100	-	-	

This table shows that women without a history of abortion have a higher percentage of cases (42%). and the highest percentage of women in the control group did not have a prior history of abortion (27.0%); this difference was statistically significant (p-value =0.000).

Table (9) Previous history of stillbirth distribution according to cases and controls:

Previous history of stillbirth	**Cases**		**Controls**		**Total**		**OR**	**95%CI**	**P-value**
	No	**%**	**No**	**%**	**No**	**%**			
Yes	6	3.0	14	7.0	20	10.0	0.392	0.144-1.066	0.04 S
No	94	47.0	86	43.0	180	90.0	-	-	
Total	100	50.0	100	50.0	200	100	-	-	

It is clear from the table that there is a difference in the percentages of pregnant women who have no previous history of stillbirth, with a higher percentage of pregnant women who have no previous history of stillbirth (47 %) in cases and a higher percentage of pregnant women who have no previous history of stillbirth (47 %) in cases (43 %). This was statistically significant (p<0.04).

Table (10) The study sample distribution based on previous Macrosomia history:

Previous history of Macrosomia	**Cases**		**Controls**		**Total**		**OR**	**95%CI**	**P-value**
	No	**%**	**No**	**%**	**No**	**%**			
Yes	5	2.5	23	11.5	28	14.0	0.176	0.064-0.485	0.000 HS
No	95	47.5	77	38.5	172	86.0	-	-	
Total	100	50.0	100	50.0	200	100	-	-	

The table shows the difference in the percentages of pregnant women who do not have a history of gigantism as the higher percentage of pregnant women who had no previous history of gigantism (47.5%) and the highest percentage of women without a previous history of gigantism (38.5%) in the control group. This difference was statistically significant (p value = 0.000).

Table (11) Polycystic ovarian syndrome distribution based on cases and controls:

Poly cystic ovarian	**Cases**	**Controls**	**Total**			**P-value**

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syndrome	No	%	No	%	No	%	OR	95%CI	
Yes	7	3.5	20	10.0	27	13.5	0.301	0.121-0.749	0.007 HS
No	93	46.5	80	40.0	173	86.5	-	-	
Total	100	50.0	100	50.0	200	100	-	-	

This table shows a higher percentage of pregnant women without polycystic ovarian syndrome (46.5%) in cases and a higher percentage of pregnant women without polycystic ovarian syndrome (40.0%) in controls. This distinction was statistically significant (p-value0.004).

Table (12) Distribution of study sample based on previous delivery type:

Type of previous delivery	**Cases**		**Controls**		**Total**		**OR**	**95%CI**	**P-value**
	No	**%**	**No**	**%**	**No**	**%**			
Non-delivery	42	21.0	25	12.5	67	33.5	-	-	0.000 HS
Normal	37	18.5	13	6,5	50	25.0	0.59	0.264-1.317	
Caesarean	21	10.5	62	31.5	83	41.5	4.96	2.463-9.988	
Total	100	50.0	100	50.0	200	100	-	-	

-Reference(Non-delivery)

This table shows that there is a higher percentage of pregnant women who have had a previous caesarean delivery (21.0 %) and a higher percentage of pregnant women who have had a previous caesarean delivery (31.5 %) in the control group; this difference was statistically significant (p-value=0.000).

Table (13) Smoking habit distribution in the study sample:

Smoking Habits	**Cases**		**Controls**		**Total**		**OR**	**95%CI**	**P-value**
	No	**%**	**No**	**%**	**No**	**%**			
Smokers	1	0.5	0	0.0	1	0.5	0.423	0.016-10.642	0.24 NS
Passive smokers	46	23.0	56	28.0	102	51.0	1.549	0.889-2.699	
Non-smokers	56	26.5	44	22.0	97	48.5	-	-	
Total	100	50.0	100	50.0	200	100	-	-	

-Reference(Non-smokers)

The effect of smoking and the difference in the percentages for pregnant women is explained in the table as the higher percentage in non-smoking pregnant women (26.5%) in the case of a higher percentage in passive smoking pregnant women (28.0%) in the control group, this difference was not statistically significant (p value > 0.05).

4. Discussion

This study focused on the age group (20-29) years, which includes the majority of pregnant women in both study groups, because the mother's age group (20-29) years is the most significant for gestational diabetes, with a p-value of 0.000. The findings of this investigation matched those of a study conducted in the Kingdom of Saudi Arabia [14]. They have detected the risk of GDM being dramatically elevated from 25 years farther in India [15], Peshawar [16], Iran [17], and Qatar [18]. This backs with the American Diabetes Association's guideline to screen people over the age of 25 and the discovery that maternal age >=35 years is the factor that most predicts GDM. [19]. Pregnant women who completed primary school were thus educated and had similar prospects to GDM, according to a research done in the Kingdom of Saudi Arabia [14]. However, this finding contradicts research conducted in Bangladesh [19] and China [20], which revealed no significant link between educational attainment and GDM.

A previous history of hypertension is also a risk factor for GDM. This finding contradicts the findings of an Iranian study [17], which found no significant correlation between a history of high blood pressure, pre-eclampsia, and GDM. Despite this, blood pressure was observed in GDM. Pregnancy risk factors include high blood pressure and pre-eclampsia. It has been reported that pregnant women with GD have an increased risk of pregnancy-related hypertension when compared to non-diabetic women. Pregnant women with hypertension, on the other hand, are at an increased risk of GDM. This association is thought to be due to insulin resistance, which leads to hyperinsulinemia and increases in hypertension and GDM [21].

GDM in previous pregnancies can lead to GDM in subsequent pregnancies. These findings are consistent with those of studies conducted in Saudi Arabia [14], India [15], Peshawar [16], and Iran [17], which found that the role of family history of gestational diabetes in first-degree relatives was highly significant, possibly due to a genetic factor passed down from generation to generation among families.

Family history is also risk factor for GDM similar finding were ….reported in study done in china (20), in Goza [22], in Niyeria [23], and in Romina [24], And in South India [25], reported that the pregnant women with family history of diabetes were at higher of developing GDM.

This could be explained the family history of diabetes an pattern.. measure for here dietary women factor that may be .. of cause GDM in pregnant women. women with family history of diabetes are one of the most common clinical risk markers of GDM compared to the biochemical indicators.

Significant association was found between the increase number of previous pregnancy and GDM women at higher risk of having GDM. (OR: 2.329;95%c 1,108-4.894) Comparing the results with a study conducted in India with a control group, similar results were reported [26], and in Quarta [18], and china [20], reported that the number of pregnancies has been identified as risk factor for GDM, showing an increase in GDM with the number of pregnancies.

With a p-value of <0.005, there is a substantial relationship between high parity and GDM. These findings are consistent with those of previous studies in Iran [17], Nigeria [23], and Romina [24], which discovered that higher parity of respondents had a substantial connection with gestational diabetes. However, this result is inconsistent with a study conducted in Saudi Arabia [14], which discovered that primary equivalence is a risk factor for GDM, and this difference can be explained by the fact that this study and other studies may indicate a strong family planning program in these countries, which made the study sample on the same parity level.

With a p value of< 0.00, there is a significant relationship between a past history of miscarriage and stillbirth and GDM in this research. The current study's findings are consistent with those reported in China

[20] and Nigeria [23]. A similar finding was reported in an Iranian study, where a previous history of macrosomia was shown to be a significant risk factor for developing GDM (Ro: o.176,95 percent. (10.064-0.0485) as compared to the control group [17]. Similar findings were observed in studies conducted in Iran [17], Nigeria [23], Romania [24], and Korea [25], all of which concluded that macosomia is a risk factor for GDM in future pregnancies. This might be due to an excess of amniotic fluid in the present pregnancy, a fetus that is big for gestational age before week 24 of pregnancy, or the best document. The 2009 guidance of the International Diabetes Federation (IDF) and current ACOG recommendations keep macrosomia as a key risk factor for GDM [26].

A significant association was found between PCOS and GDM. They were at higher risk of developing GDM (oR: 0.301; 95: cl, (0.121-0.749) when compared to the reference group. Similar results were reported in a study conducted in Peshawar [16], and in Romina [24], and in India [26], showed that the history of PCOS is closely related to the development of GDM, and this is explained by the association with an increased degree of insulin resistance during pregnancy [27].

Caesarean section in a prior pregnancy was also reported as a risk factor for GDM, this result agreement with the study done in china [20], and in Nigeria [23], and in Romania [24], were found caesarean section a key risk factor for GDM.

Smoking has no statistically significant link to GDM (p-value > 0.05). The current study agrees with findings reported in Iran [17], but it differs from a study conducted in China [20] that revealed smoking to be a risk factor for GDM. This might be explained by During pregnancy, smoking cigarettes may raise the risk of GDM (gestational diabetes mellitus). In experimental investigations, smoking has been linked to hyperinsulinemia and insulin resistance, while the link to diabetes is uncertain [27].

5. Conclusion

This study shows the rate of GDM among age group (20-29), and the risk factors associated with GDM were: Age, level education the risk of primary school is higher. Significant association between History of hypertension, history of gestational diabetes mellitus and Family history of diabetes mellitus with GDM., high gravidity and high parity associated with GDM. And there is significant between histories of abortion history of stillbirth with GDM.

And significant association between Previous history of macrosomia, polycystic ovarian syndrome and GDM.

Recommendations:

1- For prenatal check-ups, all pregnant women should go to the hospital/clinic health post.

2-All pregnant women must be screened for GDM.

3 - A suitable GDM guideline must be developed so that no pregnant women are left unscreened.

4- GDM patients on insulin treatment should be closely monitored.

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