



**The prevalence of gestational diabetes mellitus among pregnant females in Beni-Suef governorate and its hazards on the maternal and fetal outcome .**

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**Abstract:**

Diabetes mellitus (DM) is increasing worldwide especially in developing countries. Increasing age, BMI, weight, marital period and family history for diabetes are highly prone to gestational diabetes mellitus. The aim of this work is to estimate prevalence of GDM among pregnant females in Beni-Suef governorate and its hazards on mother and offspring. Our present study was included 1000 pregnant females were followed and their outcomes with estimated gestational age between 24th and 28th week. At first a proforma containing general information was fulfilled, Then the study population were divided into two groups . 1<sup>st</sup> group was screened by Random Blood Sugar (RBS) while 2<sup>nd</sup> group was screened by a standardized 2h -75 Oral Glucose Tolerance Test (OGTT) according to WHO guidelines of GDM. Our study detected the prevalence of GDM was 2.6%. There was statistically significance of increasing age and BMI, positive family history of DM and positive history of twin pregnancy. There was no statistically significance as regards history of PCO, past history of GDM and past history of macrocosmic baby. We recommend the early screening before 24th week of gestation, for GDM regardless of any other risk factors and those women with increased BMI, age, weight and positive history of diabetes mellitus has to be considered as high-risk group. All GDM diagnosed women should be closely monitored for glycemic control for good maternal and fetal outcome.

**Keywords:** Gestational diabetes mellitus; Prevalence; OGTT.

**1. Introduction**

The prevalence of diabetes mellitus (DM) is increasing worldwide and more in developing countries. The increasing prevalence in

developing countries is related to increasing urbanization, decreasing levels of physical activity, changes in dietary patterns and increasing prevalence of obesity [1].

As women with gestational diabetes mellitus (GDM) and their children are at increased risk of developing diabetes mellitus in future, special attention should be paid to this population especially in developing countries [2].

The risk factors for gestational diabetes mellitus are age >30 years, family history of diabetes mellitus, obesity, history of macrosomia, glycouria, previous unexplained neonatal death, unexplained recurrent abortion, Previous congenital malformations, history of polyhydramnios, history of stillbirth, history of gestational hypertension and history of pre-eclampsia [3].

Pregnancy is associated with insulin resistance and hyperinsulinemia that may predispose some women to develop diabetes. Gestational diabetes mellitus (GDM) is defined as any degree of glucose intolerance with the onset or first recognition during pregnancy, with or without remission after the end of pregnancy [4]. This definition does not exclude the possibility that unrecognized glucose intolerance may have antedated the pregnancy, and so, the term hyperglycemia in pregnancy emerges to be more appropriate as suggested lately by the Endocrine Society [5]. The International Association of Diabetes and Pregnancy Study Groups (IADPSG) classify hyperglycemia first detected during pregnancy as either 'overt diabetes' or 'gestational diabetes mellitus' [6]. In 2013, the World Health Organization recommended that hyperglycemia first detected during pregnancy

be classified as either 'diabetes mellitus in pregnancy' or 'GDM' [7].

The amount of GDM varies in direct proportion to the prevalence of T2DM in a given population, or ethnic group. The prevalence rates for GDM are higher for African, Hispanic, Indian, and Asian women than for Caucasian women [8].

Recently, the prevalence of GDM has increased by 2-3 folds, ranging from 8.9-53.4% [9]. This is mainly due to the adoption of the new criteria proposed by the IADPSG on screening, and diagnosis of GDM. The IADPSG recommends universal screening for GDM and requires one single glucose value above the cut-off value (instead of 2) during the oral glucose tolerance test (OGTT) for Metzger et al. (2010) [6].

This dramatic rise in the GDM prevalence will have a major impact on health care systems. Also, the consequences of labeling a large number of women with GDM are not known. The GDM is associated with adverse maternal and neonatal sequelae [10].

The major morbidities associated with infants of diabetic mothers include respiratory distress, growth restriction, polycythemia, hypoglycemia, hypocalcemia, and hypomagnesaemia, and congenital malformations [11].

## **2. patient and Methods:**

The present study is a prospective cohort hospital-based, This study enrolled all pregnant women, with their estimated gestational age

between 24th and 28th week in addition to those with high risk factors as described below are screened at any gestational age before 24 weeks, attending antenatal care (ANC) clinic at Beni-Suef University Hospital and other governorate centers and its effect on pregnancy outcome. This study is a part of a project that is carried in ASSUIT University since 2015 for screening for GDM and this project is guided and supported by WHO guidelines of GDM.

proved this study according to Ethical committee of Beni Suef University. international ethical roles

#### **Exclusion criteria:**

- History of diabetes mellitus before the current pregnancy.

#### **Time of screening:**

- All pregnant females are screened at 24th :28 week of gestation, with exception before 24th week of gestation if there is risk factors
- Obese (BMI more than 30).
- Older than 25 years old.
- Hypertensive.
- Known case of PCO (polycystic ovary).
- Twin pregnancy.
- Previous infant with macrosomia
- Diabetes in a first-degree relative
- Current glycosuria

The above category of patients should be subjected to screening as soon as possible after the initial visit and if negative repeat at 24–28 weeks.

#### **Study population:**

The study includes (1000) pregnant females, were followed and their offspring studied. After informing, proforma containing general information on demographic characteristics, socio-economic status, diet state, education level, parity, family history of diabetes and/or hypertension and past history of GDM was filled. Then examination and investigations.

#### **Patient under the study**

##### 1. History taking:

- The personal data including name, age of marriage, gestational age, parity, address, job, telephone number.
- Past history of gestational diabetes, twin pregnancy, previous history of macrosomic baby, PCO history, drug history or previous diseases or bad obstetric history (recurrent miscarriage, IUFD, congenital anomalies).
- Family history of diabetes mellitus (first degree relatives).
- Diet assessment.

##### 2. Clinical examination:

- Full examination including vital signs, BMI, general, chest, cardiovascular system, abdomen, lower limbs.

##### 3. Laboratory investigation:

The study population were divided into two groups:

- 1<sup>ST</sup> group :(500 women) undergo usual random blood sugar without preparation.
- 2<sup>nd</sup> group: (500 pregnant women) undergo a standardized 2h -75 g oral glucose tolerance test (OGTT).

### Testing Procedures of OGTT

- For three days preceding the test, the patient should consume a normal diet.

The patient should arrive fasting for a minimum of eight hours before the test. If the patient does not arrive fasting, the test should be redone.

- The patient should consume the correct amount of glucose (75 grams of anhydrous glucose) over a maximum of a 5-minute period.

- Sample should be taken at 120-minute, and the blood sample should be processed as required and sent to the lab for analysis.

### 3. Results:

The glucose tolerance test is given to determine how quickly glucose is cleared from the blood. The test is used to test for diabetes diagnosis, insulin resistance, impaired beta cell function, reactive hypoglycemia, acromegaly, and other disorders of carbohydrate metabolism.

Patients with plasma glucose values more than 140 mg/dl were labeled as GDM and the rest as the control or the non-GDM group.

All pregnant females whose test above 140 mg /dl are asked for FBS, 2HPP and HbA1c as confirmatory tests.

- HbA1c  $\geq$ 48 mmol/mol (6.5%)
- Patients diagnosed to have GDM undergo abdominal ultrasound to asses any fetal abnormalities.

- Also those patient are managed by:

1. Education about GDM and its hazards,
2. Medical nutrition therapy,
3. Finally, insulin therapy if the above measures fail.

Our data was collected from 1000 pregnant female, half of them was screened by RBS and second half screened by OGTT.

- Group I: by RBS.
- Group II: by OGTT.

It was found that 23.4% of study group were positive family history of diabetes mellitus, 2.2% had positive history of twin pregnancy, and PCO, 0.3% had positive history of macrosomic baby, and 0.2% had positive history of GDM.

Table 1: Variables	Frequency (n=1000)	
	No.	%
Normal	974	97.4%
GDM	26	2.6%
		3.2% by OGTT 2% by RBS

Description of nutrition history among study group diagnosed as GDM was illustrated in table (1).

It was found that the mean random blood sugar among the study group screened by RBS was

(102.4±21.8) mg/dl ranged between 80 and 273 mg/dl, mean FBS was (126.2±33.4) mg/dl ranged between 90 and 200 mg/dl; the mean two hours postprandial test of (178.6±58.9) mg/dl ranged between 114 and 320 mg/dl, and mean HbA1C was (6.3±0.99) % ranged between 5 % and 9 %.

**Table (2):**

	<b>Dislike</b>	<b>rarely</b>	<b>Some</b>	<b>Most</b>
<b>Nutrition history</b>				
<b>Dairy product</b>	6(24%)	5(20%)	11(44%)	3(12%)
<b>Vegetable</b>	1(4%)	7(28%)	13(52%)	4(16%)
<b>Fruits</b>	1(4%)	6(24%)	13(52%)	5(20%)
<b>Fast food</b>	0(0%)	15(60%)	8(32%)	2(8%)
<b>Sweet beverage</b>	0(0%)	14(56%)	10(40%)	1(4%)
<b>Sweets</b>	0(0%)	13(52%)	9(36%)	3(12%)
<b>Number of meals per day</b>				
<b>One</b>	6		24%	
<b>Two</b>	11		44%	
<b>Three</b>	8		32%	

It was found that 2% of study group who diagnosed with OGTT test show polyhydramnios in ultrasound examination versus 98% show normal findings. Prevalence of gestational diabetes mellitus (GDM) among study group that 3.2% of study group who diagnosed as gestational diabetes mellitus by OGTT in group II and 2% diagnosed by RBS in group I versus 97.4% were normal based on blood glucose level (Table 2).

It was found that there is statistically significant high mean of age and low mean of BMI among group tested by OGTT test. (Figure 1)

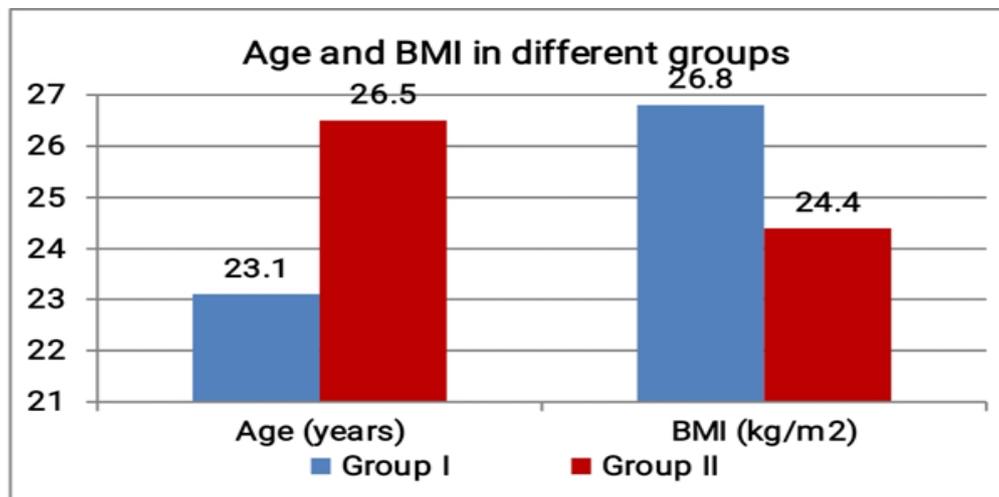


Figure (1)

is statistically significant high percentage of positive family history, and positive history of twin pregnancy among group diagnosed by OGTT test (Table 3).

Past history in different diagnosis test.

Table (3): Variables	Group I		Group II		p-value	Sig.
	No.	%	No.	%		
<b>Family history of DM</b>						
Negative	406	81.2%	360	72%	<b>0.001</b>	<b>HS</b>
Positive	94	18.8%	<b>140</b>	<b>28%</b>		
<b>Twin pregnancy</b>						
Negative	498	99.6%	480	96%	<b>&lt;0.001</b>	<b>HS</b>
Positive	2	0.4%	<b>20</b>	<b>4%</b>		
<b>Macrosomic baby</b>						
Negative	497	99.4%	500	100%	0.2	NS
Positive	3	0.6%	0	0%		
<b>PCO</b>						
Negative	488	97.6%	490	98%	0.7	NS

Positive	12	2.4%	10	2%		
<b>History of GDM</b>						
Negative	498	99.6%	500	100%	0.5	NS
Positive	2	0.4%	0	0%		

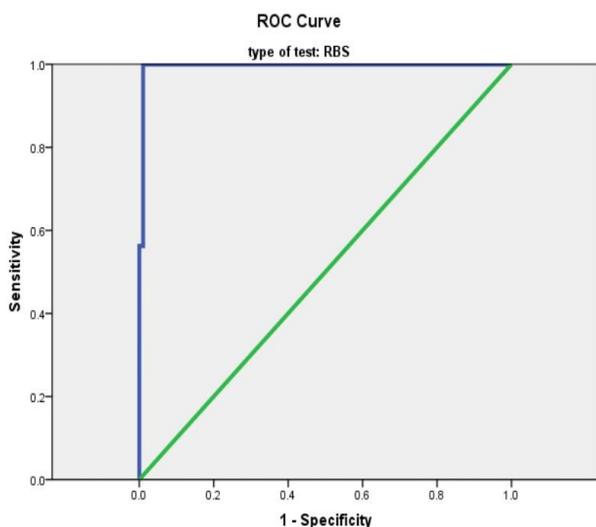
The past history characteristics among pregnant females diagnosed as GDM were illustrated in table 4

Table 4 Variables	Frequency (n=26)	
	No.	%
<b>Family history of DM</b>		
Negative	24	92.3%
Positive	2	7.7%
<b>Twin pregnancy</b>		
Negative	26	100%
Positive	0	0%
<b>Macrosomic baby</b>		
Negative	26	100%
Positive	0	0%
<b>PCO</b>		
Negative	24	92.3%
Positive	2	7.7%
<b>History of GDM</b>		
Negative	24	92.3%
Positive	2	7.7%
<b>Abdominal US</b>		
Polyhydramenous	10	38.5%
No	16	61.5%
<b>NICU admission &gt; 24 post delivery</b>		
Negative	17	65.4%
Positive	9	34.6%
<b>Insulin required for glycemc control.</b>		

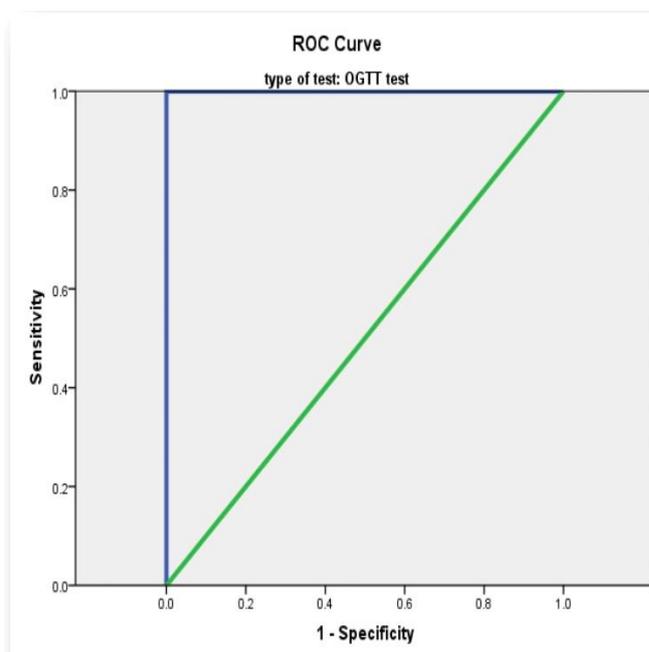
Negative	21	80.8%
Positive	5	19.2%
<b>Hyper bilirubinemia</b>		
Negative	22	84.6%
Positive	4	15.4%

Sensitivity and specificity test for RBS and OGTT test in diagnosis of GDM illustrates sensitivity of RBS test (100%) and specificity (95.2%) at cut off 139.5 mg/dl versus 100% sensitivity, and 100% specificity for OGTT test at cut off 143, which indicated that RBS detect GDM at lower cutoff value as shown in figure (2,3).

**Figure (2): ROC curve for RBS test**



**Figure (3): ROC curve for OGTT test**



#### **4. Discussion:**

Diabetes is a metabolic disorder of carbohydrate, fat and protein, affecting a large number of population in the world, Diabetes mellitus is not a single disorder but it is a group of metabolic disorder characterized by chronic hyperglycemia, resulting from defects in insulin secretion, insulin action, or both [12].

The increasing trend of prevalence of diabetes and GDM is due to the rising incidence of obesity and changing lifestyle patterns. Women with GDM are at a higher risk of both maternal complications like gestational hypertension, pre-eclampsia, operative delivery and fetal complications like macrosomia, birth injuries, stillbirths, neonatal hypoglycemia and hyperbilirubinemia. In addition, these women and their offspring are known to develop type 2 diabetes mellitus later in life [13].

Sultana Tahmina in January 2015 made a cross-sectional comparative analysis of women who were screened and diagnosed GDM [14].

Five hundred pregnant women were screened ,36 were diagnosed GDM using Carpenter & Coustan criteria (CC group). 733 women were screened. Among them, 167 women were diagnosed as GDM using the IADPSG criteria (IADPSG group). The prevalence of GDM was 7.2% in the CC group and 22.78% in the IADPSG group (p=0.000).

Median age of women in the CC group was 25 years (interquartile range 23.50-27.00) and 26 years (interquartile range 23.00-30.00) in the

IADPSG group. Among the perinatal outcomes, a statistically significant improvement was found in the number of neonates developing respiratory distress syndrome and hyperbilirubinemia in the IADPSG group.

Cong Luat et al.,2018, a prospective cohort study of 2030 women was undertaken in Vietnam between 2015 and 2016. The prevalence of GDM varied considerably by the diagnostic criteria: 6.4% (ADA), 7.9% (EASD), 22.8% (IADPSG/WHO), and 24.2% (NICE) [15].

Onyenekwe et al., 2017 [16], showed the prevalence of gestational diabetes in Enugu, South East Nigeria using the updated diagnostic guidelines, across sectional and descriptive study. The WHO (2013) criteria for GDM were met in 51 subjects (35.9%), Previous miscarriages and macrosomic babies, family history of diabetes mellitus, previous GDM, hypertension and recurrent urinary tract infection were found to be significant risk factors for the development of GDM, which agree with our study [7].

Regarding BMI, Robin et al. (2012) Found the average value was  $27.89 \pm 3.48 \text{ kg/m}^2$ . AS regarding past obstetric history 20 (9.0%) women had previous GDM, 8 women (3.6%) with oligohydrominos, 6 (2.7%) women with polyhydraminos, and 134 neonate (57.75%) has hyperbilirubinemia [17].

In Chennai, India, it was recorded as 18.9% in 2004 Seshiah V et al. [18]. In South India, the

prevalence of gestational diabetes mellitus has increased from 1% in 1998 to 16.55% in 2004 Bhat M et al., 2010 [19].

Women of age more than 25 are being considered as risk factor. Our mean average age was a mean age  $24.5 \pm 5.6$  years. Which is the same statement of many studies Seshiah V et al., 2004[18], Boriboonhirunsan D et al., 2006 [20].

The study by Getahun D et al., 2008 reported that the prevalence of gestational diabetes mellitus largely driven by the increase in 25-35 years age group [21].

The increase in BMI is also a risk factor for gestational diabetes mellitus Bhat M et al 2010 [19]. A study done by Robin et al.,2012. Which agree with our study, in our population overall BMI value was  $24.6 \pm 3.5$  kg/m<sup>2</sup> and 20% of women above 30% [17].

Family history of Diabetes Mellitus has a strong correlation with occurrence of gestational diabetes mellitus. Studies done by Hadaegh et al., 2005 showed that parental history of Diabetes Mellitus has significant risk which agree with our study. In our study 23.4% of the women had positive family history of Diabetes Mellitus [22].

Polyhydramnios also has correlation with gestational diabetes mellitus that shown by Boriboonhirunsaran et al., 2006 which agree with our study that 7.7% of women were complicated with polyhydramnios [20].

In the study reported by Xiong et al.,2001, the prevalence of GDM ranges between 2.2 and 2.8% from 1991 to 1997, with an average rate of 2.5% [23].

Priyanka et al.,2013 had showed a study that was carried out in 500 patients between 24 and 28 weeks of gestation, attending the antenatal outdoor. The prevalence of GDM in this study was 6.6%. Maternal and fetal complications in the GDM group were much higher than in the non-GDM group [24].

## **5. Conclusion and Recommendations:**

- The prevalence of GDM is raising worldwide parallel to the increment in the prevalence of obesity and T2DM.
  - GDM is a condition that should be treated aggressively, and it is a problem that affects a significant number of women during pregnancy and is associated with maternal and neonatal adverse outcomes.
  - We recommend the possibility of use RBS as screening test followed by confirmatory tests (FBS & 2HPP&HbA1C) especially with low economic state areas and unavailability of OGTT.
  - Screening, diagnosis, and management of hyperglycemia are critical In order to circumscribe and minimize potential complications to mother and child.
- Treatment of GDM consists of diet and exercise. Insulin should be initiated if the initial measures fail to achieve glycemic goals.

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