# Epidemiological study of Gestational Diabetes Mellitus among Women attending the Obstetric Outpatient Clinic at Qena University Hospital

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**Abstract**

**Background**: Gestational diabetes mellitus (GDM) is characterized by high blood glucose, which typically disappears after childbirth. Although it can happen at any point during pregnancy, it happens more frequently in the second or third trimester.

**Objectives**: To measure the frequency and identify probable risk factors for gestational diabetes mellitus among pregnant women at the Qena University Hospital.

**Patients and methods:** The Department of Obstetrics and Gynecology at Qena University Hospital served as the site of our cross-sectional study. Only pregnant women who attended the obstetrics and gynecology department and accepted to share in this study were included. Non-pregnant women or diabetic women before pregnancy were excluded. All patients were subjected to a full history and routine clinical examination. A "two-step" method for diabetes mellitus assessment was chosen. A structured questionnaire was conducted among 300 pregnant females targeting the details of the following areas: socio-demographic characteristics, obstetric history, present history, and history.

**Results:** The frequency of GDM among pregnant women was 13.3%. The most contributing factors for GDM were prior GDM, Family history of DM, and GDM, overweight, stillbirth, history of macrosomia, History of PCO, Family history of Hypertension, mother's age >35 years, and history of repeated abortion.

**Conclusion:** Early detection and diagnosis of GDM in pregnancy are crucial especially in those with risk factors.

**Keywords:** Gestational; Diabetes; Mellitus; Obstetrics; Qena.

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## Introduction

GDM, which frequently disappears after delivery, is characterized by high blood glucose. It can happen at any stage of pregnancy; however, it seems to happen more commonly in the second or third trimester **(sweet et al., 2022).** Two key risk factors for GDM have been frequently identified by earlier studies: obesity and diabetes family history. Other factors for the condition include non-white race, advanced maternal age, prior cause-unknown stillbirths, and history of GDM. Along with an increased risk of GDM, maternal obesity increases the chance of multiple harmful effects on the mother's health, including thrombosis, gestational hypertension, preterm birth, and cesarean section **(Komilovan, 2022).**

According to **Davidsen et al.,** GDM and obesity have been associated with significant infant problems. Congenital anomalies, macrosomia, and birth traumas are a few of them. Despite inconsistent evidence, macrosomia of research has connected unipolar major depression to important risk factors and conditions that co-occur with gestational diabetes mellitus (GDM) **(Davidsen et al., 2022).**

According to the most recent International Diabetes Federation (IDF) studies, GDM affects 14% of pregnancies worldwide, giving birth to over 18 million infants each year. The first screening procedure included a glucose challenge test with 50 g of glucose. The American Diabetes Association (ADDA) standards recommend doing a 3-hour oral glucose tolerance test (OGTT) with 100g of glucose if the one-hour blood glucose level is greater than 140 mg/dl **(Brown et al., 2022).**

The aim of the current work was to measure the frequency of GDM and identify probable risk factors for gestational diabetes among the pregnant females attending the Qena University Hospital**.**

## Patients and method

The Department of Obstetrics and Gynecology at Qena University Hospital served as the site of our cross-sectional study. To get the right sample size for prevalence research, apply the simple equation below:

$$n = \frac{z^2\, p(1-p)}{d^2}$$

where n: sample size, Z: standard normal variant (at 5% type 1 error ($P < 0.05$), it is 1.96, P (expected population percentage based on previous research or pilot studies) = 10%, d (absolute error or precision) =0.05, and the level of confidence is 95%. The result was 168 we raised the sample to 300 pregnant women to get more informative results.

The ethical committee was asked for approval. The study only included pregnant patients at the Qena University Hospital who agreed to take part in it. Women who were not pregnant or who had diabetes before becoming pregnant were not included.

All patients had standard clinical examinations and a thorough history collection. When compared to the "one-step" method, the "2-step" method for assessing DM was chosen because it is more practical and does not require all patients to be fasting for the test. Initial screening was done using a glucose challenge test with fifty grams of glucose; if the 1-hour blood glucose level exceeded 140 mg/dl, then a 3-hour oral glucose tolerance test (OGTT) with one hundred grams of glucose was performed, and diagnosis was established.

The study was approved by the ethical committee of the Qena Faculty of Medicine in October 2021. The ethical approval code is SVU-MED-COM009-1-21-10-257.

## Statistical analysis

Data was collected, categorized, and statistically analyzed using Version 26 of the Statistical Package for Social Sciences

(SPSS) program. Categorical variables were compared using the chi-square test and reported as frequencies and percentages. Means and standard deviations (SD) were used to display quantitative measurements, and Student t tests were used to compare them. It was decided to undertake a regression analysis between several variables. Significant findings at P< 0.05.

**Results**

The study included three hundred pregnant women, their average ages ranged from 15 to 49 years, with the mean age being 28.30 ± 6.152 years. Gestational diabetes mellitus was present in 13.3% of women. Of them, 50.6% were between the ages of 20 and 35, and 65.3% came from rural regions. 34.7% of the women who were studied had completed only elementary or middle school. In (**Table.1**), the association between gestational diabetes mellitus and demographic characteristics is displayed.

**Table 1. Impact of socio-demographic features on GDM among pregnant women**

| Characters | | GDM (N=40) | No GDM (N=260) | P value |
|---|---|---|---|---|
| | Total | Number (%) | Number (%) | |
| **Age groups** | | | | |
| 15-19 | 19 | 0 (0%) | 19 (100%) | **<0.001*** |
| 20-24 | 72 | 1 (1.38%) | 71 (98.6%) | |
| 25-29 | 79 | 5 (6.33%) | 74 (93.7%) | |
| 30-34 | 73 | 10 (13.69%) | 63 (86.3%) | |
| 35-39 | 45 | 18 (40%) | 27 (60%) | |
| 40-44 | 9 | 6 (66.07%) | 3 (33.3%) | |
| 45-49 | 3 | 0 (0%) | 3 (100%) | |
| **Mother's education** | | | | |
| Below secondary | 104 | 13 (12.5%) | 91 (87.5%) | **0.757** |
| Secondary and above | 196 | 27(13.8%) | 169 (86.2%) | |
| **Mother's occupation** | | | | |
| Housewife | 249 | 25(10%) | 224(90%) | **<0.001*** |
| Employee | 51 | 15(29.4%) | 36(70.6%) | |

* Chi-square test

**(Fig.1)** displays the prevalence of GDM according to age group. The BMI of the studied female participants was 26.3061±4.6976 on average. Female participants in the research ranged in weight from healthy weight (33.7%) to overweight (51.3%) to obese (15%). In terms of a family history of GDM, diabetes mellitus, and hypertension, (91%) of the women in the study had a family history of each, as did (65,7%) of the women in the study. Among the studied women, 74.7% had positive consanguinity. The impact of clinical parameters on GDM was demonstrated in **(Table.2)**, where there was a statistically significant difference between women with GDM and those without regarding history of GDM, a family history of DM, (P < 0.001) for each. The distribution of gestational diabetes mellitus concerning body mass index was demonstrated in **(Fig.2).**

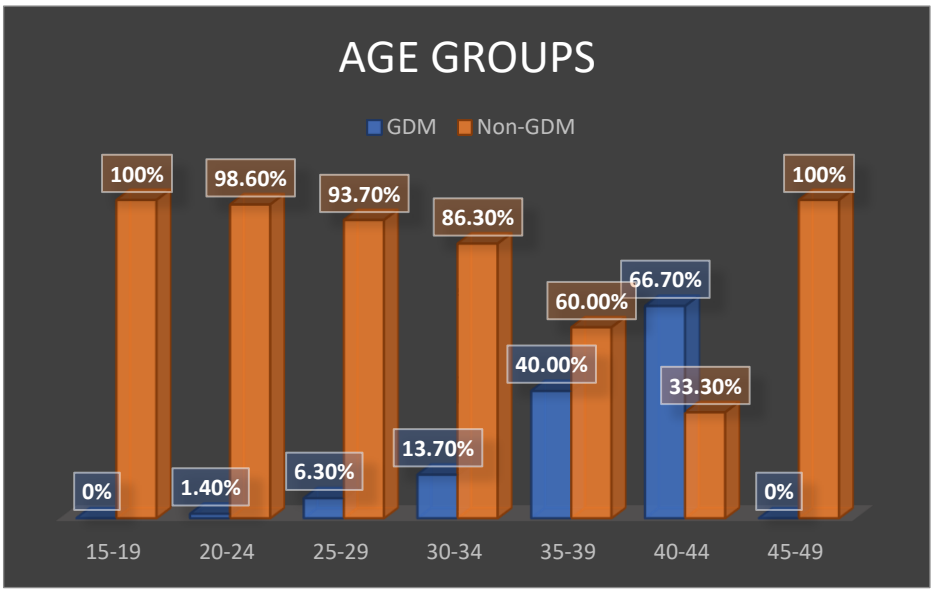


**Fig.1. GDM distribution among women concerning age group**

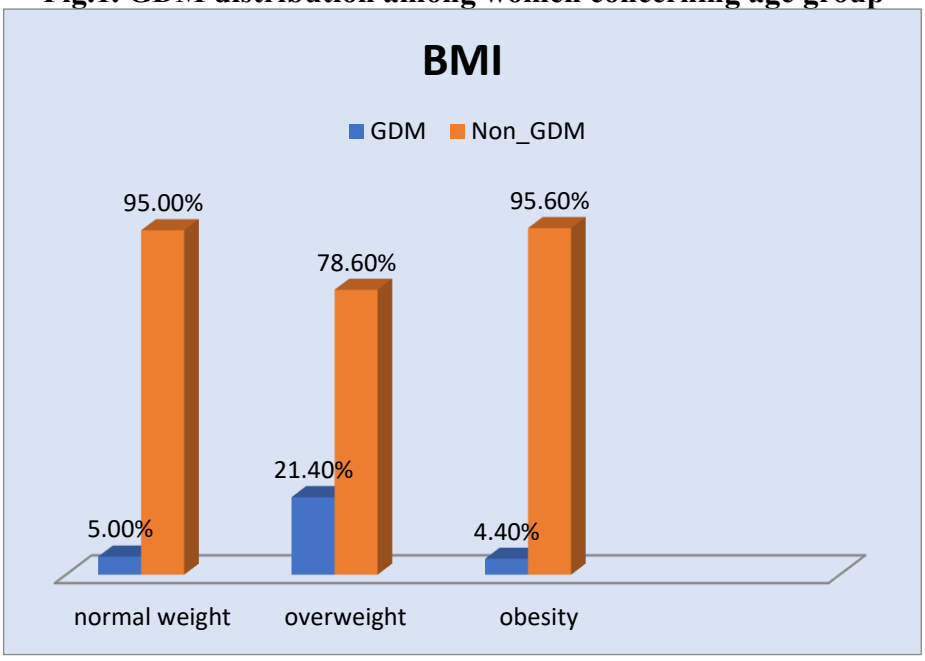


**Fig.2. GDM distribution among women concerning BMI**

**Table 2. Impact of clinical features on GDM and among pregnant women.**

| **Characters** | | **GDM (N=40)** | **No GDM (N=260)** | **P value** |
|---|---|---|---|---|
| | Total | Number (%) | Number (%) | |
| **BMI** | | | | |
| Normal | 101 | 5 (5%) | 96 (95%) | **<0.001*** |
| Overweight | 154 | 33 (21.4%) | 121 (78.6%) | |
| Obese | 45 | 2 (4.4%) | 43 (95.6%) | |
| **Family history of GDM** | | | | |
| Yes | 27 | 16 (59.3%) | 11(40.7%) | **<0.001*** |
| No | 273 | 24 (8.8%) | 249(91.2%) | |
| **Family history of DM** | | | | |
| Yes | 103 | 34 (33%) | 69(69%) | **<0.001*** |

| | | | | |
|---|---|---|---|---|
| No | 197 | 6(3%) | 191(97%) | |
| **Family history of hypertension** | | | | |
| Yes | 100 | 25(25%) | 75(75%) | **<0.001*** |
| No | 200 | 15(7.5%) | 185(92.5%) | |
| **Consanguinity** | | | | |
| Yes | 76 | 16(21.1%) | 60(78.9%) | **0.022*** |
| No | 224 | 24(10.7%) | 200(89.3%) | |

*Chi-square test.

Concerning the obstetric parameters of the studied cases, (43.33%) of the pregnant females were between 24 and 28 weeks of pregnancy, (56.67%) were > 28 weeks, (42.67%) were primigravida and (57.33%) were multigravida, (83.67%) had singleton pregnancy while (16.33%) had multiple gestation, and (13.67%) had prior gestational diabetes. The impact of obstetric parameters on GDM was demonstrated in **(Table.3)**, where there is a statistically significant difference between women with GDM and those without prior GDM, gravidity, and antenatal visits (P <0.001).

**Table 3. Impact of obstetric features on GDM among pregnant women.**

| **Parameters** | | **GDM(N=40)** | **Non-GDM (N=260)** | **P value** |
|---|---|---|---|---|
| | Total | Number (%) | Number (%) | |
| **Gestational age** | | | | |
| 24-28weeks | 130 | 21 (16.2%) | 109 (83.3%) | **0.209** |
| >28weeks | 170 | 19 (11.2%) | 151 (88.8%) | |
| **Gravidity** | | | | |
| Primigravida | 128 | 0 (0%) | 128(100%) | **<0.001*** |
| Multigravida | 172 | 40 (19.1%) | 132 (76.7%) | |
| **Gestation** | | | | |
| Single | 251 | 27 (10.8%) | 224(89.2%) | **0.003*** |
| Multiple | 49 | 13(26.5%) | 36(73.5%) | |
| **Prior GDM** | | | | |
| Yes | 41 | 33 (80.5%) | 8 (19.5%) | **<0.001*** |
| No | 259 | 7 (2.7%) | 252 (97.3%) | |
| **Macrosomic infant** | | | | |
| Yes | 25 | 12(48%) | 16 (52%) | **<0.001*** |
| No | 275 | 28(10.2%) | 247(89.8%) | |
| **Still birth** | | | | |
| Yes | 23 | 11(47.8%) | 12 (52.2%) | **<0.001*** |
| No | 277 | 29 (10.5%) | 248(89.5%) | |
| **Repeated abortion** | | | | |
| Absent | 211 | 11(20.4%) | 43(79.6%) | **0.001*** |
| Present | 89 | 21(23.6%) | 68(76.4%) | |
| **Antenatal visits** | | | | |
| Regular | 161 | 13 (8.1%) | 148 (91.9%) | **< 0.001** |
| Irregular | 139 | 47 (33.8%) | 92 (66.2%) | |

*Chi square test.

**(Table.4)** shows that eleven factors contribute to the occurrence of GDM among pregnant women, the most contributory factors were prior GDM, Family history of DM, Family history of GDM, overweight, unexplained infant death (stillbirth), History of macrosomia, History of PCO, Family history of Hypertension, mother's age >35 years, and history of repeated abortion (P <0.001), and the least contributing risk factor was number of fetus ( P= 0.004).**Table 4. Multivariable Logistic regression analysis for risk factors of GDM.**

| Variable | Odds ratio OR | 95% CI | | P Value |
|---|---|---|---|---|
| | | Lower | Upper | |
| History of GDM | 29.780 | 14.122 | 62.800 | **<0.001** |
| Family history of DM | 10.383 | 4.705 | 24.968 | **<0.001** |
| Family history of GDM | 6.691 | 4.081 | 10.696 | **<0.001** |
| BMI (overweight) | 5.236 | 1.969 | 13.924 | **<0.001** |
| Still birth | 4.568 | 2.640 | 7.906 | **<0.001** |
| History of macrosomia | 4.174 | 2.752 | 8.75 | **<0.001** |
| History of PCO | 3.733 | 2.088 | 7.673 | **<0.001** |
| Family history of HTN | 3.680 | 2.036 | 6.652 | **<0.001** |
| Repeated abortion | 2.620 | 1.483 | 4.629 | **< 0.001** |
| Mother's age>35 | 1.671 | 1.326 | 2.107 | **<0.001** |
| Number of fetuses | 1.215 | 1.021 | 1.445 | **0.004** |

**Discussion**

High blood sugar (glucose) is a symptom of gestational diabetes mellitus (GDM), which often disappears after childbirth. It can occur at any time of pregnancy, but the second or third trimesters are when it happens most frequently **(Komilovna, 2022).**

According to our study's demographic information, a total of 300 pregnant women between the ages of fifteen and forty-nine years who were of reproductive age were included. Their mean age was 28.30 ±6.174 years, and they were mostly between the ages of 20 and 35, with 65.3% of them from rural regions. Only 17% of pregnant women worked, and 83 percent of them were housewives.34.7% have completed less than a high school degree. In terms of age and profession, diabetic and non-diabetic women differed significantly from one another**.** In comparison to women who were not diabetic, diabetic women were older and employed. Women with GDM were defined as being older than 25 years old, residing in cities, working, and being educated by Oppong et al. In their study, patients with GDM were an average age of 32, more than one third had a university education, and the majority lived in metropolitan areas and held jobs. The higher number of overweight and obese women in their study's general sample as well as among those who got GDM may be explained by the high percentage of urban residents in it **(Oppong et al., 2015).**

Although maternal age is a known risk factor for GDM, there is disagreement over how age affects the likelihood of GDM developing. The American Diabetes Association (ADA) advised using a low cutoff of 25 years or younger for screening for GDM **(Lee et al., 2018).**

Based on our findings, 272 (90.7%) of the women in the study had previously

experienced gestational diabetes mellitus. The prevalence of GDM was 13.3% among pregnant patients at the Qena University Hospital. 213 (71%) of the women in the study had never undergone an abortion, whereas 87 (29%) had had many abortions. 46.3% of pregnant women visit their doctor seldom. GDM was present in the current pregnancy in 80.5% of pregnant women with prior GDM. Preeclampsia affected 20.4% of pregnant GDM patients. Additionally, 11.7% of pregnant women with regular prenatal visits developed GDM, compared to 16.3% of those with infrequent visits**.** In Accra, Ghana, pregnant women had a 9.3% prevalence of GDM, according to research by Oppong et al. Due to the high prevalence of GDM, it is important to screen all pregnant women for the condition, especially overweight or obese, if possible using the single two-hour 75-gram OGTT **(Oppong et al., 2015).**

In our study, there were two stages to the oral glucose tolerance test (OGTT). All 300 pregnant women enrolled in the research had a one-hour OGTT as the first stage, and 63 (21%) of them had favorable results. Only 63 pregnant women underwent the second phase (3-hour OGTT), and 40 (63.5%) of them had good results. According to **Mwanri et al.,** the combined prevalence of GDM was 11.5%. The frequency of GDM in Asia is higher than that of European nations (5.4%) but lower than that of African nations (14.0%) **(Mwanri et al., 2015).** This may be due to maternal age and BMI disparities, as well as ethnic background **(Yuen, 2015).**

For instance, at the same age, South Asians are more likely than White Europeans and Black Africans to develop GDM. Similarly, South Asian women who had GDM were older and more obese. Because of this, a high frequency of GDM in Asia is linked to advancing age, high BMI, and racial group. Additionally, Asians may be genetically predisposed to developing insulin resistance at a higher rate than Caucasians **(Kodama et al., 2018).**

**Cho et al.** showed that the frequency of GDM in Asia and Africa is more than that in Europe. These findings agree with the frequency of T2DM and GDM seen in Africa and Asia in comparison to Europe **(Cho et al., 2018).**

At the Qena University Hospital, there were 11 risk factors linked to the development of gestational diabetes mellitus (GDM). The risk factors with the highest contribution to GDM were history of GDM, family history of DM, stillbirth, history of macrosomia (weight >= 4 kg), history of PCO, family history of Hypertension, repeated abortion, mothers age >35 years, number of fetus twins, and BMI. Similarly, Oppong et al.'s sample revealed that obese women had nearly three times the odds of GDM as women with a BMI in the normal range. In addition, compared to participants with normal BMI, overweight women had a 20% greater risk of developing GDM **(Oppong et al., 2015).** Also**,** Sweeting et al. showed that the etiology of GDM involves insulin insensitivity as a prominent role, and that seems to be increased in overweight and obese pregnant women compared to their normal-weight counterparts **(Sweeting et al., 2022).**

The family history of DM and family history of GDM showed a moderate positive correlation with GDM in this pregnancy and showed a strong positive correlation between prior history of GDM and current GDM in this pregnancy. There is a weak positive correlation between history of PCO, a family history of hypertension, gravidity, history of macrosomia, and GDM. The number of fetuses, BMI, history of congenital abnormalities, smoking exposure, consanguinity, and GDM are not significantly correlated with each other in the present pregnancy. The care review

examined the risk factors for GDM. Most recommendations, including those of the ADA in 2016, urge universal screening for GDM in the second trimester **(Care, 2019).**

With our data, it was confirmed that the risk factors defined by NICE and ADIPS are associated with an increased risk of GDM. The strongest independent predictor was a history of GDM, and erhnicity with high prevalence of diabetes. **(The Guideline Development Group).**

According to Alfadhli et al.'s study, those who have a history of prior GDM are 3.5 times more likely to get GDM than people who don't. When compared to those without a history of congenital malformations, individuals with a history do so at a rate of 4.3 times more likely to develop GDM **(Alfadhli et al., 2015).**

**Conclusion**

Early detection and diagnosis of GDM in pregnancy are crucial especially in those with risk factors.We recommend considering the early screening of GDM as a golden target and paying attention to this fact while outlining the lines of the recent guidelines for the management of GDM. In addition, further studies must be done to analyze the possible risk factors and treatment strategies for GDM.

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