

Assessment of Gestational Diabetes Mellitus Knowledge, Attitudes, and Practices Among Jordanian Women: A Cross-Sectional Study

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ABSTRACT

Gestational Diabetes Mellitus (GDM) is a metabolic condition associated with high blood glucose levels during pregnancy, especially during the third trimester. This cross-sectional study aimed to assess the knowledge, practice, and attitudes of Jordanian females regarding GDM and evaluate the effect of different demographic factors and relevant characteristics of participating females on the level of their knowledge, practice and attitudes. This cross-sectional study enrolled Jordanian females between May and June of 2024. A questionnaire was designed that included four sections, including demographic/clinical information, knowledge, attitude, and practice. The participants demonstrated an overall moderate level of knowledge and good attitude and practice regarding GDM. Additionally, the results revealed a statistically significant Correlation between the stage of pregnancy, monthly income, and knowledge score. Also, a statistically significant association was found between marital status and attitude score. In addition, a statistically significant association was found between the number of visits to the maternity and childhood center during pregnancy and practice score. The results provide valuable insights about the knowledge, attitudes, and practices of women with GDM in Jordan regarding GDM and other related aspects. The findings of this study may contribute to the advancement of developing optimal programs that facilitate self-management of GDM among Jordanian women

Keywords: *Assessment, knowledge, Practice, Attitude, GDM, Jordan*

INTRODUCTION

Gestational Diabetes mellitus (GDM) is considered one of the subtypes of Diabetes mellitus (DM)¹. It is a metabolic condition associated with high blood glucose levels during pregnancy, chiefly during the third trimester^{2,3}. Currently, GDM is regarded as one of the most Prevalent complications during pregnancy⁴.

There are several determinants Coupled with an increased risk of the Onset of gestational diabetes during pregnancy, including maternal obesity, family history, maternal age more than 25 years, history of GDM in Prior pregnancy, Polycystic ovarian syndrome (PCOS), and Impaired Glucose Tolerance or Prediabetes^{5,6}.

The main step in the management of GDM is the maintenance of a normoglycemia state during pregnancy by changing the diet, increasing physical activity, and controlling weight gain during pregnancy^{7,8}. However, some pregnant females will also need drug treatment^{9,10}. The treatment of GDM includes insulin and oral hypoglycemic agents, such as glyburide and metformin¹¹.

GDM, if Poorly managed, have been founded to have temporary and Persistent complications on the mother and the her fetus¹². The maternal complications include preeclampsia (PE), cesarean section, and polyhydramnios in the short term, and the progression of diabetes mellitus after pregnancy in the long term¹³. The fetal and neonatal complications include congenital malformation, neonatal

death, stillbirth, macrosomia, obstetric trauma, shoulder dystocia, and neonatal hypoglycemia¹⁴.

Early detection and appropriate treatment can help reduce complications of gestational diabetes¹⁵. Consequently, Proper Females' knowledge about GDM and other related aspects plays a key role in the prevention of complications and good outcomes¹⁶.

No Earlier studies have been Undertaken in Jordan to assess females' knowledge, attitude, and practice (KAP) regarding gestational diabetes and its complications. Assessing the KAP related to GDM among Jordanian females would be conducive to present optimized strategies to reduce the risk of GDM and manage it and reduce its Adverse outcomes.

The aims of the present study were to assess the knowledge, practice, and attitudes of Jordanian females regarding GDM definition and other related aspects, including complications and management. Other purposes were to Examine the Impact of different demographic factors and pertinent characteristics of participating females on the level of their knowledge, practice and attitudes.

METHOD

Study design and setting: A survey-based, cross-sectional study of Jordanian females was carried out using an online questionnaire between May and June of 2025. All details about the study were succinctly described to the suitable female participants, and they were

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Knowledgeable that their participation was voluntary. They informed that their participation will be anonymous and it will not be accessible to anyone. Before responding, females were asked for their consent to participate. The Strengthening of Reporting of Observational Studies in Epidemiology (STROBE) reporting guidelines for reporting cross-sectional studies were employed to develop and report this study¹⁷.

Survey development: The survey questions were designed by the research team after reviewing relevant literature and based on international standards relating to gestational diabetes mellitus, and they were validated^{10,18,19}. The survey questions were reviewed by five university academic physicians and five clinicians to ensure the validity and appropriateness of the scale items. Their comments and suggestions have been carefully considered. A comprehensive literature review was performed to ensure that all pertinent standards were taken into consideration while determining content validity. The questionnaire was created by reviewing relevant research from Google Scholar, PubMed/Medline, and Science Direct. The scale was then applied to 25 females. Their data were excluded from the final study because they were collected for the pilot study. The survey questions were designed and administered in Arabic language, as Arabic is the official language of females in Jordan, using Google Forms. The validation choices "Required" and "Limit to one response" were used to reduce the number of missing data instances and avoid duplicate responses. Finally, after completion of questionnaire it was composed of four sections. The first section was designed to collect general demographic data about the participants, such as age, gender, occupation, and level of education. Ten questions in the second section were designed to assess participants' overall knowledge of GDM. These questions were related to the definition, diagnosis, management, treatment, and complications. For each knowledge-based question, a correct answer is awarded one point, while an incorrect answer is awarded zero points. For questions with more than one correct answer, one point is awarded for each correct answer. For successfully completed survey questions, the total score is 25 points. Based on the total score, knowledge levels are divided into three categories: poor knowledge (0-8), intermediate knowledge (9-16), and excellent knowledge (17-25). Ten questions on a 5-point Likert scale were used in the third portion to assess research participants' attitudes regarding GDM. A total attitude score of 0-10 was achievable, with each good attitude earning 1 point; those with a score >5 were considered to have a good attitude. The fourth section included 7 questions to assess the practice of study participants regarding GDM using a 5-point Likert scale. Each positive practice received 1 point, with a total possible practice score of 0-7; participants with a score >3 were considered to have a good practice.

Ethical Consideration: Ethical approval was obtained on May 11, 2025 for this study from Institutional Review Board of Balqa Applied University and the research number was (2025/2024/8/104). We make sure that all women's who were participated in this study signed informed consent prior their enrollment.

Statistical Data Analysis: The Statistical Package for Social Sciences (SPSS, version 25.0) software was used to analyze the data. Descriptive statistics, including frequencies and percentages, were conducted for all sociodemographic information and knowledge items. Multiple linear regression analysis was conducted to evaluate the association between sociodemographic characteristics and knowledge scores, Attitude, and practice with a 95% confidence interval. The total score

for each knowledge item was considered the outcome variable. A P-value < 0.05 was interpreted as statistically significant.

RESULTS

Sociodemographic characteristics of the participants

Table 1 shows the Sociodemographic characteristics of the 488 Jordanian females who participated in this study. More than half of the participants were 18-29 years old (282, 57.8%). Nearly half of the participants (246, 50.4%) live in urban areas and have a monthly income of 500 JD or more (249, 51.0%). The level of educational diversity was presented, with 205 (42.0%) holding a Diploma and 162 (33.2%) holding a bachelor's degree. Regarding employment status, 221 (45.3%) were unemployed or housewives. Regarding participants' history of GDM, 42.5% do not have a history of GDM, and only 10.2% have a history of GDM. The largest share of participants did not have a family history of GDM (395, 80.9%).

When asked about their marital status, about half of the participants were married (255, 52.3%). Regarding the number of previous pregnancies, about one quarter of females have three or more previous pregnancies (129, 26.4%). About 18% of females have more than 6 visits to the maternity and childhood center during pregnancy.

Participants' knowledge of GDM

Table 2 lists participants' knowledge of the definition, risk factors, signs and symptoms, diagnosis, management, and complications of GDM. The most common source of information about GDM was social media (46.5%), followed by friends or family and health care professionals (42.8%, 41.1%).

Regarding the definition of GDM, the majority of females knew that GDM is characterized by high blood sugar levels (388, 79.5%). When asked about the risk factors of GDM, about two-thirds of females knew that obesity or being overweight and a family history of diabetes mellitus are considered risk factors of gestational DM, respectively 310 (63.5%), 332 (68.0%). Also, a round half of females knew that a history of gestational DM in a previous pregnancy is considered a contributing factor (250, 51.2%).

Regarding the common signs and symptoms, the largest share of participants knew that frequent urination and about two-thirds of participants knew that excessive thirst are common signs and symptoms of GDM, respectively (343, 70.2%, 306, 62.7%). About 36% of females knew that the oral glucose tolerance test (OGTT) is the most common test to diagnose GDM.

With regard to management of GDM, almost 72% of participants knew that they followed a healthy diet and exercise regularly, followed by administering medications (insulin injections, tablets, and capsules), 60.4%. When asked about short-term complications of GDM for the mother, almost (57.5%) considered increased risk of miscarriage or premature birth, followed by pre-eclampsia (56.1%) were one of these complications.

With regards to the scores of completed questionnaires related to GDM knowledge, the results showed that the mean score for participants was 12.7 ± 6.83 out of 25 points. About 39% of females had moderate knowledge regarding GDM.

Attitude score

The average attitude score was 7.74 ± 2.11 (possible range, 0-10 points), indicating that the surveyed females had a good attitude toward GDM. Table 3 demonstrates the distributions of the responses to the ten questions in the attitude dimension. The vast majority of respondents (>85%) strongly agreed or agreed with 7 of the 10 statements in the attitude dimension.

Practice Score

The analysis revealed that the average practice score was 5.95 ± 1.83 (theoretical range, 0-7 points), showing that the participant women had a good practice toward GDM. Table 4 demonstrates the distributions of the responses to the seven questions in the practice section.

Association between participants' sociodemographic characteristics and knowledge score, Attitude score, and Practice score

Multivariable logistic regression analyses were performed to identify variables associated with the knowledge score, attitude score, and practice score (Table 5). The multiple linear regression model showed that a statistically significant association was found between stage of pregnancy, monthly income, with knowledge score. Also, a statistically significant association was found between marital status and attitude score. In addition, a statistically significant association was found between the number of visits to the maternity and childhood center during pregnancy with practice score.

Table 1. Sociodemographic characteristics (n=488)

Variable	Category	Frequency (n)	Percentage (%)
Age (years)	18-29	282	57.8
	30-39	95	19.5
	40-49	93	19.1
	More than 50	18	3.7
Region	South	202	41.4
	Central	147	30.1
	North	139	28.5
Type of Area	Rural	242	49.6
	Urban	246	50.4
Monthly Income	Less than JD 500	239	49
	JD 500 or more	249	51
Level of Education	Illiterate	5	1.1
	Primary	7	1.4
	Secondary	69	14.1
	Diploma	205	42.0
	Bachelor	162	33.2
	Higher Education	40	8.2
Employment status	Unemployed/ Housewife	221	45.3
	Employed in the medical field	126	25.8
	Employed in other fields	141	28.9
Participants' History of gestational diabetes (GDM)	No	205	42.0
	Yes	50	10.2
	Not married	233	47.7
Family history of gestational diabetes	No	395	80.9
	Yes	93	19.1
Are you currently married?	No	233	47.7
	Yes	255	52.3
Number of previous pregnancies (Completed or not)	Never	16	3.3
	Once	51	10.5
	Twice	59	12.1
	Three or More	129	26.4
	Not married	233	47.7
	Never	52	10.7
Number of visits to the Maternity and Childhood Center during pregnancy	1-2 times	40	8.2
	2-4 times	40	8.2
	4-6 times	37	7.6
	> 6 times	86	17.6
	Not married	233	47.7
Stage of pregnancy (if pregnant)	Not Pregnant	138	28.3
	1 st trimester	74	15.2
	2 nd trimester	30	6.1
	3 rd trimester	13	2.7
	Not married	233	47.7

Table 2. Knowledge of participants regarding gestational DM (n=488)

Item No.	Question	Frequency (n)	Percentage (%)
1	What is your main source of information about gestational diabetes?		
	Healthcare professionals	201	41.1
	Friends or family	209	42.8
	Social media	227	46.5
	Books or bicycles, or magazines	46	9.4
2	Is gestational diabetes a condition characterized by high blood sugar levels?		
	Yes	388	79.5
	No	20	4.1
	Don't Know	80	16.4
3	What factors do you think contribute to an increased risk of gestational diabetes?		
	Advanced maternal age	191	39.1
	Obesity or being overweight	310	63.5
	Family history of diabetes mellitus	332	68
	A history of prediabetes	150	30.7
	A history of gestational diabetes in a previous pregnancy	250	51.2
	Having polycystic ovary syndrome (PCOS)	137	28
	I don't know	66	13.5
4	What are the common signs and symptoms of GDM?		
	Frequent urination	343	70.2
	excessive thirst	306	62.7
	There are no clear symptoms in some cases	143	29.3
	I don't know	83	17
5	What is the most common test to diagnose gestational diabetes?		
	Random blood glucose test	35	7.1
	Glycated Hemoglobin (HbA1c) test	176	36
	Oral Glucose Tolerance Test (OGTT)	174	35.6
	I don't know	103	21.1
6	When is GDM screening usually done?		
	first trimester (0-12 weeks)	51	10.4
	second trimester (13-27 weeks)	207	42.4
	third trimester (28 to 40 weeks)	74	15.1
	I don't know	156	31.9
7	How can gestational diabetes be managed?		
	Administering medications (insulin injections, tablets, and capsules)	295	60.4
	Follow a healthy diet and exercise regularly	349	71.5
	I don't know	81	16.5
8	What are the short-term complications of gestational diabetes for the mother?		
	High blood pressure during pregnancy (pre-eclampsia)	274	56.1
	Increased risk of cesarean section	182	37.2
	Increased risk of miscarriage or premature birth	281	57.5
	I don't know	81	16.5
9	What are the long-term complications of gestational DM for the mother?		
	Type 2 Diabetes	295	60.4
	Obesity and overweight	209	42.8
	Cardiovascular Disease	174	35.6
	Recurrence of gestational diabetes in the future	279	57.1
	I don't know	94	19.2
10	What are the fetal complications of GDM?		
	Macrosomia (big baby)	224	45.9
	Neonatal hypoglycemia	182	37.2
	Premature birth and resulting respiratory problems	250	51.2
	Increased risk of obesity and diabetes in the future	186	38.1
	I don't know	113	23.1

Table 3. Attitude of participants regarding GDM (n=488).

Attitude						
Frequency (n)						
Percentage (%)						
Item No.		Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
1	Pregnant women need more awareness about gestational diabetes and how to manage it.	303 62.1	150 30.7	19 3.9	4 0.8	12 2.5
2	All pregnant women should be tested for gestational diabetes, even if they have no symptoms.	241 49.5	200 41	28 5.7	9 1.8	10 2
3	Eating a healthy diet and exercising before and during pregnancy reduces the risk of gestational diabetes	209 42.8	226 46.3	38 7.8	7 1.4	8 1.6
4	Gestational diabetes can pose a risk to the health of the mother and fetus if it is not well controlled.	240 49.2	205 42	29 5.9	5 1	9 1.8
5	Some traditional or herbal remedies can be an effective alternative to medical treatment for gestational diabetes.	59 12.1	86 17.6	173 35.5	108 22.1	62 12.7
6	Gestational diabetes is not a serious health problem because it disappears spontaneously after delivery without the need for medical follow-up.	42 8.6	83 17	121 24.8	149 30.5	93 19.1
7	Women who develop gestational diabetes are at greater risk of developing type 2 diabetes in the future.	87 17.8	241 49.4	123 25.2	20 4.1	17 3.5
8	Consulting a nutritionist can help women with gestational diabetes control their blood sugar levels.	170 34.8	243 49.8	53 10.9	11 2.3	11 2.3
9	Stress and psychological pressure lead to high blood sugar levels in women with gestational diabetes	165 33.8	252 51.6	54 11.1	7 1.4	10 2
10	Attending awareness workshops or reading reliable resources about gestational diabetes can help improve a woman's ability to manage her condition.	165 33.8	252 51.6	54 11.1	7 1.4	10 2

Table 4. Practice of participants regarding GDM (n=488)

Practice						
Frequency (n)						
Percentage (%)						
Item No.		Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
1	Eating small, frequent meals instead of three large meals helps stabilize blood sugar levels.	128 26.2	229 46.9	101 20.69	17 3.48	13 2.66
2	Regular blood sugar monitoring is essential for women with gestational diabetes.	189 38.7	238 48.77	46 9.43	6 1.22	9 1.84
3	A woman with gestational diabetes should follow a balanced diet that contains specific amounts of carbohydrates, proteins, and vegetables.	190 38.9	249 51	38 7.78	6 1.22	5 1.02
4	It is crucial to limit sugar and starch intake to manage blood sugar levels during pregnancy.	208 42.6	225 46.1	44 9.01	5 1.02	6 1.22
5	Appropriate exercise, such as walking, helps control blood sugar levels in women with gestational diabetes.	180 36.88	225 46.1	65 13.3	12 2.45	6 1.22
6	You should follow your doctor's instructions regarding medications or proper practices during pregnancy.	224 45.9	203 41.59	37 7.58	18 3.68	6 1.22
7	Managing weight throughout pregnancy is essential for minimizing the risk of gestational diabetes and its associated complications.	197 40.36	218 44.67	55 11.27	11 2.25	7 1.43

Table 5. Association between participants' sociodemographic characteristics and knowledge score, Attitude score, and Practice score (n=488).

Variable	Knowledge Score ¹		Attitude score ¹		Practice score ¹	
	Beta	P-value		P-value		P-value
Age (years)	1.136	0.07		0.413		0.683
Are you currently married?	1.35	0.138		<u>0.02</u>		0.206
Number of previous pregnancies (Completed or not)	-1.022	0.11		0.15		0.501
Number of visits to the Maternity and Childhood Center during pregnancy	0.39	0.146		0.35		<u>0.002</u>
Stage of pregnancy (if pregnant)	1.156	<u>0.002</u>		0.088		0.537
Participants' History of gestational diabetes (GDM)	0.121	0.183		0.1		0.167
Family history of gestational diabetes	-1.031	0.149		0.189		0.158
Level of Education	0.934	0.125		0.154		0.214
Employment status	1.211	0.645		0.478		0.976
Region	-0.136	0.08		0.98		0.821
Type of Area	0.298	0.916		0.114		0.311
Monthly Income	0.042	<u>0.006</u>		0.696		0.31

¹ Multiple Linear Regression

DISCUSSION

In the current study, the level of knowledge, attitude, and practice among Jordanian females was assessed. The participants demonstrated an overall moderate level of knowledge and good attitude and practice related to GDM. Additionally, the results revealed a statistically significant association between the stage of pregnancy, monthly income, and knowledge score. Also, a statistically significant relationship was discovered between marital status and attitude score. In addition, a statistically significant association was revealed between the number of visits to the maternity and childhood center during pregnancy and practice score.

The results of this study were coordinate with the results of other published research^{18,20}. In Bangladesh, a study involving 1374 participants was conducted to evaluate the level of knowledge of GDM, 63.1% of respondents showed a moderate level of awareness. (20). In a cross-sectional survey conducted in Nigerian government-accredited medical institutions in 2023, 69% of study participants were aware of gestational diabetes¹⁸.

However, various studies demonstrated contrary results^{21,22}. In 2023, A cross-sectional study was performed out to investigate the knowledge of pregnant women with gestational diabetes which indicates 54% of women had insufficient knowledge, and that the majority of them were unaware of the risks and symptoms of gestational diabetes²¹. Also, In 2024, pregnant women attending the antenatal care clinic at Ibadan University Hospital participated in a cross-sectional survey to assess their awareness of gestational diabetes. The results revealed that the majority of pregnant women in this study had limited knowledge²².

At a local hospital in a coastal region of Kenya, among 354 pregnant women, 46.98% had a good attitude, and 60.17% had good practice²³. Also, a cross-sectional study, carried out at government-approved healthcare facilities in Nigeria in 2023, 65% had a positive attitude, and 79% had desirable GDM practice¹⁸.

However, a cross-sectional study conducted at a local health center in Warri, Nigeria, found that most pregnant women do not recognize that gestational diabetes is a medical disorder that can cause various health problems for both mother and child¹⁹.

In 2022, a cross-sectional descriptive correlational study was conducted involving 197 antenatal women visiting for antenatal care at

the Reproductive Health Center (RHC). The findings indicate 68% of respondents had low knowledge, and 80.2% had a moderate attitude. Practice level towards management of GDM was found to be poor in 59.9% participants and good in only 1% of participants²⁴.

Also, in a related study, a questionnaire was distributed to investigate the relationship between knowledge levels and sociodemographic characteristics. Consistent with the findings of the current study, the results showed that women earning less than 10000 SDG per month had significantly higher levels of knowledge²⁵.

The main contribution of this study is that it addresses the awareness gap related to gestational diabetes among Jordanian women. The broad and varied sample size of individuals is another advantage. The sample is more representative of Jordan's female population and the study's findings are more broadly applicable when women from various regions of the country are recruited. Additionally, this study is unique. In Jordan in particular and in the region in general, as it focuses on multiple dimensions of women's knowledge, attitudes and practices towards GDM.

This study has some limitations that should be considered. It used a cross-sectional design; therefore, causal relationships could not be confirmed. Additionally, our study employed an online-based questionnaire, which introduces a potential source of selection bias.

CONCLUSION

These findings provide important insights into women's knowledge, attitudes, and practices related to gestational diabetes in Jordan, as well as the factors that may contribute to the lack of awareness and knowledge, both in terms of a comprehensive understanding of this health condition and the practices and attitudes associated with it. These findings may help develop plans and strategies that improve the practical and intellectual level of everything related to GDM. Furthermore, improving Jordanian women's awareness of gestational diabetes may contribute to early detection and reduce complications for both mother and fetus.

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