Awareness of gestational diabetes mellitus among females in Jeddah, Saudi Arabia – A cross-sectional study

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ABSTRACT

Aim: This study aimed to assess the awareness about gestational diabetes mellitus (GDM) among married females in Jeddah, Saudi Arabia. Methods: A cross-sectional study was done on all women in reproductive age and an electronic questionnaire was used. Data about participants’ demographics, parity, BMI, pregnancy, family and personal history of chronic diseases, gestational diabetes were collected. Their knowledge about effect of gestational diabetes on mother and on neonatal outcomes and their source of information about GDM were assessed. Results: The mean age of the participants was 37.99 ± 9.44 years and 77.8% of them had poor knowledge about GDM and 6.1% had good knowledge. Multipara women with a university education had a significantly higher mean knowledge level and the most common source of participants’ knowledge about GDM was social media. Conclusion: Females’ knowledge about GDM was significantly low in Jeddah. Health education campaigns and mass media education are urgent to increase their awareness about GDM. Health care practitioners should focus on popularizing GDM and raising awareness of its consequences.

Keywords: Awareness, diabetes, females, gestational, Jeddah, Saudi

Introduction

Gestational diabetes mellitus (GDM) is one of the common complications that affect the health of pregnant women and fetuses making pregnancy a high-risk pregnancy.¹-² GDM is a subtype of diabetes mellitus defined as glucose intolerance with onset or first recognition during pregnancy.³

Studies showed that women who develop GDM have chronic insulin resistance and that GDM can lead to later-life diabetes development.³ According to the International Diabetes Federation (IDF) report, one in seven pregnant women suffer from gestational diabetes.⁴

GDM is associated with high risk of fetal death, macrosomia, preterm birth, preeclampsia, operative delivery and birth injury, delayed lung maturity, respiratory distress syndrome, jaundice, hypoglycemia, hypocalcemia, perinatal mortality,⁵ and raises the chance for mother to develop type 2 diabetes in the future.⁶ The main factors associated with progressive insulin resistance during pregnancy are increasing rates of human placental lactogen, progesterone, prolactin, and cortisol throughout pregnancy.⁷ Moreover, increased body weight and caloric intake can also contribute to the insulin resistance associated with pregnancy and can compensate for the normally increased production of insulin in pregnant women.⁸

Screening for GDM is done between 24 and 28 weeks of pregnancy, however it is done earlier or at the first prenatal visit for women at high risk (women with history of GDM, previous unexplained stillbirth, prior infant with macrosomia or congenital

Access this article online

Quick Response Code:
Website: www.jfmpc.com
DOI: 10.4103/jfmpc.jfmpc_2485_21

How to cite this article: Abualsaud RM, Baghdadi ES, Bukhari AA, Katib HA. Awareness of gestational diabetes mellitus among females in Jeddah, Saudi Arabia – A cross sectional study. J Family Med Prim Care 2022;11:3442-8.
anomaly, history of diabetes in her family, obese, hypertensive, age above or equal to 35 years).\[3\]

Prevalence of GDM differs worldwide in relation to race, ethnicity, age, body composition and by diagnostic and screening criteria.\[7\] A study done in Asia in 2018 recorded that Saudi Arabia is the third highest country with a prevalence of GDM (22.9%).\[8\] Another study done in the Eastern Mediterranean region in 2019 and concluded that between six countries, the prevalence of GDM in Saudi Arabia was 17.6% which is higher 3.6 times than Israel (4.9%).\[9\] A study done in Jeddah, Saudi Arabia published in 2020 found that the prevalence of GDM was 19.6%, which is high compared to other countries.\[10\]

Number of studies were conducted worldwide to assess the level of awareness regarding GDM. A cross-sectional study done in Telangana, Southern India in 2020 discovered that age, number of births to date, diabetes history, knowledge through trimester played a role in difference in knowledge between participants.\[11\] A previous study conducted in Iran in 2019 concluded that there is a good knowledge, performance, and attitude toward GDM.\[12\] A surveillance done in Apia, Samoa, in 2017 indicated that only 58% pregnant women were aware of GDM.\[13\] Another study done in South India in 2013 noticed that 17.5% women had good knowledge, 56.7% had fair knowledge, and 25.8% women had poor knowledge about GDM.\[14\]

Locally, there are several studies done in Saudi Arabia assessing the awareness of GDM. An analytical cross-sectional study done in Al-Khobar in 2020 reported that 36.5% had excellent knowledge, 50.5% had average knowledge, and 13% had poor knowledge.\[15\] A previous study done in Najran in 2019 showed that pregnant women were poorly aware of the effects of GDM on mothers and neonates and that the level of education played a part in improving knowledge.\[16\] Another study done in Dhahran in 2019 found that 64% of the participants had fair knowledge, 17.5% had poor knowledge, and 18.5% had good knowledge about GDM.\[17\] A cross-sectional study done in Saudi Arabia in 2018 considered that most of the 9002 participants were in fair knowledge about GDM.\[18\] Most (54%) of them were aware of risk factors and less aware of diagnosis (15.9%).\[18\]

Despite the steadily increasing prevalence of GDM in Saudi Arabia, there is lack of studies that estimate the awareness level in Jeddah, Saudi Arabia. The aim of this study was to measure Saudi females’ awareness about GDM.

**Subjects and Methods**

Study design and setting: A cross-sectional study was done in Jeddah city, Saudi Arabia, from September to December 2020 among all women living in Jeddah, Saudi Arabia, who are in reproductive age group and who agreed to participate in the study. Unmarried females were excluded.

Sample size: the required sample size was 404 according to Raosoft sample size calculator with the supposition of a 95% confidence level, a 5% accepted margin of error, and a 5% possible non-response. To avoid bias, a sample size of 505 married females were the study participants.

Data collection: a pre-designed self-administered questionnaire was used as an electronic form using Google forms to collect data. The questionnaire was adopted and remodeled after a study conducted in the city of Najran, Saudi Arabia.\[16\] The content of the questionnaire was translated into Arabic and reviewed by doctors specialized in the same field in order to retain the interpretation of the important components of the questionnaire and to better fit the targeted population.

The questionnaire included 33 questions divided into 2 sections. The first section of the questionnaire included items about participants’ characters, parity, BMI, pregnancy and family and personal history of chronic diseases and gestational diabetes. The second section included items to assess participants knowledge about effect of gestational diabetes on mother and neonatal outcomes and their sources of information. In order to prevent the respondents from guessing, the questions included multiple choices with “I don’t know” option. The dependent variable was knowledge of the effects of GDM on mothers and neonates. All demographical, medical, and gestational characteristics were independent variables.

Level of knowledge about GDM was reported as good knowledge if the study participant correctly responded to more than or equal to 75% of knowledge assessment tools, fair if responded to 50%–75% and poor for <50%.

Ethical approval: an ethical approval for the study was obtained from the biomedical ethical committee of King Abdul-Aziz University (Ref: 636-20). Data were stored in a secured data base electronic system with limited access and were only be accessed by the authors. No names or ID numbers were asked to complete the data collection form participants. The consent of participants was obtained and required for the survey to be completed.

Data analysis: Data were analyzed using (SPSS) program version 25, where qualitative data was expressed as frequencies and percentages and Chi-squared test (χ2) was used to determine the relationship between variables. Quantitative data were presented as mean and standard deviation (Mean ± SD) and Kruskal Wallis and Mann-Whitney tests were used for to determine the relations between the non-parametric variables. Spearman’s correlation analysis test was done and a P value of less than 0.05 was considered as statistically significant.

**Results**

[Table 1] shows that the mean age of the participants was 37.99 ± 9.44 years, 88.7% had a Saudi nationality, 65.1% had a university education, 45.9% were employed, and 51.3% had
normal weight with a mean BMI of 22.06 ± 7.06. Of them, 77.8% were multipara, 11.9% were pregnant and most of them were in the second trimester. The most common chronic diseases in family were DM (59%), HT (51.9%), and 9.7% had GDM.

Of the participants’, the most common chronic diseases were hypothyroidism (11.7%), HTN and POS (6.7%) and 6.9% had a history of GDM.

[Table 2] shows that 29.3%, 58%, 60.4%, and 61% knew that GDM increases the risk of instrumental delivery, elective CS, preterm delivery, and polyhydramnios, respectively. Of them, 19.6%, 27.5%, 23.6%, and 17.4% knew that GDM can cause oligohydramnios, induction of labor, PPH, and rupture of membranes, respectively. About one quarter (25.7%) of the participants and 49.1% knew that GDM can cause placental abruption and preeclampsia, respectively.

[Table 3] shows that 18.2%, 60.4%, 53.5%, and 22% knew that GDM can cause LBW, HBW, NICU admission >24 hrs, and hypoglycemia at birth, respectively. Of them, 22.4%, 16.2%, 11.3%, and 21.6% knew that GDM can cause hyperbilirubinemia, shoulder dystocia, breech delivery, and stillbirth, respectively. Only 21.6% and 19.8% knew that GDM can cause neonatal death and congenital neonatal anomalies, respectively.

About one third (32.9%) of the participants reported that they had no idea about gestational diabetes and 2.45% had no interest to know. [Figure 1] illustrated that the most common sources of participants’ knowledge about GDM were social media (30.5%) and family/friends (25.7%).

[Table 4] demonstrated that participants of Saudi nationality, who had university educational level and who were multipara had a significant higher mean knowledge score (p=< 0.05). On the other hand, a non-significant relationship was found between other participants’ characters, BMI or pregnancy (p => 0.05).

The mean knowledge score for those who had a family history of GDM and those who had not were 9.24 ± 5.07 and 6.62 ± 4.76, respectively. And the mean knowledge score of participants how had GDM, before and those who had not were 10.74 ± 4.99 and 6.59 ± 4.72, respectively.

[Figure 2] shows that the prevalence of poor, fair, and good knowledge about Gestational diabetes among the participants was 77.8%, 16%, and 6.1%, respectively. [Figure 3] illustrated
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participants who had a family and personal history of GDM had a significant higher mean knowledge score \( (p = \leq 0.05) \). On the other hand, a non-significant positive correlation was found between participants’ knowledge scores and their age \( (r = 0.01, P \text{ value} = 0.777) \) [Figure 4].

Discussion

GDM is a significant health issue because of its large prevalence and its serious complications. An important observation of previous studies was that Saudi women had a very high prevalence of GDM.\([10,19,20]\) The increasing incidence of obesity, the high prevalence of type 2 diabetes, and Saudi women's custom of conceiving at an older age all seem to be factors in the high prevalence of GDM in Saudi women.\([10]\)

This study aimed to assess female's knowledge about GDM in Jeddah, Saudi Arabia. In this cross-sectional study, a total of 505 married women were included in this study. Our study examined the knowledge of 505 married females about GDM. Only 6.1% of individuals had an excellent awareness of GDM, while 16% had fair knowledge and the majority (77.8%) had poor knowledge. Our findings are similar to those of Thomas et al., 2020,\([11]\) who found that participants’ awareness of GDM was poor in 93.69% of participants. Other research in Saudi Arabia, on the other hand, revealed fair awareness.\([15-17]\)
As for the level of education, more than half (65.1%) of the participants had a university education level. It was demonstrated that university educational level participants had a higher knowledge score. This finding is consistent with the previous study conducted by Amina Abdo Salhi, which showed that the level of education played a role in improving knowledge.[14]

Another study reported a relatively significant relationship between respondents’ GDM knowledge and their educational level. This means that the respondent's understanding of GDM improves as their academic level increases.[21]

Moreover, our study showed that participants who were multipara had a significantly higher mean knowledge score. This might be explained by the reason that multiparous women had a background from their previous experience. In comparison, a study conducted in a primary health center in South India found that 17.5% had an excellent understanding of GDM, 56.7% had fair knowledge, and 25.8% had a poor understanding. The study concluded that women's level of knowledge regarding GDM was not shown to be significantly related to their age, education, or parity.[14]

Also, there was an inverse relationship between respondents’ understanding of GDM and parity in a previous study.[21] This could be a result of illiteracy and poverty, or that multiparous women with several pregnancies and perhaps children have a limited understanding of GDM.[21] This variation could be due to the lack of GDM assessment, especially among multiparous women.

In this study, we tried to highlight the sources of knowledge about GDM, and the most common sources of participants’ knowledge about GDM were social media (30.5%) and family/friends (25.7%), which is an interesting finding in our study. These findings agreed with a previous study published in 2020 in Telangana, India, which showed that knowledge was mainly obtained through electronic and written media among 69.7% of antenatal women included in the study.[11] This may be because social media is one of the most efficient and effective ways of receiving and disseminating information in Saudi Arabia.[22]

Further, it is essential to note that social media platforms in Saudi Arabia, particularly WhatsApp, are utilized for more than just family and friend contact.[23] In addition, social media has influenced how people make decisions about a variety of health issues.[24]

Moreover, obtaining information from family/friends and considering it a key source of awareness was similar to the results of other studies.[13,17,28] For example, in a survey conducted by Loretta L. Pecchioni, et al.,[29] nearly half (47.6%) of the respondents stated that they resorted to family members and friends who had some health-related knowledge like doctors, nurses, pharmacists, or other hospital employees. Some of these people, on the other hand, were not healthcare workers but rather people who had personal experience with a similar disease. Studies have shown that insufficient knowledge about

### Table 4: Relationship between participants’ mean knowledge scores about GD and their characters, parity, BMI, pregnancy

| Variable                        | Knowledge score (mean SD) | Test | P       |
|---------------------------------|---------------------------|------|---------|
| Nationality                     |                           |      |         |
| Saudi                           | 7.08±4.95                 | 2.43 | 0.015   |
| Non-Saudi                       | 5.29±3.63                 |      |         |
| Education level (last certificate obtained) |                     |      |         |
| Illiterate                      | 3                         |      |         |
| Elementary School               | 2.66±2.3                  | 5    | 0.023   |
| Middle School                   | 10±7.77                   |      |         |
| Secondary School                | 7.18±4.69                 |      |         |
| University                      | 6.47±4.63                 |      |         |
| Postgraduate                    | 8.09±5.35                 |      |         |
| Occupation                      |                           |      |         |
| Housewife                       | 6.33±4.53                 | 2    | 0.154   |
| Student                         | 7.16±4.68                 |      |         |
| Employee                        | 7.34±5.14                 |      |         |
| Parity                          |                           |      |         |
| Multipara                       | 7.15±4.88                 | 2    | 0.014   |
| Para 1                          | 6.38±4.38                 |      |         |
| Nulliparous                     | 5.36±4.95                 |      |         |
| BMI categories                  |                           |      |         |
| Underweight                     | 6.92±4.76                 | 3    | 0.21    |
| Normal weight                   | 6.49±4.69                 |      |         |
| Overweight                      | 7.43±4.4                  |      |         |
| Obese                           | 8.77±7.24                 |      |         |
| Are you pregnant?              |                           |      |         |
| No                              | 6.73±5.08                 | 0.63 | 0.528   |
| Yes                             | 6.90±4.82                 |      |         |
| If you answered the previous question yes, in which trimester of your pregnancy are you? | | | |
| First trimester (first to third month) | 5.2±4.21                  |      |         |
| Second trimester (fourth to sixth month) | 6.57±4.39                 | 2    | 0.420   |
| Third trimester (seventh to ninth month) | 8.35±6.49                 |      |         |

Figure 4: Spearman’s correlation analysis between participants’ knowledge scores and their age N.B. (r = 0.01, P value = 0.777)
an illness leads to poor awareness of medical information. This leads to a lack of compliance with management strategies and, as a result, adverse pregnancy outcomes.\(^{[5]}\)

In our study, healthcare providers (HCP) were not a common source of participants’ knowledge about GDM with a low percent (8.9%). This is consistent with a previous study from Saudi Arabia.\(^{[5]}\) The study concluded that HCP did not play an effective role in the promotion and education of community knowledge of GDM, with 64.8% being aware of GDM and only 14.4% reporting receiving information from healthcare providers.\(^{[5]}\) This could be due to lack of education about GDM received through the HCP. Another explanation might be not visiting the HCP and so not receiving enough information about GDM. 

That lack of knowledge was explained by the lack of promotion of GDM education by Thomas et al., 2020.\(^{[11]}\) Thomas advised raising public knowledge regarding this issue through targeted public awareness campaigns.\(^{[11]}\) In contrast, a study that assessed the sources of participants’ awareness concluded that doctors (37%), family members (24%), and television/radio (22%) were the three most often mentioned sources of this information. Posters, newspapers/magazines, and the internet were less often cited sources.\(^{[8]}\) This draws our attention that healthcare professionals and doctors must be educated since both plays critical roles in raising awareness among pregnant women.\(^{[4]}\)

Recognizing the sources of GDM-related information and knowledge among women will allow healthcare providers to create a clear database to decrease errors by ensuring that the information supplied to the public is in line with the national or local healthcare recommendations.\(^{[7]}\)

The knowledge about GDM and its associated complications on mothers and neonates will result in increasing the awareness of this disease among women. It will contribute to its prevention, reduction in occurrence, and early detection.

**Limitations**

A limitation of our study was that it was limited to a single region in Saudi Arabia. Moreover, women who had a history of GDM were susceptible to recall bias. Regardless of the limitations, identifying the information sources that allowed women to increase the knowledge and awareness was a strength of our study.

**Conclusion**

This study revealed that studied females had a lack of knowledge regarding GDM as 77.8% of women had poor knowledge. A significant association was found between university educational level, multiparity, family, or personal history and the higher level of knowledge. Social media and family/friends were the most popular sources of participants’ awareness of GDM, HCPs had a lower percentage as a source of participants’ knowledge and one-third of the respondents reported that they have no idea about gestational diabetes. There is a need to raise the Saudi females’ awareness about GDM through mass media campaigns and health education through HCPs. Saudi Ministry of Health should pay more attention to popularize GDM and increase the awareness about its complications.

**Acknowledgments**

The authors gratefully acknowledge the cooperation of all participant females.

**List of abbreviations**

- GDM: Gestational Diabetes Mellitus
- IDF: International Diabetes Federation
- SPSS: Statistical Package for the Social Sciences
- \(\chi^2\): Chi-squared test
- HCP: Health Care Providers

**Financial support and sponsorship**

Nil.

**Conflicts of interest**

There are no conflicts of interest.

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