

Original Article

Gestational diabetes mellitus: Awareness, risk factors, perceived effects, and lifestyle intervention among pregnant women in a Nigerian tertiary health institution

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ABSTRACT

Objectives: To assess the awareness, risk factors, perceived effects, and level of awareness of lifestyle interventions for the prevention of gestational diabetes mellitus (GDM) as well as the association between educational background and the level of awareness of GDM.

Materials and Methods: A cross-sectional survey of 244 antenatal women was carried out using a validated self-administered questionnaire containing five sections with sections A to E bordering on demographics, awareness of GDM, risk factors, perceived effects on pregnancy, and lifestyle interventions towards prevention from May through August 2021. Data were analyzed using descriptive statistics of frequencies, percentages, means, and standard deviation. The chi-square test was used to assess the association between educational background and level of GDM awareness.

Results: Out of 244 respondents who showed awareness of GDM, 212 (86.9%) had an understanding of what GDM is, 212 (86.9%) knew the risk factors, 227 (93.0%) agreed that they knew the effects, 191 (78.3%) knew about lifestyle interventions. Despite the positive responses, disparities exist in their levels of awareness of each alleged variable. There was an association between educational background and level of awareness of GDM with a P-value of 0.0001 (<0.05).

Conclusion: The majority of antenatal women were aware of GDM, risk factors, effects, and lifestyle interventions with diverse degree levels. Less than half were fully aware of the risk factors, and the effects on pregnancy. Regular health/medical professional visits were the most acceptable lifestyle intervention for the prevention of GDM. There was a significant association between education and the level of awareness of GDM. Thus, the government is to enact strong policies that will favor female education as education is a strong determinant of awareness of disease conditions.

Keywords: Awareness, Gestational diabetes, Perceived effects, Risk factors, Lifestyle intervention

INTRODUCTION

In the global arena, where the diabetes pandemic is quickly engulfing developing nations, there is yet another condition gestational diabetes mellitus (GDM) which is gradually increasing and poses a public health threat.^[1-3]

GDM is a form of diabetes mellitus that emerges during pregnancy as a result of glucose intolerance.^[4,5] It is a significant contributor to both maternal morbidity and perinatal morbidity and mortality.^[6,7] The prevalence has increased by 12% annually in high-risk populations over the past 8 years, with Nigeria being no exception.^[8,9] There are a number of known risk factors for GDM in women, including older age, a history of the condition in the

previous pregnancies, a family history of type 2 diabetes, pre-gestational body weight, and obesity.^[3,10] Untreated GDM can increase the risk of perinatal deaths, large-gestational-age fetuses, shoulder dystocia, neonatal hypoglycemia, fetal organomegaly, fetal birth trauma, neonatal respiratory and metabolic complications.^[4,11] There is a higher risk of miscarriage and congenital malformations if maternal hyperglycemia continues during organogenesis, particularly in patients with pre-gestational diabetes.^[12]

To prevent GDM, it is crucial to identify potentially changeable risk factors and to estimate their potential impact on this widespread condition. A lower risk of gestational diabetes has been linked to a number of potentially changeable prenatal factors and modified lifestyle

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Received: 13 August 2022 Accepted: 11 September 2023 EPub Ahead of Print: 27 November 2023 Published: 07 February 2024 DOI: 10.25259/IJMS_200_2022

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changes.^[13] Education has been proven to be a powerful tool for increasing women's awareness and knowledge of specific health conditions related to pregnancies, particularly GDM.^[14,15] In addition, the use of preventive measures is inversely related to the knowledge of harmful effects of GDM, which can only be acquired through a strong educational foundation and exposure to GDM through awareness campaigns, conferences, and workshops.^[3] There has been a paucity of research on antenatal women's awareness of GDM in general, with or without GDM.^[16,17] Therefore, this study was carried out to ascertain the awareness, risk factors, perceived effects, and lifestyle interventions towards the prevention of GDM as well as the correlation between educational background and the level of awareness of GDM among pregnant women.

MATERIALS AND METHODS

A cross-sectional descriptive survey methodology was used in the study. There were 780 study participants. Using the Taro Yamane formula, a sample size of 264 was determined.^[18] The study's inclusion criteria included the subjects' willingness to participate, their availability at the time of the study, and their attendance at University of Nigeria Teaching Hospital (UNTH) antenatal clinic while pregnant. Selecting mothers who met the inclusion criteria was done using a straightforward random sampling technique.

A questionnaire created by the researcher served as the data collection tool. The questionnaire had 16 items which were arranged in five sections. Section A contained six items on demographic data; Section B comprised four items on awareness of GDM; Section C comprised two items on the risk factors of GDM; Section D comprised two items on the perceived effects of GDM on pregnancy; and Section E comprised two items on the lifestyle interventions toward the prevention of GDM. Three experts from the Department of Nursing Sciences, University of Nigeria, Enugu Campus, established the face and content validity. Twenty-six women from medical facilities with similar characteristics to the study facility served as the instrument's pilot test subjects. The data obtained from the pilot testing were analyzed using Cronbach's alpha test which yielded a reliability coefficient of 0.7.

The Institutional Review Board of the University of Nigeria Teaching Hospital in Enugu, Nigeria granted ethical approval for this study (NHREC\05\01\2008B-FWA0002458IRB00002323). Following a thorough explanation of the study's goals and the participant's responsibilities, written informed consent was obtained from the participants. The study was voluntary, and confidentiality and anonymity were maintained throughout. Data collection lasted for 4 weeks. The data analysis utilized descriptive statistics such as means, standard deviations, frequencies, and percentages and was carried out with the help of SPSS

version 21. The relationship between educational background and knowledge of GDM was investigated using Chi-square.

RESULTS

The total number of questionnaires distributed was 264, but only 244 (92.4%) of them were returned. Eight were lost, and 12 were not fully filled. The mean age of the study participants was 27.8 ± 7.5 years. However, the majority of 193 (79.1%) of the participants were married. The majority of the participants 193 (79.1%) were married, 141 (57.8%) had tertiary education, 212 (86.9%) were Christians, 189 (77.4%) were gainfully employed as; civil servants 103 (42.2%), artisans 86 (35.2%), 126 (51.6%) have had 2–3 pregnancies [Table 1].

Majority of the participants, 212 (86.9%) were aware of GDM, and 201 (94.8%) of them agreed that it is a condition characterized by high blood sugar that affects pregnant women. The majority of them, 149 (70.3%), cited medical

Table 1: Sociodemographic characteristics of the participants ($n=244$).

Variables	Frequency	Percentage	95% CI
Age range			
18–23 years	60	24.6	19.19–29.99
24–29 years	102	41.8	35.61–47.99
30–35 years	51	20.9	15.80–26.00
36–41 years	31	12.7	8.53–16.88
Mean±SD		27.8±7.5 years	
Marital status			
Married	193	79.1	74.00–84.20
Single	31	12.7	8.53–16.88
Divorced	3	1.2	–0.15–2.61
Widowed	17	7.0	3.77–10.16
Highest education attained			
Primary	21	8.6	5.09–12.13
Secondary	82	33.6	27.68–39.53
Tertiary	141	57.8	51.59–63.98
Religion			
Christianity	212	86.9	82.65–91.12
Muslim	30	12.3	8.17–16.42
Others (atheists)	2	0.8	–0.31–1.95
Occupation			
Full-time housewife	31	12.7	8.53–16.88
Civil servant	103	42.2	36.02–48.41
Farm work	15	6.1	3.13–9.16
Artisan	86	35.2	29.25–41.24
Others	9	3.8	1.32–6.05
Number of pregnancies			
1	65	26.7	21.09–32.19
2–3	126	51.6	45.37–57.91
4–5	39	16.0	11.39–20.58
Above 5	14	5.7	2.82–8.66

CI: Confidence interval, SD: Standard deviation

professionals as their informational source. Two hundred and nine (85.7%) of the respondents agreed that diabetes can manifest itself for the 1st time while pregnant [Table 2].

The majority of the participants 212 (86.9%) affirmed that they were aware of the risk factors associated with GDM. Only 82 (33.6%) of 244 (100%) participants chose options 7–10 on the questionnaire, indicating that fewer participants were fully aware of the risk factors, while 122 (50%) chose options 4–6, indicating partial awareness [Table 3].

The majority of respondents 227 (93%) confirmed that they were aware of the alleged effects of diabetes on pregnancy. One hundred and eighteen (48.4%) indicated full awareness by choosing 7–10 options on the questionnaire, while 99 (40.6%) chose 4–6 options, indicating partial awareness [Table 4].

The majority of the 191 participants (78.3%) were aware of lifestyle interventions for the prevention of GDM and that

their options were not mutually exclusive. A regular visit to a health/medical professional 121 (63.4%), regular blood sugar testing 105 (55.0%), a good diet plan 101 (52.9%), regular exercise/regular physical activity 81 (42.4%), and education 11 (5.8%) were all listed as lifestyle interventions, respectively [Table 5].

Out of 212 pregnant women who indicated awareness of GDM, half 133 (62.7%) had tertiary education, and out of 32 (13.1%) who indicated not aware, less than a third 8 (25.0%) had tertiary education. The Chi-square test of the association was 50.7 with $P = 0.0001$ (<0.05) which indicated that there was a significant association between educational background and the level of awareness [Table 6].

DISCUSSION

GDM awareness, risk factors, perceived effects, and lifestyle interventions were measured from a group of pregnant women

Table 2: Awareness about GDM ($n=244$).

	Frequency	Percentage	95% CI
Awareness of GDM			
Yes	212	86.9	82.65–91.12
No	32	13.1	8.88–17.35
If yes, what is GDM? ($n=212$)			
A condition of high blood sugar that develops in women during pregnancy	201	94.8	91.83–97.80
A condition of high blood sugar that develops in women before pregnancy	2	0.9	–0.36–2.24
A condition of high blood sugar that develops in women after delivery	5	2.4	0.32–4.40
All of the above	4	1.9	0.06–3.72
None of the above	–	–	–
If yes, what is your source of information about GDM? ($n=212$)			
Health professionals	149	70.3	64.13–76.44
Mass media	3	1.4	–0.17–3.01
Social media	11	5.2	2.20–8.17
Friends/Relatives	49	23.1	17.44–28.79
Are you aware that diabetes can occur for the 1 st -time during pregnancy?			
Yes	209	85.7	81.26–90.05
No	35	14.3	9.95–18.74

GDM: Gestational diabetes mellitus, CI: Confidence interval

Table 3: Risk factors associated with GDM ($n=244$).

	Frequency	Percentage	95% CI	
Awareness of the risk factors of GDM				
Yes	212	86.9	82.65–91.12	
No	32	13.1	8.88–17.35	
Level of awareness of the risk factors of GDM ($n=244$)				
Responses	Options	Frequency	Percentage	95% CI
Fully aware of the risk factors	7–10	82	33.6	27.68–39.53
Partially aware of the risk factors	4–6	122	50	43.73–56.27
Not aware of the risk factors	0–3	40	16.4	11.75–21.04

GDM: Gestational diabetes mellitus, CI: Confidence interval

Table 4: Awareness of perceived effects of GDM on pregnancy ($n=244$).

	Frequency	Percentage	95% CI	
Are you aware of the effects of diabetes (GDM) on pregnancy?				
Yes	227	93.0	89.84–96.23	
No	17	7.0	3.77–10.16	
Level of awareness of the perceived effects of GDM ($n=244$)				
Responses	Options	Frequency	Percentage	95% CI
Fully aware of the effects	7–10	118	48.4	42.09–54.63
Partially aware of the effects	4–6	99	40.6	34.41–46.74
Not aware of the effects	0–3	27	11.1	7.13–15.00

GDM: Gestational diabetes mellitus, CI: Confidence interval

Table 5: Lifestyle interventions toward the prevention of GDM ($n=244$).

	Frequency	Percentage	95% CI
Are you aware of lifestyle interventions for the prevention of diabetes in pregnancy (GDM)?			
Yes	191	78.3	73.10–83.45
No	53	21.7	16.55–26.90
*What are the lifestyle interventions for the prevention of diabetes in pregnancy (GDM) that you are aware of?			
Regular exercise/physical activity	81	42.4	35.40–49.42
Good diet plan	101	52.9	45.80–59.96
Regular testing of blood for sugar	105	55.0	47.92–62.03
A regular visit to a health/medical professional for a checkup	121	63.4	56.52–70.18
Others	11	5.8	2.46–9.06

*Responses not mutually exclusive. GDM: Gestational diabetes mellitus, CI: Confidence interval

Table 6: Association between educational background and level of awareness of GDM.

Educational background	Awareness about GDM			χ^2	P-value
	Yes	No	Total		
	Freq.	Freq.			
Primary	8 (3.8)	13 (40.6)	21	50.7	± 0.00
Secondary	71 (33.5)	11 (34.4)	82		
Tertiary	133 (62.7)	8 (25.0)	141		
Total	212	32	244		

GDM: Gestational diabetes mellitus

attending antenatal care in a Nigeria Tertiary Health Institution.

The result showed that most respondents were aware of GDM. A study in Samoa found that pregnant women had varying levels of knowledge about GDM, with a very small percentage having good knowledge based on the number of risk factors identified.^[19] Similarly, 92 (46%) of 200 study participants in a study by Shriram *et al.* in a primary health center in South India were aware that diabetes can manifest for the 1st-time during pregnancy.^[20] These results are at variance with a report of a study at a medical college hospital in Jaipur which showed majority of the study participants

knew that pregnancy can cause diabetes.^[21] This variation in awareness might be related to the settings of different health-care facilities. It is possible that the respondents' level of awareness was influenced by the fact that this study was conducted in a tertiary care facility and that the experts were able to provide them with accurate information about GDM. It is suggestive that more studies are needed to confirm this theory, but it is possible to explain the level of awareness found in this study by the fact that it was conducted there.

Although most respondents claimed awareness of the risk factors for GDM, not up to half were fully aware of alleged risk factors meaning more had partial knowledge. This result, therefore, became evident that in so far as pregnant women were reported aware of risk factors associated with GDM, the majority were not very clear of the associated risk factors of which the higher value recorded on partial awareness. The interpretation of the result is the fact that though a great number had got the information from health professionals; an outstanding number must have obtained the information through friends/relatives. It is suggestive that the information from friends and relatives may not be detailed when compared with that obtained from health professionals. The results were in line with other studies.^[20,22]

The majority of participants were aware of and identified the effects of diabetes on pregnancy. The result is not surprising because most of the participants said that they obtained their information directly from health-care professionals. This is probably why they were at home with the correct feedback. The findings agreed with the study on awareness of GDM among antenatal women attending tertiary care hospital in Sri Ramachandran Medical College, Chennai, Tamil Nadu,^[21] which revealed that respondents were fully aware of the effects of GDM on pregnancy outcome as they affirmed positively to the identified effects, lead to pregnancy complications and bad obstetric history. This finding is also in concordance with similar works.^[23,24]

The majority of them were informed about the lifestyle interventions for GDM prevention. A regular visit to a health/medical professional, regular blood sugar testing, and a good diet plan had the highest ratings. Diabetes association estimates that if the previous pregnancy had resulted in GDM, there is a 60% chance of developing GDM.^[25] Hence, a healthy diet and consistent exercise are both very beneficial in preventing GDM. Moreover, it has been established as a recommendation for all pregnant women to engage in 30 min of moderate-intensity physical activity most, if not every day of the week.^[25,26] Maternal glucose is used as a determinant of whether a dietary prescription is successful or unsuccessful when determining the best diet for pregnant diabetics.^[27] These findings were in concordance with a work carried out among antenatal women attending outpatient departments in a rural hospital in Bangalore in which most of the participants outlined helpful behaviors for curbing gestational diabetes.^[28] Furthermore, in urban areas in Mumbai, India, nulliparous literate women reported the usefulness of exercise and a good diet.^[23] Similar to this, Hewage *et al.*, in a study in Singapore, identified desirable intervention characteristics, including information on GDM, diet and exercise options, reminders for blood glucose testing, a platform to record blood glucose readings and illustrate or understand trends, and a means of communicating with care providers.^[29]

In addition, there was a strong correlation between the educational level of pregnant women and their awareness of GDM ($P < 0.05$). Awareness about GDM increased as the education of participants increased regarding GDM level of awareness.^[30] The interpretation is that education is a strong determinant of GDM awareness. Parsons *et al.* emphasizes that education is a process that informs, inspires, and assists people in adopting and maintaining healthy practices and lifestyles.^[31] The significant relationship between knowledge of GDM and both levels of education in this study could be explained by the ease with which educated women can seek information from various sources and by the possibility that they may have learned about GDM at school, either

through training or sharing of experiences. An equivalent study from Ghana found that pregnant women with higher levels of education were more knowledgeable about the risk factors associated with GDM and, possibly, its management and outcomes.^[32] On the other hand, this conclusion is inconsistent with a study from a rural hospital in Bengaluru which found no significant link between education and GDM knowledge.^[28]

CONCLUSION

Most of the respondents were familiar with GDM. More than half said that health-care professionals were their primary source of information. Even though the majority of respondents showed a high level of awareness, less than half had a complete understanding of the risks and the effects of GDM on pregnancy. Regular checkups with a health or medical professional, routine blood sugar testing, and a healthy diet plan were the most acceptable lifestyle interventions for the prevention of GDM. There was a significant association between educational background and level of awareness ($P < 0.05$).

Authors' contributions

The formulation, design, data collection, analysis, and interpretation for this work were all carried out by the sole author with the help of research assistants.

Acknowledgments

For allowing to use their facility to conduct this study, the author is grateful to the hospital's management. Additionally, I want to express my gratitude to all the expectant mothers who came to the facility's antenatal clinic and were willing to cooperate with the researcher by providing the necessary data, which enabled the study to be completed.

Ethical approval

The author(s) declare that they have taken the ethical approval from IRB (NHREC\05\01\2008BFWA0002458IRB00002323).

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

Use of artificial intelligence (AI)-assisted technology for manuscript preparation

The author confirms that there was no use of artificial intelligence (AI)-assisted technology for assisting in the writing or editing of the manuscript and no images were manipulated using AI.

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How to cite this article: Chikeme PC. Gestational diabetes mellitus: Awareness, risk factors, perceived effects, and lifestyle intervention among pregnant women in a Nigerian tertiary health institution. *Indian J Med Sci*. 2024;76:22-7. doi: 10.25259/IJMS_200_2022