

# The Correlation Between Gestational Diabetes Mellitus Patient's Characteristics, Attitude and Knowledge to Antenatal Physical Exercise

Ogbutor Udoji Godsdaiy<sup>1,\*</sup>, Omorode Deborah<sup>1</sup>, Ephraim Chukwuemeka<sup>1</sup>, Nkemakonam Ezeonu<sup>1</sup>, Ezunu Emmanuel<sup>2</sup>, Nwabueze Odegua Zuwaira<sup>1</sup>

<sup>1</sup>Department of Physiotherapy, Federal Medical Centre, Asaba, Nigeria

<sup>2</sup>Department of Internal Medicine, Federal Medical Centre, Asaba, Nigeria

## Email address:

godsdaiy.ogbutor@fmcasaba.org (Ogbutor Udoji Godsdaiy), gcclinics@yahoo.com (Ogbutor Udoji Godsdaiy)

\*Corresponding author

## To cite this article:

Ogbutor Udoji Godsdaiy, Omorode Deborah, Ephraim Chukwuemeka, Nkemakonam Ezeonu, Ezunu Emmanuel, Nwabueze Odegua Zuwaira. The Correlation Between Gestational Diabetes Mellitus Patient's Characteristics, Attitude and Knowledge to Antenatal Physical Exercise. *Journal of Gynecology and Obstetrics*. Vol. 10, No. 6, 2022, pp. 257-263. doi: 10.11648/j.jgo.20221006.14

**Received:** October 31, 2022; **Accepted:** November 15, 2022; **Published:** December 8, 2022

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**Abstract:** Background: Gestational diabetes mellitus (GDM) is currently emerging as a major global health concern for pregnant women. Considerably, knowledge has been gained regarding the diagnosis, implications, and management with improved outcomes for the mother and fetus. Scientific evidence support ante-natal regular participation in physical exercise as an essential part of management of GDM. However, despite the well-documented health benefits of physical exercise, 60 to 80% of pregnant women with GDM, do not engage in the recommended levels of physical exercise. This study was designed to examine the relationship between participant characteristics, knowledge and attitude to physical exercise. Materials and methods: A total of 76 subjects from the Ante-natal clinic of Federal Medical Center, Asaba, Delta State, Nigeria were engaged in this study. A modified and pre-tested self-administered questionnaire with a structured knowledge and attitude (KA) component was employed and data was collected for analysis. Results: The rate of response was 100%. The age range of the study group was 26-40 years. The majority (82.9%) of the study population were of the Ibo tribe of Nigeria while about 67.1% had a post primary education and 80.3% were self-employed. The total knowledge score was 67.1% while 65.8% were found to have a positive attitude toward physical exercise. The patients' characteristics such as age, education, employment status, employment type, occupation, monthly income, duration of pregnancy, number of pregnancies, number of successful pregnancies and number of children were found to significantly correlate with knowledge of ante-natal physical exercise. Education, occupation, and gestational week of GDM were found to significantly correlate with attitudes toward physical exercise during pregnancy in women with GDM. Conclusion: The results of this study showed that, there is a high level of awareness of the need for physical exercise and positive attitude towards physical but the predominant circumstances around the women have a major influence on the exercise performance.

**Keywords:** Knowledge, Attitude, Physical Exercise, Age, Occupation, Education, Gestational Diabetes Mellitus

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## 1. Introduction

Gestational diabetes mellitus (GDM) is the most prevalent metabolic condition in pregnancy [8]. It is defined as Impaired Glucose Tolerance (IGT) with onset or first recognition during pregnancy. Globally, 90% of diabetes in pregnancies is associated with GDM [11]. According to the

International Diabetes Federation the incidence of gestational diabetes mellitus (GDM) and perinatal complications associated with the condition are also on the rise. It was further stated that, GDM affects approximately 21 million pregnancies annually, and 1 of 8 live births in Africa [19]. The Center for Disease Control [26] estimates that the incidence of GDM in the United States (US) is about 10%. In Nigeria, the prevalence of GDM was 18.2% in 2021 [19]. It

is reported to be higher in some countries with rates as high as 17.8–41.9% [26].

Gestational diabetes has a strong impact on maternal and fetal outcomes and women with GDM are at increased risk for development of pre-eclampsia. Much of this risk is related to the degree of glycemic control during the pregnancy, with poor glycemic control leading to higher risk for poor obstetrical outcomes [1]. According to [13], there is a linear relationship between increased plasma glucose levels during pregnancy and adverse maternal and fetal outcomes independent of other known factors for these outcomes. There exists a Continuum of risk for adverse pregnancy outcomes for high maternal glucose levels [6]. Studies have reported Pre-eclampsia, Induced labor, Caesarean section, Polyhydramnios, Post-partum hemorrhage, Infection and Birth trauma as maternal complications [7, 21, 31-33]. There is also a high risk of recurrent GDM in subsequent pregnancies and the magnitude of risk increased with the number of prior pregnancies with GDM [41]. Fetal complications have also been reported to include Prematurity, macrosomia, birth trauma, bone fracture, nerve palsy, respiratory distress syndrome, Jaundice, hypocalcaemia, polycythemia/hyperviscosity, Cardiac anomalies including hypertrophic cardiomyopathy and consequent left ventricular outflow tract obstruction and Stillbirth [22, 29, 34].

Scientific evidence has shown that ante-natal lifestyle therapies such as physical exercise and healthy diet can enhance pregnancy outcomes and lower the risk of gestational diabetes. In contrast, a sedentary lifestyle may increase the risk of this disease for both the mother and the fetus through altered maternal pregnancy adaptations [3, 37]. Both international and national organizations charged with the diagnosis and management of this condition recommend lifestyle interventions that include diet and exercise [3]. An average of about 30 minutes of moderate-intensity dynamic physical exercise on most days of the week is recommended for healthy pregnant women and GDM patients [17, 24, 35, 40]. Physical exercise such as walking, swimming, water activities, dancing, stationary cycling, modified yoga or Pilates, resistance exercises, and stretching are all regarded safe [2, 5, 9]. A study by [9] further stated that ante-natal physical exercise should involve both aerobic and strengthening exercises, and that Pelvic floor exercises should be included to help reduce the risk of developing urine incontinence.

Despite research indicating the multiple benefits of frequent physical exercise, 60 to 80% of pregnant women, and more than 60% of women with GDM, do not engage in the recommended levels of physical exercise [14, 16, 39]. Additionally, most women reduce their physical activity levels after becoming mothers [27]. Some researchers have also posited that Females are less likely than males to engage in physical exercise and mothers are much less likely than women without children to be physically active [10, 27]. A study by [12], reported that non-Caucasian pregnant women are less likely to participate in physical exercise.

Empirical studies have shown that lack of knowledge

constitute a major barrier which in turn causes restricted adherence to therapy techniques and an unfavorable pregnancy outcome [25, 30]. The performance of physical activity by these patients was primarily influenced by attitude, knowledge and perception of physical exercise. A study by [14] found that GDM patients believed that ante-natal physical exercise was beneficial and important but were concerned about safety.

However, available data with regard to knowledge and attitudes to physical exercise in women with GDM is sparse in Nigeria. This type of study will provide information that could help public health specialist and the general public to formulate policies that will target the essential barriers to the performance of physical exercise.

## 2. Materials and Method

The study was conducted in the Department of obstetrics and gynecology in collaboration with the Department of Physiotherapy, Federal Medical Center (FMC), Asaba, Delta State, Nigeria. The Centre is the only Federal tertiary health institution located in the capital city of Delta State. It occupies a strategic position as it receives referrals from all parts of the states and neighboring states. The study population therefore, serves as a representative population of the state. Antenatal subjects attending Federal Medical Center (FMC), Asaba, were enrolled for the study. This study examined the relationship between the patient's characteristics, knowledge and attitude of GDM patients to physical exercise. It is a cross-sectional descriptive study and employed a purposive sampling technique to recruit respondents. Inclusion criteria were women diagnosed with gestational diabetes mellitus, Aged 18 to 40 years (Old enough to legally provide informed consent and because pregnant women aged 40 years are generally considered as having higher risk pregnancies), Singleton pregnancy and a normal 18-week ultrasound scan (As considered to be lower risk, therefore able to exercise without restriction, Able to read and write in English. Exclusion criteria were patients with twin pregnancy, underage pregnancy, women with glucose intolerance, women who have not done ultrasound scan, illiterate women. Sample size was calculated using:

$$N = 2 \left[ \frac{(Z\alpha + Z\beta)\sigma}{ES} \right]^2$$

N = the desired sample size

Z $\alpha$  = the significant level, 1.96

Z $\beta$  = the power, 0.84

$\sigma$  = the standard deviation, 10

ES = effect size, 5

Therefore,

$$N = 2 \left[ \frac{(1.96 + 0.84)10}{5} \right]^2$$

N = 69

Total number of participants will be 69, increased to 76 due to attrition.

All participants were assured of anonymity and confidentiality of responses. Data were collected using a self-administered pretested close-ended questionnaire. The questionnaire contained three domains; the first socio-demographic and maternal characteristics (such as age, education, religion, residence, employment, parity, gestational period, etc.), the second on knowledge and the third on attitude. Data were analyzed using Statistical Package for Social Sciences (SPSS) version 20 and results were entered as frequency and percentages.

### 3. Results

The study involved a total of 76 GDM patients and all completed the questionnaire. The age range was 26-40 years, 67.1% did not attain a first degree, 82.9% was from Ibo ethnicity, 94.7% were employed, 77.7% was low income earners, 57.9% has no family history of type 2 diabetes and 76.3% of them were diagnosed of GDM at 25-30th week of pregnancy. (Table 1).

**Table 1.** Sociodemographic data of the participants (N = 76).

Age	Frequency	Percentage (%)
26-30	15	19.7
31-35	54	71.1
36-40	7	9.2
Education		
Secondary	51	67.1
First Degree	6	7.9
Postgraduate	19	25.0
Ethnicity		
Igbo	63	82.9
Urhobo	7	9.2
Yoruba	6	7.9
Employment Status		
Employed	72	94.7
Unemployed	4	5.3
Employment Type		
Self Employed	61	80.3
Civil Servant	4	5.3
Private Organisation	7	9.2
Nil	4	5.3
Occupation		
Banker	5	6.6
Caterer	4	5.3
Civil Servant	4	5.3
Hair stylist	4	5.3
Lawyer	2	2.6
Trader	53	69.7
Nil	4	5.3
Monthly Income		
Nil	4	5.3
Low income	59	77.7
Middle income	9	11.8
High income	0	0
No disclosure	4	5.3
Week of Pregnancy		
<25	0	0
25 – 30	38	50
31 – 36	32	42.1
>36	6	7.9
Gestational week of GDM Diagnosis		
<25	2	2.6
25 – 30	58	76.3

Age	Frequency	Percentage (%)
31 – 36	14	18.4
>36	2	2.6
Number of Pregnancies		
1	13	17.1
2	31	40.8
3	22	28.9
4	8	10.5
5	2	2.6
Number of Successful Pregnancies		
0	4	5.3
1	13	17.1
2	39	51.3
3	18	23.7
4	2	2.6
History of GDM in Previous Pregnancies		
Yes	0	0
No	76	100
Family History of T2DM		
Yes	32	42.1
No	44	57.9
Number of Abortions		
Nil	66	86.8
1	10	13.2
Number of Children		
Nil	6	7.9
1	11	14.5
2	39	51.3
3	18	23.7
4	2	2.6

#### 3.1. Frequency of Knowledge and Attitude of Physical Activity During Pregnancy in Women with GDM

The total knowledge score was 67.1%. Considering the overall response of the participants, their level of knowledge is more than average. 74% knows that exercise reduces the risk of GDM. 100% knows abdominal strengthening exercise, 86.8% knows ankle toes exercises, 100% knows aerobic exercise, and 100% knows cycling. Awareness about other exercises like pelvic floor exercise, back exercise and breathing exercise was poor. Values are shown in table 2.

**Table 2.** Knowledge of Physical Activity during Pregnancy in Women with GDM (N = 76).

Question	Response (%)	
	I do	I don't
Do you know exercise reduces risk of GDM in pregnancy?	74 (97.4)	2 (2.6)
Do you know exercise prevents excessive weight gain in pregnancy?	76 (100)	0 (0)
Do you know exercise increases energy and stamina during pregnancy?	73 (96.1)	3 (3.9)
Do you know exercise improves ability to cope with labour and delivery?	53 (69.7)	23 (30.3)
Do you know that engaging in regular exercise improves glycaemic control?	10 (13.2)	66 (86.8)
Do you know breathing exercise?	6 (7.9)	70 (92.1)
Do you know back exercise?	6 (7.9)	70 (92.1)
Do you know abdominal muscles strengthening exercise?	76 (100)	0 (0)
Do you know pelvic floor strengthening exercises?	2 (2.6)	74 (97.4)
Do you know ankle-toe exercise?	66 (86.8)	10 (13.2)

Question	Response (%)	
	I do	I don't
Do you know aerobic exercise?	76 (100)	0 (0)
Do you know cycling exercise?	76 (100)	0 (0)
Knowledge Summary Index		
Adequate knowledge	51 (67.1)	
Inadequate knowledge	25 (32.9)	

The results showed that 65.8% had positive attitude

towards exercise. The main reason for doing exercise was the belief that exercise will help in the management of GDM (96.1%). The statement “Performing day to day household activities gives adequate physical exercises to pregnant women with GDM and they do not have to perform prescribed exercises” was disagreed by 90.8%. About 92.1% reported that they make out time daily to exercise. Values are shown in table 3.

**Table 3.** Attitude towards Physical Activity during Pregnancy in Women with GDM (N = 76).

Question	Response (%)			
	SA	A	D	SD
I personally like doing exercise	0 (0)	48 (63.2)	28 (36.8)	0 (0)
I have sufficient information on exercising in pregnancy	0 (0)	10 (13.2)	66 (86.8)	0 (0)
I make out time to exercise daily	0 (0)	6 (7.9)	70 (92.1)	0 (0)
Prescribed exercise is essential for pregnant women with GDM	0 (0)	71 (93.4)	5 (6.6)	0 (0)
Performing day to day household activities gives adequate physical exercises to pregnant women with GDM and they do not have to perform prescribed exercises	0 (0)	7 (9.2)	69 (90.8)	0 (0)
In GDM management, I feel the priority should be dieting and use of medication/insulin and not prescribed exercises	0 (0)	76 (100)	0 (0)	0 (0)
Doing planned prescribed exercise will help in overall management of GDM	0 (0)	73 (96.1)	3 (3.9)	0 (0)
I feel that our culture does not support exercising in pregnancy	0 (0)	76 (100)	0 (0)	0 (0)
Do you feel that with GDM, prescribed exercises are unsafe for you and your baby	0 (0)	76 (100)	0 (0)	0 (0)
I get enough family support for doing exercise	0 (0)	76 (100)	0 (0)	0 (0)
Attitude Summary Index				
Positive attitude	50 (65.8)			
Negative attitude	26 (24.2)			

SA = strongly agree, A = agree, D = disagree, SD = strongly disagree

**Table 4.** Chi-square association between participant characteristics and their knowledge of physical activity during pregnancy in women with GDM (N = 76).

Characteristics	$\chi^2$	P
Age	7.21	0.027*
Education	3.68	0.159
Ethnicity	4.81	0.090
Employment status	8.61	0.003*
Employment Type	13.62	0.003*
Occupation	23.69	0.001*
Monthly Income	12.24	0.016*
Week of Pregnancy	19.88	0.019*
Gestational week of GDM Diagnosis	19.11	0.059
Number of Pregnancies	17.52	0.002*
Number of Successful Pregnancies	25.26	<0.001*
Family History of T2DM	1.50	0.221
Number of Abortions	0.87	0.35
Number of Children	22.49	<0.001*

### 3.2. Association Between Participant Characteristics and Their Knowledge and Attitude of Physical Activity During Pregnancy in Women with GDM

It was observed that there were significant associations in knowledge of physical activity during pregnancy in women with GDM between age, education, employment status, employment type, occupation, and monthly income, week of pregnancy, number of pregnancy, number of successful pregnancies, and number of children ( $p < 0.05$ ). it was observed that there was insignificant association in knowledge of physical activity during pregnancy in women

with GDM between education, ethnicity, Gestational week of GDM Diagnosis, family history of T2DM and number of abortions ( $p > 0.05$ ) (table 4).

It was observed that there was significant association in attitude towards physical activity during pregnancy in women with GDM between education, occupation, gestational week of GDM ( $p < 0.05$ ).

It was observed that there was insignificant association in attitude towards physical activity during pregnancy in women with GDM and age, ethnicity, employment status, employment type, monthly income, week of pregnancy, number of pregnancies, number of successful pregnancies, family history of T2DM, number of abortions, number of children (Table 5).

**Table 5.** Chi-square association between participant characteristics and their attitude towards physical activity during pregnancy in women with GDM (N = 76).

Characteristics	$\chi^2$	P
Age	0.64	0.728
Education	11.23	0.004*
Ethnicity	3.50	0.174
Employment status	0.47	0.494
Employment Type	6.88	0.076
Occupation	16.23	0.013*
Monthly Income	3.69	0.449
Week of Pregnancy	15.40	0.080
Gestational week of GDM Diagnosis	32.17	0.001*
Number of Pregnancies	4.06	0.398
Number of Successful Pregnancies	9.60	0.087
Family History of T2DM	2.24	0.135
Number of Abortions	1.03	0.309
Number of Children	8.19	0.085

## 4. Discussion

The findings from the study showed that there was a high level (67.1%) of awareness among respondents. This level of awareness could be as a result of health education by the nurses or midwives during their antenatal visits. It could also be as a result of their level of education, their type of occupation and the ease with which the internet is accessible thanks to technological development. This high percentage of knowledge of physical activity during pregnancy was observed in previous studies [36, 38]. Most of the women were aware of ankle toe exercises, aerobics, swimming and abdominal strengthening exercises but had poor awareness to pelvic floor exercises, breathing exercises and back exercises. A study by [20] found out that Most of the pregnant women were aware of walking, aerobics, and back exercises, and relaxation exercise. However, pelvic exercise (Kegel), cycling, swimming, and breathing exercise were mostly not known as a component of Antenatal exercise. This was in contrast to [15] found out that abdominal exercises, strengthening exercises, aerobics and stretching exercises were the types of exercises minimally acknowledged during pregnancy. Furthermore, [28] found most of the women had knowledge of pelvic floor exercise, muscle strengthening exercise, back care exercise, and relaxation and breathing exercise as types of antenatal exercises but swimming and cycling were mostly not known as types of antenatal exercises.

It was observed that there was favorable attitude (65.8%) of the participants towards physical activity. This high percentage of attitude towards physical activity has been observed in previous studies [14, 28]. The positive view by these women suggest that environment plays an important role in their perception as all of them were from the urban areas and their interaction with other women from these areas will reinforce their beliefs towards exercise.

This study showed that there was significant association in knowledge of physical activity during pregnancy in women with GDM between age, education, employment status, employment type, occupation, monthly income, week of pregnancy, number of pregnancy, number of successful pregnancies, and number of children. These findings are consistent with similar studies [18, 23, 36]. Where patients with higher education, better occupation and higher age had better knowledge about GDM. This study also found that there was significant association in attitude towards physical activity during pregnancy in women with GDM between education, occupation, and gestational week of GDM. These findings are consistent with similar study [28] found that age and occupation significantly influence attitude towards antenatal exercises in pregnancy and [4] found that patients with better occupation and higher age had favorable attitude towards physical activity in GDM.

## 5. Conclusion

The findings from this study showed that respondents with higher level of education, higher monthly income and older age had good knowledge and favorable attitude towards

physical activity.

## Declaration of Conflict of Interest

The authors declare that they have no competing interests.

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