Assessment of Dietary and Drug Compliance among Diabetic Pregnant Women Attending Antenatal Clinic in Nigeria

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Authors' contributions

This work was carried out in collaboration between all authors. Author JOK designed the study, designed the questionnaire in collaboration with author OBKU and wrote the first draft of the manuscript. Author ZO managed the literature searches. All authors read and approved the final manuscript.

Original Research Article

ABSTRACT

Aims: The negative impact of the gestational diabetes mellitus (GDM) on the maternal and fetal health is well documented. The study assessed dietary and drug compliance in 52 diabetic pregnant women attending antenatal clinic.
Study Design: The survey research design was used. Primary data was collected from surveyed participants.
Place and Duration of Study: Adeoyo Maternity Teaching Hospital in Ibadan, South West Nigeria, between November 2014 and March 2015.
Methodology: The participants for the study were purposively selected. Out of the 60 diabetic pregnant women attending antenatal in the hospital, 52 consented to participate in the study. Data were analyzed using descriptive statistics and regression analysis. All analyses were set at p≤0.05 level of significance.

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Results: Results showed that the women were below 35 years old and 81% had above secondary education. Most of the respondents earn below the national minimum wage per month of ₦18,000 (~$ 91) and 50% of the respondents reported to have the history of parents with diabetics. Most of the respondents showed good compliance for medication and most of the dietary recommendation. However, the respondents displayed poor compliance for the consumption of high cholesterol meat (52%), nuts and legumes (44%) and sweeteners (52%). Factors which positively and significantly influence dietary compliance included age of respondents, educational level and family history of diabetics while pregnancy stage negatively influence dietary compliance. Drug compliance was positively and significantly influenced by educational level, income level and family history of diabetes.

Conclusion: More attention should be placed on better monitoring of the dietary regimen for diabetic pregnant women attending antenatal by qualified diet educator or dietician.

Keywords: Gestational diabetes; dietary and drug compliance; pregnant women; Nigeria.

1. INTRODUCTION

Diabetes mellitus is associated with abnormal glucose metabolism, with raised blood sugar and sugar in the urine. When this arises in pregnancy and disappears after birth, it is called gestational diabetes mellitus (GDM). Up to 14% of women develop GDM in pregnancy, with some women more at risk than others, and the severity can vary too [1]. Risk factors for gestational glucose intolerance include previous GDM, family history of type II diabetes mellitus and being older [2]. Often there are no symptoms, or the symptoms can include tiredness, excessive thirst, passing a lot of urine and blurred vision. GDM can also cause significant problems such as a very large baby, an increased risk of the shoulder getting stuck during birth and injury to the mother during birth, increased chance of having an induced birth and caesarean birth [3]. Babies can also often be born too early and have less chance of surviving, have problems with breathing and jaundice. In addition, there can be long-term effects such as increasing the risk of diabetes for mother and child later in life. Diet may play a significant part in the control of diabetes, with wholegrain carbohydrates and low glycaemic index diets (LGI) being helpful. LGI diets aim to slow down the digestion of food, allowing the body to better adjust to the load of sugar coming in after a meal [4,5].

Even though there are drugs for treating GDM, therapeutic control of GDM requires strict, rigorous and permanent lifestyle changes that include dietary interventions, physical activity, strict medication regimes and good metabolic control [6]. Dietary adjustments are an integral part of the management of diabetes. Persons having diabetes often need personal guidance so as to enrich their knowledge and thus aid suitable selection of foods and intake of balanced diet [6]. Dietary counseling for diabetes management is found to be helpful in improving the diets in affluent countries having high rates of literacy, easily available information about food compositions and a wide range of food choices.

Nigeria currently leads the world, as it has the largest number of diabetic pregnant women and is considered as the "diabetes capital of the world" [7]. The International Diabetes Federation (IDF) has estimated the total number of diabetic subjects to be around 40.9 million in Nigeria, which will further rise to 69.9 million by the year 2025 [7]. A poor and inadequate glycaemic control among the patients with type 2 diabetes constitutes a major public health problem and a major risk factor for the development of diabetes complications [8]. Self care in the form of adherence to diet and drugs, blood glucose monitoring, foot care, exercise and recognition of the symptoms, are the crucial elements which are required for a secondary prevention [9].

In Nigeria, financial constraint is a key factor to poor and inadequate glycaemic control among the patients with diabetes as most patients have to pay out-of-pocket for their drugs and for blood glucose tests, and at a price which has been found to be much higher than the cost of these drugs in other parts of the world [10]. WHO [11] report shows that, in Nigeria, substantial portion of health care costs (74.5%) is borne by the patients yet further estimates shows that 90.2% of Nigerians live below the poverty level of $2 per day. This situation is still currently the same. Thus accessing health care is a challenge for people living with diabetes in Nigeria [12,13].

Furthermore, the struggle to comply with lifestyle changes accompanying the treatment of GDM

has made its management difficult. Generally, non-compliance rates for chronic illness regimens and for lifestyle changes can be as high as 70% [8]. Patients with diabetes are especially prone to substantial regimen compliance problem [3] making glycaemic control difficult to attain. This non-compliance is usually higher among the lower socioeconomic groups [14]. Because the risk of complications of diabetes can be reduced by proper compliance, patient non-compliance to treatment recommendations is often frustrating for diabetes health care professionals. In order to be effective, dietary and treatment guidance always needs to be tailored to suit the patient's lifestyle, specific therapeutic goals and level of motivation. To promote compliance, sensitivity to cultural, ethnic and financial constraints is of prime importance [15,16]. This article assessed the dietary and drug compliance in diabetic pregnant women attending antenatal clinic at Adeoyo Maternity Teaching Hospital in Ibadan, South West Nigeria.

1.1 Dietary Intake Regimen and Medication in Diabetic Pregnant Women

Generally, foods which distribute calories and carbohydrates evenly throughout the day are recommended for diabetic pregnant women [17]. Fiber and saturated fat intake play an important role in diabetic patients, especially in type 1 diabetic patients [18]. The most appropriate intake of carbohydrates should consist of vegetables, legumes, fruits, wholegrain foods and naturally occurring foods rich in fiber. These foods have low glycaemic index (GI) (low sugar or glucose release into the bloodstream after consumption). Low-GI foods are rich in fibre and are important part of a healthy diet [17]. The fiber intake for a diabetic patient should be ideally ≈ 20 g/1000 kcal/day. Studies have shown that dietary fiber intake reduces complications associated with diabetics [19]. A saturated and trans-unsaturated fatty acid consumption of less than 10% of the total energy intake has been recommended. Total fat intake should not exceed 35% of total energy and dietary cholesterol should be less than 300 mg/day. Saturated fat is an important risk factor for diabetic nephropathy, diabetic retinopathy as well as CVD [19-22]. Toeller et al. [19] discovered that only about 14% of diabetic pregnant women

in Africa actually follow the recommended fat intake. Further studies showed that intake of diet rich in Mono Unsaturated Fatty acid (MUFA) (10-20% total energy) and Poly Unsaturated Fatty Acid (PUFA) should not exceed 10% of total energy intake [20,22].

The use of medication along with corrected diet is vital in the management of diabetes mellitus. The effectiveness of the treatment is largely dependent on the level of compliance toward prescribed medication [23].

Theoretically, compliance is defined as the extent to which a person's behaviour in terms of taking medications, following diets, or executing lifestyle changes coincides with medical or health advice. Apart from lifestyle modifications, adherence to medication treatment is essential in order to obtain the full therapeutic benefit of diabetes management [18]. There is no gold standard available for measuring medication compliance. Methods used to assess level of compliance have been through pill counts or biological assays. The use of questionnaires, constructed with questions to elicit responses measuring compliance, have been found to provide a more accurate assessment of compliance in comparison with other methods [19]. This study adopted the use of standardized questionnaire as the instrument of measure of dietary and drug compliance in diabetic pregnant women.

Compliance to medication is influenced by several factors such as lack of information, complexity of regimen, concomitant disease, and perceptions of benefit, side effects, medication cost, and emotional well being [24]. A few studies have also identified certain demographic factors as determinants of compliance [25].

1.2 Theoretical Framework: Health Belief Model

The Health Belief Model (HBM) is a psychological model that attempts to explain and predict health behaviors by focusing on the attitudes and beliefs of individuals. The HBM has been adapted to explore a variety of long- and short-term health behaviors [26], including studies related to diabetes in pregnancy and other related conditions.

Application to Study

Concept	Definition	Application
Perceived susceptibility	one's subjective perception of the risk of contracting a health condition	Any woman with previous history or family history of diabetes are prone to having an diabetes in pregnancy
Perceived severity	Feelings concerning the seriousness of contracting an illness or of leaving it untreated (including evaluations of both medical and clinical consequences and possible social consequences)..	Complications of diabetes in pregnancy can cause prolong labour due to macrosomic baby, intrauterine death and maternal death
Perceived benefits	The believed effectiveness of strategies designed to reduce the threat of illness	Focused antenatal care provides adequate intervention and care of patient with gestational diabetes.
Perceived barriers	The potential negative consequences that may result from taking particular health actions, including physical, psychological, and financial demands	Identify and take measures to prevent possible physical, psychological complications that may arise while giving nursing care and make it as accessible and affordable as possible
Cues to action	Events, either bodily (e.g., physical symptoms of a health condition) or environmental (e.g., media publicity) that motivate people to take action.	Offer information about gestational diabetes care by organizing workshops, seminars to train nurses and other health professionals and raising awareness on the importance of rendering safe care
Self-efficacy	The belief in being able to successfully execute the behavior required to produce the desired outcomes.	Adequate training and awareness of the importance of providing service to client will prompt any nurse or care provider to render service and develop positive attitude to the services.

The HBM is based on the understanding that a person will take a health related action if that person:

- Feels that a negative health condition can be avoided
- Has a positive expectation that by taking a recommended action, an individual will avoid a negative health condition
- Believes that an individual can successfully take a recommended health action

2. METHODOLOGY

2.1 Study Area and Description of Population

The study was carried out in Adeoyo Maternity Teaching Hospital which is one of the oldest tertiary health institutions in Oyo state, Nigeria. The target population for this research included the diabetic pregnant women attending Antenatal at the hospital. The total number of diabetic pregnant women attending Antenatal at the hospital at the time of this survey was 60. All the women were given opportunity to participate in the study however, 52 (representing 87%) accepted by signing the consent form (one of the requirements for ethical approval).

2.2 Instrument for Data Collection and Method of Data Analysis

Structured questionnaire was used to collect information about the dietary and drug compliance among diabetic pregnant women. The questionnaire was designed in line with the study objectives. Reliability analysis was applied to test the internal consistency of the questionnaire. Result of the analysis showed that the average Cronbach's alpha value for the instrument was 0.78. Items of an instrument were considered to represent a measure of high internal consistency if the total Cronbach's alpha value was more than 0.70 [27,28]. Both descriptive and inferential statistics were employed in analyzing data collected in the study. Frequency tables were used to present results for the descriptive analysis. The regression analysis was used to analyze the factors influencing dietary and drug compliance (dependent variables). The constructs in the questionnaire measuring dietary and drug compliance were coded along the appropriate ranking scales which were further used to generate scores for each construct to measure the stated research variables. Compliance with diet regimen was graded as: good, medium, and poor depending on the reported adherence to the prescribed regimen by the diabetic patient.

Good compliance is recorded when the patient strictly follows the prescribed regimen, medium when the respondent follows the regimen sometimes, and poor when she does not follow at all. Compliance with anti-diabetic drugs was assessed by the extent of adherence of the respondents to the prescribed doses of medications and timeliness. Good compliance was recorded when the respondents takes all her medications in accordance with the prescription and at appropriate time, medium if sometimes misses doses and poor when often misses doses. The independent variables hypothesized to influence compliance include demographic variables (age, educational level, religion affiliation), income variable and disease characteristics (duration and family history). All statistical analysis were done using the statistical package for social science (SPSS version 17) and set at $P \leq 0.05$ levels of significance.

3. RESULTS AND DISCUSSION

3.1 Socio-Demographic Information of Respondents

The result of the personal characteristics of the respondents is presented in Table 1. Result showed that the respondents generally were young (below 35 years old) and mostly married which implies that they were still in active reproductive age. The majority (81%) of the respondents had good level of education mostly above secondary education. Previous studies show that literacy level impacts behavioral or lifestyle changes [29, 30, 31]. Thus high level compliance is expected among the more literate respondents. Most of the respondents earn below the national minimum wage per month of ₦18,000 (~$ 91). This may pose a challenge to the women's capacity to afford certain financial requirements for necessary healthcare, purchase of drug without household or spouse support and could serve as constraint to compliance especially for drugs intake [32]. A few of the respondents reported use of tobacco (15%) and oral contraceptive (29%). Apart from being a trigger factor for diabetic, addiction to tobacco smoking may negatively influence dietary compliance. Furthermore, some 50 percent of the respondents reported to have the history of parents with diabetics. This is expected to positively influence their awareness of the importance of dietary and drug use discipline. The majority (58%) of the women have had between 2 and 3 previous pregnancies which

might have influenced their willingness or patience to seat in counseling sessions. Further results showed that most of the women are in the second trimester. The dietary intervention generally begins during the first trimester [6].

Table 1. Demographic Information of Respondents

Variables	Freq (n= 52)	%
Age		
19 – 25 years	17	34.0
26 – 34 years	25	50.0
35 years and above	8	16.0
Marital status: Married	46	95.8
Religion		
Christianity	28	54.0
Islam	24	46.0
Education		
Below secondary	10	19.2
Secondary and above	42	80.8
Monthly income level (₦)		
≤15,000	20	38.5
16,000-30,000	10	19.2
31,000-45,000	6	11.5
>45,000	16	30.7
Ever smoked	8	15.4
Oral use of contraceptive	15	28.8
History of parent with diabetes	26	50.0
Pregnancy stage		
1 – 3 months	14	26.9
4 – 6 months	20	38.5
7 – 9 months	18	34.6
No. of previous pregnancies		
None	2	2.9
One	9	17.3
Two	14	26.9
Three	16	30.7
Four	7	13.5
Above four	4	7.7

₦1 = $ 0.0050
Source: Computed from field Survey (2015)

3.2 Respondents' Compliance Assessment

The responses of the respondents to questions measuring dietary and drug compliance are evaluated and presented in Table 2. The analysis for dietary compliance showed that most of the respondents have good compliance for the intake of fresh fruits (65%), vegetables (58%), fish (52%), alcohol (62%) and whole grain carbohydrate (46%). However, the respondents

displayed poor compliance for the consumption of high cholesterol meat (52%), nuts and legumes (44%) and sweeteners (52%). From the assessment of the respondents on their level of drug compliance most of the respondents took their drug compliance seriously. Previous studies have reported that diabetes patients in developing countries usually show more compliance to drugs than dietary regimen [33, 34, 35, 36]. However, about 41 percent of the respondents have less than good compliance rating for regularity in using medication.

The result of the regression analysis as presented in Table 3 shows that the factors which positively and significantly influence dietary compliance included age of respondents, educational level and family history of diabetics.

Increase in these variables will increase dietary compliance significantly. This result is consistent with the findings of Johnson et al. [2]. Pregnancy stage negatively influence dietary compliance implying that as the women enters advanced stage of pregnancy, dietary compliance reduces. The descriptive result showed that most of the women are either in the second or third trimester; this must have contributed to their poor dietary compliance with respect to some diets. Drug compliance was positively and significantly influenced by educational level, income level and family history of diabetes. This implied that respondents' drug compliance increased with increasing level of education, income and family history of diabetes. This result is consistent with the findings of Kapur et al. [3].

Table 2. Assessment of level of dietary compliance

Variables	Compliance rating		
	Good	Medium	Poor
Dietary compliance			
Proper timing/spacing of meals	20 (38.5)	28 (53.9)	4 (7.6)
Good fruits intake (fresh fruits with low GI)	34 (65.4)	18 (34.6)	-
Good vegetables intake (fresh with high fibre)	30 (57.7)	19 (36.5)	3 (5.8)
Sufficient nuts and legumes	18 (34.6)	11 (21.2)	23 (44.2)
Low intake of red and processed meats (high cholesterol)	12 (23.1)	13 (25.0)	27 (51.9)
Adequate intake of fish and sea food	27 (51.9)	20 (38.5)	5 (9.6)
Whole grains (carbohydrate)	24 (46.1)	21 (40.1)	7 (13.8)
Low/non-fat intake	19 (36.5)	23 (44.2)	10 (19.3)
Avoidance of sweetened beverages	10 (19.3)	15 (28.8)	27 (51.9)
Avoidance of alcohol	32 (61.5)	16 (30.8)	4 (7.6)
Drug compliance			
Regular medication	31 (59.6)	18 (34.6)	3 (5.8)
Complete dosage	33 (63.5)	13 (25)	6 (11.5)
Side effect tolerance	34 (65.4)	15 (28.8)	3 (5.8)
Adequate preparation for change of environment (travels)	36 (69.2)	13 (25.0)	3 (5.8)

N = 52; Figures in parentheses are percentages
Source: Computed from field survey (2015)

Table 3. Factors influencing dietary and drug compliance

Variables	Dietary compliance	Drug compliance
Constant	.26* (2.451)	.46* (2.407)
Age of respondents (years)	.16* (2.98)	.23 (0.63)
Educational level (Dummy: > secondary = 1; < secondary = 0)	.14* (2.39)	.72* (2.62)
Religion (Dummy: Christian = 1; Islam = 0)	.25 (1.32)	-.49 (0.17)
Income level (₦)	.28 (0.35)	.067* (2.72)
Pregnancy stage (months)	-.748* (2.916)	.76 (0.21)
Family history of diabetics (Dummy: yes = 1; no = 0)	.139* (2.93)	.53* (2.82)
Adjusted R^2	0.404	0.546

* Signifiant at P = .05 or less; t-values in parentheses
Source: computed from field survey data (2015)

4. CONCLUSION AND RECOMMENDATIONS

The negative impact of the Gestational Diabetes Mellitus (GDM) on the maternal and fetal health is well documented. The use of therapeutic options able to prevent manage GDM has a positive impact on maternal and neonatal outcomes. The study assessed dietary and drug compliance in 52 diabetic pregnant women attending antenatal clinic at Adeoyo Maternity Teaching Hospital in Ibadan, South West Nigeria.

Findings from this study showed that respondents are more compliant to drug use as compared to dietary regimen despite the fact that dietary advice, which is a non-pharmacological option, represent the first choice in managing GDM. Associating factors with compliance included age of respondents, level of income, level of education and family history of history of diabetic. Based on the findings, the following recommendations have been made:

1. More attention should be placed on better monitoring of the dietary regimen for diabetic pregnant women attending antenatal by qualified diet educator or dietician.
2. The consumption of high cholesterol meats and use of sweeteners for beverage consumption should be discouraged especially among women with GDM. Special follow up should be given to women in later trimesters.
3. Subsidy arrangements for healthcare costs especially for drugs used by women with GDM should be encouraged. This may be in the form of health insurance, special foundations and NGOs' inputs.

CONSENT

The participants were asked to fill out individual consent forms designed to confirm their knowledge of purpose of the study and informed consent to participate.

ETHICAL APPROVAL

The proposal for this study was submitted for vetting at the beginning of the research. Subsequently, ethical clearance was obtained from the ethical review committee, Babcock University, Nigeria. Thus, this study is not against the public interest, or that the release of information is allowed by legislation.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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