

Exploring the Knowledge, Attitude, and Practices of Healthy Pregnant Women Towards Gestational Diabetes Mellitus in Nigeria

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Abstract

Gestational Diabetes Mellitus (GDM) is a major public health issue and a threat to the well-being of a mother and her offspring. As a growing concern in sub-Saharan Africa, this paper explores the knowledge, attitude, and practices of healthy expectant mothers towards GDM, and the content of GDM information delivered by prenatal nurses during Antenatal Clinic (ANC) in Warri, Delta State, Nigeria. Semi-structured telephone interviews were employed with 22 participants comprising 20 pregnant women and 2 antenatal nurses. The results reveal that majority of the pregnant women were unaware of GDM as a particular health condition during pregnancy that poses a risk to both maternal and infant health and could lead to a long-term risk of developing the chronic condition of Type 2 Diabetes Mellitus (T2DM). This low level of awareness was attributed to a lack of adequate information during prenatal clinic sessions. The findings from this study emphasize the need to enhance the quality of public health education offered to pregnant women during pre and antenatal clinical services emphasizing GDM as part of the overall global agenda on promoting maternal and infant health.

Keywords

gestational diabetes mellitus, Nigeria, qualitative methodology, healthy pregnant women, public health education and awareness, sustainable development goals

Introduction

Gestational Diabetes Mellitus (GDM), or Diabetes in Pregnancy (DIP), is a condition associated with Hyperglycemia in Pregnancy (HIP) (WHO, 2013; Hod et al., 2015). HIP occurs because of intolerance to glucose and is recognized for the first time in pregnancy. (Muche et al., 2019). Estimates indicate that majority of HIP cases (75%–90%) are GDM (ADA, 2014; Guariguata et al., 2014). Globally, there were an estimated 223 million women (20–79 years) living with diabetes in 2019, a figure that is projected to increase to 343 million by 2045 (IDF, 2019). Most cases of HIP are reported in low- and middle-income countries with the highest standardized prevalence of GDM reported in the Middle East and North Africa (MENA) region, and in the Southeast Asian (SEA) region (27.6% and 20.8%, respectively). In Africa, the standardized frequency of GDM is 14.2% (Wang et al., 2022). The data on GDM in sub-Saharan Africa (SSA) provide varied results with some indicating a prevalence

of 14% among high-risk individuals (Mwanri et al., 2015), which is similar to the standardized frequency reported by Wang et al. (2022), while others report a GDM average of 9% based on a systematic review and meta-analysis by Natamba et al. (2019). Regardless of such variations in the data, GDM is a severe and neglected threat to maternal and child health which may place many pregnant women at risk of experiencing pregnancy-related complications including high blood pressure and obstructed labor (IDF, 2019; Mukona et al., 2019). Exposure to hyperglycemia in

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the womb risks predisposing infants to a high risk of becoming overweight or obese (a macrosomic condition with birth weights above 4.0 kgs), preterm birth, and to Type 2 Diabetes mellitus (T2DM) (He et al., 2015; Ye et al., 2022). Increased weight of prepartum may also endanger women to deliver by cesarean section (CS) which may be inaccessible or expensive for most women in low-income countries (Yaya et al., 2018), and suffer from vaginal lacerations and postpartum hemorrhage. This in addition to the risks of developing T2DM in the long term nonetheless remains despite most women with GDM reverting to normal glycemic conditions post-natal (Zhu & Zhang, 2016). Women with GDM are 10 times more likely to develop Type 2 Diabetes Mellitus (T2DM) than pregnant mothers with normal glycemic levels (Vounzoulaki et al., 2020). Estimates indicate 20 million, or 16% of live births, had some form of hyperglycemia in pregnancy, with an estimated 84% attributed to GDM and where 1 in 6 births was affected by GDM (IDF, 2019).

The known risk factors for GDM among women in SSA include maternal age, overweight or obesity, a family history of T2DM, macrosomia, stillbirth, and abortion and being hypertensive (Mwanri et al., 2015; Natamba et al., 2019). According to Natamba et al. (2019), macrosomia appears to be a common complication among women with GDM with suggestions provided towards rigorous documentation of the prevalence of the condition whilst characterizing risk factors and better understanding the impacts on both the mother and infant. These risk factors could be further complemented by malnutrition and poorly treated infections, the latter of which is attributed to chronic infections via inflammation and immune activation linked to prevalent diseases in the region including HIV, malaria, and TB (Glennie et al., 2012; Nyirenda, 2016).

The key determinants that prevent a woman in sub-Saharan Africa (SSA) from accessing care during gestation are the paucity of information as a result of inadequately trained Healthcare Workers (HCWs), the absence of a standard protocol, and health literacy (Mukona et al., 2019; Nielsen et al., 2012). The lack of access to vital maternal health services impacts the achievement of the Sustainable Development Goals (SDGs) which includes a decrease in untimely death from non-communicable diseases (NCDs), minimizing maternal as well as neonatal death, and achieving gender equality and empowerment of women and girls (United Nations, 2020).

The prevalence of GDM in Nigeria is estimated at 0.5%–38%, whereas the pooled prevalence was 11.0% (Azeez et al., 2021) and the key determinants of GDM in Nigeria were in line with the empirical literature (Natamba et al., 2019). The public health significance of GDM

mitigation in a context like Nigeria includes ensuring the careful control and management of blood glucose levels among pregnant women in order to “reduce the risk of adverse pregnancy outcomes with the support of their healthcare provider” (IDF, 2022). The Nigerian government is yet to develop policies specific to prevent the modifiable predisposing factors of GDM (Okafor et al., 2016) despite recommendations made towards efforts geared at modifying GDM risk factors (Azeez et al., 2021). There is need, therefore, for further exploration of interventions that reduce the risk of GDM in sub-Saharan Africa (Natamba et al., 2019). Doing this requires an in-depth understanding of the knowledge, attitudes, and practices on GDM among pregnant women.

A majority of studies in Nigeria regarding the knowledge and practices about GDM of women who attend ANC services tend to be quantitative. Deeper insight through qualitative inquiry remains sparse in lieu of the epidemiologic transition of NCD-related diseases in developing countries like Nigeria (Islam et al., 2014). This study sought to fill the gap through an exploratory inquiry on the knowledge, attitudes, and practices of healthy pregnant women in Warri, Delta State, Nigeria, on GDM, and the content of health education delivered by prenatal nurses during ANC with a focus on GDM at a local ANC.

Method

A qualitative research design was employed to explore healthy pregnant women’s knowledge, attitudes, and practices, regarding GDM as well as to explore the content of GDM information delivered by prenatal nurses during ANC. An interpretive paradigm was deemed appropriate for this study because it allows the individual’s inner experiences to be understood and elucidated (Kivunja & Kuyini, 2017). The perceptions of GDM among women are deemed valid from an interpretive paradigm, in that these are subjectively constructed (Lincoln & Guba, 1985; Morgan, 2007). In-depth interviews were employed to explore subjective constructions of GDM, and on the content of GDM-related education, among women attending ANC in Nigeria in order to obtain several versions of reality from the perspective of the participants (Scotland, 2012).

Study Setting

The study was conducted at a local health facility in Warri, located in the Warri-south local government area of Delta State, Nigeria, which caters to a broad range of clients including those from neighbouring regions

(Aghoja et al. 2016). A retrospective study done between 2013 and 2015 showed that there were over 3,500 cases of pre-diabetes and diabetes among pregnant women registered at the local health care facility (Orru et al., 2018).

Sample. Purposive sampling was employed in selecting 22 information-rich participants who could substantially answer the research question (Barbour, 2001, Jacobsen, 2012 and Bell et al. 2019). The inclusion criteria included the following: pregnant women attending ANC at a local health facility in Warri; nurses based at a local antenatal clinic attended by women in Warri and had spent at least 3 years in the ANC unit; expectant women 18 years and above, who had never been diagnosed with GDM at the time of the research; had access to a telephone, could communicate fluently in English, or Pidgin English (colloquial Nigerian English), and able to provide voluntary informed consent. Out of 55 pregnant women who were informed about the study, 20 were selected following their willingness to participate in the study and offering their verbal consent (Table 1).

The participants were recruited with the assistance of nurses at the ANC unit who informed attendees about the study and took down the contact details of those

who indicated their interest to participate. These details were shared with the researcher who made a follow-up telephone call with potential participants informing them about the study, how their phone numbers were availed, and their role in the research. Participants were informed that the study had been approved by the region's hospital management board, and by the university, where the researcher was enrolled as a student. The researcher read out the participant's role in the research and their right to withdraw without any consequences. Verbal consent was sought and received from those willing to participate in the study, and a time was set for the telephone interview at the convenience and privacy of the participant. Verbal consent was again sought prior to starting interviews and audio recorded for audit purposes. An additional 2 out of 3 nurses from the ANC unit at the health facility in Warri were purposively recruited to enhance the quality of the study. These nurses are involved in the preparation and delivery of lectures at the ANC. Written consent was received from the nurses prior to undertaking interviews.

Ethics. This study received ethics approval from the University of Roehampton (UK) on the 3rd of February

Table 1. Participant Profile.

Participant identifier	Age of pregnancy (weeks) and (trimester)	Educational level	Age (Years)	Number of children
P1	32 (third trimester)	Secondary	35	3
P2	32 (third trimester)	Tertiary	27	1
P3	35 (third trimester)	Secondary	30	0
P4	34 (third trimester)	Tertiary	27	3
P5	29 (third trimester)	Uneducated	28	3
P6	26 (second trimester)	Tertiary	22	0
P7	31 (third trimester)	Secondary	35	1
P8	30 (third trimester)	Tertiary	30	1
P9	33 (third trimester)	Tertiary	35	2
P10	36 (third trimester)	Tertiary	30	0
P11	33 (third trimester)	Tertiary	27	1
P12	29 (third trimester)	Tertiary	38	1
P13	27 (second trimester)	Tertiary	32	1
P14	33 (third trimester)	Tertiary	33	5
P15	24 (second trimester)	Tertiary	37	4
P16	33 (third trimester)	Tertiary	40	2
P17	24 (second trimester)	Secondary	35	3
P18	35 (third trimester)	Tertiary	32	2
P19	26 (second trimester)	Secondary	33	3
P20	21 (second trimester)	Tertiary	29	0

	Age (years)	Educational level/nursing qualification	Tenure at the ANC facility (years)	Position in the ANC unit
N1	43	Tertiary/registered nurse	4	Principal nursing officer
N2	47	Tertiary/registered nurse and midwife	6	Chief nursing officer

2020. Permission to undertake the research in the locale in Warri was granted by the Delta State Hospitals Management Board, Warri Medical Zone, Warri in a letter dated 26th March 2020.

Data Generation

Semi-structured telephone interviews were used to gather data from the pregnant women and antenatal nurses over a period of 2 months, from March 2020 to April 2020. Interviews were audio recorded and transcribed verbatim for analysis purposes. Telephone interviews were deemed appropriate as these are considered cost-effective and time saving (Wishart, 2003). In addition, the use of telephone interviews was effective in adhering to the restrictions placed on physical contact in lieu of the outbreak of the COVID-19 pandemic, thus ensuring minimal risk to both participants and the researcher. Two sets of interview guides were employed, one for the participants attending ANC services, and one for nurses at the local ANC unit in the study site in Warri. Key questions for participants sought to know about their understanding of GDM, sources of information about the condition, lay beliefs about GDM, and practices towards preventing GDM. Questions for nurses specifically focused on the information on GDM provided during lectures at the ANC sessions. Interviewing the nurses at the ANC was for the purpose of validating the responses received from the women who attend the clinic, and to gauge the information on GDM provided via lectures during ANC sessions.

The interview guide for women participants was piloted with two individuals who met the inclusion criteria. The outcome of the pilots indicated a need to clarify the use of the term “gestational diabetes” or “diabetes in pregnancy” and replace this with “sugar in urine,” or interchangeable with “sugar in blood.” The pilots were included as part of the study samples as their responses were significant in answering the research question.

Interviews were conducted by the researcher, who has practiced in some government and privately owned hospitals in Nigeria, and who also has experience attending ANC during pregnancy. The researcher’s positionality was vital in establishing rapport with participants of the study, and in establishing the researcher’s motivation to pursue public health efforts in the prevention and management of GDM among pregnant women in Nigeria. The interviews lasted approximately 20–30 min which was sufficient for exploring participants’ insights on the topic. As the interview progressed, no new information was received from the 22 participants hence achieving data saturation in reference to obtaining sufficient information

related to the research where no new ideas emerge (Etikan et al., 2016; Van Rijnsoever, 2017).

Data Analysis. The transcribed interview data were subjected to manual thematic content analysis (TCA) following the key steps outlined by Braun and Clark’s (2006) framework. Firstly, the interview recordings were written out word for word and typed. Thereafter, the typed data was read thoroughly and repeatedly while also going through the audio recordings for consistency. The data was later arranged in an orderly manner for the purpose of generating a series of primary codes (Maguire & Delahunt, 2017; Smith & Firth, 2011). The initial codes consist of the terminologies and keywords the participants used and their ideas. Similar codes were highlighted in the same colours. A comparison of codes across transcripts noted similarities and differences and consolidated them into themes and sub-themes (Table 2). Three major themes emerged from the thematic analysis, namely: awareness of GDM; causes of GDM; and measures towards preventing GDM. The interrelations between the themes and sub-themes are visually presented in a thematic map (Figure 1).

Rigor

The credibility of the study was ensured through data triangulation via responses provided by the women participants and nurses at the ANC, coupled with the empirical literature. Triangulation is deemed essential to rigor through the generation of deeper, comprehensive, and significant data as well as cross-checking the consistency of the obtained data, thus ensuring its robustness (Wahyuni, 2012; Tobin & Begley, 2004). The confirmability of the study was established by providing an elaborate description of the procedure used to obtain rich data, and from verbatim quotes attesting to the various themes informing the study findings (Brackney, 2019; Shenton, 2004). The methodology employed for the study ensures the transferability of the findings to other settings similar to Warri.

Results

Majority of the participants were in their third trimester (Table 1), and most of them had tertiary level education and had given birth to one or more children (multiparous) while only three of them were pregnant for the first time. In terms of age, most participants were above 30 years. Also, the nurses interviewed had spent 4 to 6 years working at the ANC unit of the healthcare facility and

Table 2. Index Table of the Main Themes and Sub-Themes.

Key themes	Sub-themes
Awareness of GDM	<ul style="list-style-type: none"> •Sources of awareness on GDM among pregnant women •Sugar in urine •Effect of GDM on a mother and her offspring •Older person condition
Causes of GDM	<ul style="list-style-type: none"> •Supernatural influence resulting to GDM •Consumption of excess sugar
Measures towards preventing GDM	<ul style="list-style-type: none"> •Healthy diet as a preventive measure •Exercise as a preventive measure •Attitude towards healthy lifestyle practices •Cost of preventive measures •ANC lectures

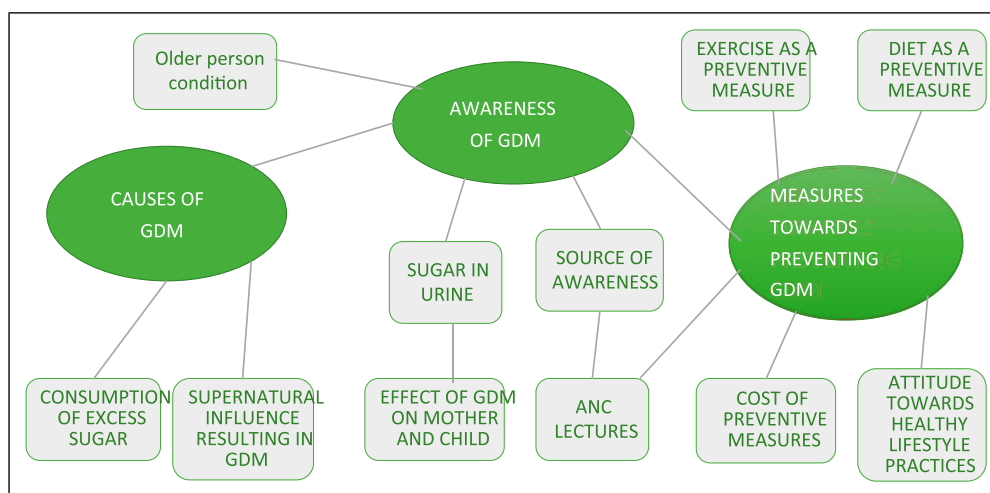


Figure 1. Thematic map showing the main themes and sub-themes that emerged from the dataset.

possessed a tertiary level of education and nursing qualifications. As prior noted during the pilots, understanding of GDM required a change in the terminology to “sugar in urine” or “sugar in blood” which were interchangeably used whilst interviewing women participants. Three major themes emerged from the analysis (Figure 1) notably: awareness of GDM, causes of GDM, and measures towards preventing GDM discussed next.

Awareness of GDM

Responses on this theme revealed constructions of the concept of GDM as “sugar in urine” and misunderstanding that the condition is only associated with older persons.

Older Person Condition. The majority of participants (n = 13) were unaware of diabetes occurring in pregnancy,

instead relating the condition (diabetes) to older persons as reflected in the following quotes:

“Diabetes in pregnancy? No, I’ve not heard about that one...It’s for old people that I know of” ... (P16, third trimester)

“I don’t know that pregnant woman do have (eh) diabetes. I don’t know” ... (P12, third trimester)

Sugar in Urine. Despite participants being relatively educated, this was not reflected in their awareness about GDM instead relating this condition with “sugar in urine” as opposed to “diabetes in pregnancy” as noted in the following quotes:

.... “the only thing have heard of is (emm) proteins in pregnancy as in protein in urine and (emm) sugar; when someone has too much sugar on the body. That’s the only

thing I have heard of. I've not heard of diabetes" ... (P6, second trimester)

"I've heard about (eeeh) sugar in the urine during pregnancy, but I have not heard about the diabetes during pregnancy" ... (P18, third trimester)

During ANC services, participants in the study have heard of sugar/glucose in the urine being referred to but could not relate it to pre-diabetes or diabetes in pregnancy. Though some participants ($n = 7$) were relatively aware of GDM, most were unsure of the classical signs and symptoms of the disorder. Excessive urination was the only symptom most of them were aware of as reflected in the following quotes:

"That's just what I know of it. That the person will feel uncomfortable and urinate all the time, or maybe the leg would be swollen." ... (P8, third trimester)

*"(emm) maybe ant in your urine, frequent urinating, (emm)** excessive craving for sugary things, those are the ones that I know of" ... (P10, third trimester)*

Perceived Effects of GDM on a Mother and Her Offspring. Although some participants were aware of diabetes in pregnancy or in terms of their subjective understanding as "sugar in the urine," most expressed misunderstanding regarding GDM's effect on a mother and her child. Most of the participants' mention having a big baby and delivering through the cesarean section as the effect of the disorder on the mother. Similarly, the majority could not state any effect on the child, although few women knew that it could transfer to the child.

"Although I don't really know much effects but at least I know that with that, the baby will just be so big... and it will have a lot of effect on the person when it's time to deliver and as a result of that maybe if the baby is too big and you can't push, it will result in you going for a CS or maybe going through a lot of tearing and tearing from the vagina just for the baby to come out. So that's the only one I know" ... (P6, second trimester)

"What I heard is that if the mother has it, the child can also have it, because it can be hereditary" ... (P17, third trimester)

Two respondents felt that it could lead to high blood pressure in the woman, while one participant stated that it could lead to jaundice in the offspring. However, none of the women knew that it could result in future DM for the mother if not treated.

*...Maybe it might cause (eeeh)** B.P (hypertension) that's it (eeeh) causes B.P and might make the child have this (eeeh) ... Jaundice, it causes jaundice for the babies. ... (P8, third trimester)*

...actually, what I know about it is that when there's sugar in urine or diabetes in a pregnant woman, it can lead to as in-can trigger B.P (hypertension) which can lead to caesarian section... (P1, third trimester)

Sources of Awareness on GDM Among Pregnant Women. Awareness about GDM among some participants was attributed to friends ($n = 2$), while some were taught in school ($n = 2$), whereas one participant noted the media. None of the participants noted being directly informed about GDM by the antenatal service HCW.

"I actually learnt about it during my nutrition class. I think that was during my master's class though" ... (P13, second trimester)

"a friend of mine has told me of it and also (eeeh) in (eeeh) there's one (eeeh) channel that I do watch on DSTV I've also heard of it" ... (P20, second trimester)

Causes of GDM

Consumption of Excess Sugar

The majority of the participants ($n = 12$) stated that GDM was due to the consumption of excess sugar as reflected in the following quotes:

"Perhaps the foetus growing making them eat too much sugar or so. I don't know" ... (P4, third trimester)

"I think (eeeh) I think it's excess sugar in (eh) the blood system or will I say in the urine" ... (P7, third trimester)

Most of the participants stated that avoiding sugary food will prevent GDM from occurring. A few participants also stated that food high in carbohydrates and starch could result in the disorder. Nonetheless, a few participants could accurately state the cause of the disorder and only one of the interviewees correctly stated two causes of the disorder as reflected in the following two quotes:

"Well, I think from my little knowledge I think (emm) excess weight gain (emm) when a woman is overweight that can be one...I think something that has to do with family something too like (emm) what do you call it now ... Yeah, something that is in the family...like probably, I don't want to use the word (emm) inheritance or hereditary. Something that has to do with hereditary though" ... (P13, second trimester)

"I think maybe it is too much consumption of some kind of some kind classes of food like carbohydrates, too much intake of carbohydrates" ... (P14, third trimester)

Although some participants could correctly state some causes of GDM, they were however unsure of it with some unable to differentiate between the causes of GDM and T2DM. Some participants attributed GDM to a hereditary cause attributed to a family history predisposing an individual to develop the disorder. Only one participant identified the cause of GDM to risks of being overweight and adopting a sedentary lifestyle.

“It Is Fate”: Supernatural Influence Resulting in GDM

Some participants attributed GDM to an external supernatural influence and felt that nothing can be done to prevent it. These were aptly captured in the following quotes:

“Those things, some of those things no be physical something, there are spiritual problem... But most times, some (na) witch...” ... (P5, third trimester)

“So I think it’s not normal so (pause)... I think maybe it’s spiritual problem” ... (P18, third trimester)

Measures Towards Preventing GDM

Healthy Diet as a Preventive Measure

The majority of the participants were unaware of the importance of consuming healthy meals during pregnancy. Some participants stated that they ate whatever they craved as reflected in the following quotes:

“(laughs) me I don’t know, anything I feel like eating I eat oh” ... (P8, third trimester)*

“For me? Anything I see I eat oh. Because if it is rice oh, I eat, if it is eba (fried cassava flour) or garri (cassava flakes) oh (ehen), just like that” ... (P19, second trimester)

Some participants stated consuming healthy meals during their pregnancy for the following reasons:

“Because it helps me. It builds my body; it builds my system. I know that it helps me to build my system. If I stay on emmm carbohydrates, my baby would not be able to grow well and even my system cannot be able to grow well” ... (P11, third trimester)

“So on a daily basis I make sure that I had all the colours (classes of food) in every meal that I make” ... (P10, third trimester)

Similarly, some of the participants stated that they consumed a lot of fruits and vegetables daily. However, most participants did not consciously ensure that they consumed enough fruits.

“So sometimes I use to eat one apple for a week. I will not take another thing. Something like watermelon, that one I can take watermelon like once or twice in three days” ... (P12, third trimester)

“My sister I will not lie to you o, it’s not everyday o. But though I’ve taken today (sha). I took pineapple today” ... (P15, second trimester)

Cost of Preventive Measures

Some participants felt that fruits as well as eating healthy meals are too expensive thus making it impossible to consume for purpose of dietary requirements during pregnancy. This perception as reflected by participants is illustrated below:

“It’s rare.... Yes, they are not always available, and they are costly... it’s expensive to get nutritious meals” ... (P7, third trimester)

“In a day? You know fruits is costly, not everybody can afford it” ... (P1, third trimester)

Exercise as a Preventive Measure

Most of the participants stated that they engage in exercise but where reference was made to walking only. Other forms of exercise include associating this with performing gender role-related house chores.

“I just walk, instead of me to take Keke (Tricycle), I just walk down” ... (P10, third trimester)

“Doing house chores is exercise (laughs). I don’t have a maid” (P2, third trimester)

“I do my housework by myself, so I think that one is still exercise” ... (P18, third trimester)

A notable reason for not engaging in exercise while pregnant was the perception of carrying a heavy weight which limited movement as reflected in the following quote:

“I don’t do exercise, I beg, to even carry the body hard, to come still do exercise ... At times if I wake up in the morning (sef eeeh), the body that controls me. If it says sit down, I will sit down, if it says get up I will get up so how will I do exercise” ... (P16, third trimester)

That's what I don't (sabi), I (no dey) fit do am....Because of the issue of the (belle) I come stop, by now (na) I (dey) house, I (no dey) do anything. Just wake up, chop, sleep, bathe. If light (dey) I'll watch film (...) That's what I do now. Because now I (no) get strength to do any... I (no) even (sabi) am but they always tell me say I should trek (Walk) small so that it will help me by the time I will deliver but it's very hard for me to trek (walk) because I do not know how to trek much ... (P5, third trimester)

(eeeh) no I did not exercise oh... (eeeh) it's not everybody that has that strength (na)... (P19, second trimester)

Antenatal Clinic Lectures

Some participants stated that they were lectured about the importance of regular exercise and consuming a balanced diet during pregnancy when attending ANC. However, most of the respondents discounted being informed about gestational diabetes during clinical sessions as reflected in the following quotes:

"diabetes in pregnancy? No, they've not talked about it" ... (P1, third trimester)

"Like I told you, the antenatal classes that we do they just brush on the surface they don't tell us details ..." ... (P10, third trimester)

Attitudes towards Healthy Lifestyle Practices

Some participants reported developing a positive attitude towards leading a healthy lifestyle during pregnancy including consuming healthy meals, fruits, and vegetables as well as engaging in regular exercise. However, most of the participants in the study did not express keeping a healthy lifestyle regime with one participant expressing a fatalistic attitude towards developing GDM as indicated in the following quotes:

"(Emmm), I cannot count it oh because it's not every day that I eat vegetables. It's not every day that I eat fruits" ... (P8, third trimester)

"Like me (eeeh) in my pregnancy, at times the (...) Pregnancy will select food, when they tell us to eat this one the body will not accept it. At times, I will just come and say me too I want to soak garri (cassava flakes) I will just put groundnut and milk and just soak" ... (P15, second trimester)

"I don't think there is- there is no how one can actually avoid it" ... (P7, third trimester)

The researcher sought to validate responses from participants on the low level of awareness of GDM due to lack

of education during ANC sessions by further inquiring from two nurses. It was reported that health talks during ANCs were not structured or organized and therefore issues or topics on GDM were not particularly discussed. These reflections are noted in the following quotes:

"Most times we talk about their questions their fears those are the things we talk about" ... (N2, chief nursing officer)

"We talk about - sometimes we give it as a lecture so that those that have sugar in the urine, that [emmm] hyperglycaemia will know what to do, what is expected from them" ... (N2, chief nursing officer)

*"We just tell them reduce*your carbohydrate you have glucose in the urine, so they are aware that they have glucose in the urine" ... (N2, chief nursing officer)*

Lecture sessions were particularly structured for women who had a high level of glucose in their urine with emphasis given on dietary control. GDM was viewed as less important compared to hypertension as this was highly prevalent. Where issues of GDM were noted, it was deemed a temporary condition and will wear off after delivery. These perceptions were noted in the following quotes:

"I cannot really say because like you see the topic I mention they are so many when we talk about diabetes, diabetes in pregnancy it might just be two percent of the population sometimes when you now talk about pregnancy-induced hypertension you are getting five percent of the population so you find out that those with pregnancy-induced hypertension their needs are higher than those with diabetes" ... (N2, chief nursing officer)

"We don't even go to all those symptoms because we just... we don't go into details like that because we don't really have that time, our health talk is one hour before you, that's, before you define it, go to signs and symptoms and all those stuff most times your time are up, you don't need to - you cannot be able to explain more that's that" ... (N2, chief nursing officer)

"So that's what we explain to them that it is because of the pregnancy not that the child is bad o, but its what happens during pregnancy and after delivery it wear off" ... (N1, principal nursing officer)

Summary

Majority of the respondents were aware of sugar in the urine during pregnancy, however, they could not associate it with pre-diabetes or gestational diabetes. Only 35% of participants were aware of GDM most of which mentioned excessive urination as a classical symptom, and most were unsure of its effect on a mother and her child.

Most of the participants aware of GDM were either informed by a friend, a television program, or taught in school, and they felt that it occurs as a result of consuming a lot of sugar. Additionally, some participants also felt that supernatural influences played a vital role in its occurrence, and thus cannot be prevented.

Most participants did not know the importance of consuming a healthy meal while pregnant and some felt it was too expensive. Similarly, Most of the respondents engaged in walking as well as performing house chores as a form of exercise while some found it difficult to engage in physical exercise. Likewise, most of the participants mentioned being educated about exercising regularly as well as consuming healthy meals during their ANC lectures, however, GDM was never mentioned.

Although some participants had positive attitudes towards preventing GDM, most did not practice it due to varying reasons. To confirm the report gotten from the participants, two antenatal nurses were interviewed, and they revealed that GDM was not particularly discussed as it was seen as less important compared to hypertension which was highly prevalent. It was also seen as a temporary condition that will wear off after delivery.

Discussion

This study was aimed at researching the insight of healthy pregnant women regarding GDM, uncovering the habits they engage in that increase their chances of developing the ailment and exploring the content of GDM information delivered by prenatal nurses during ANC. Three major themes emerged from the study: Awareness of GDM, Causes of GDM, and Prevention of GDM.

Awareness of GDM

The findings from this study showed that the level of awareness of GDM is low. It was observed that among 20 respondents, 65% of them were unaware of GDM, and although most of them were aware of diabetes, they did not know it could occur in pregnancy. Similar findings were noted in a cross-sectional survey done in Nigeria which indicated that only a few percent of the participants had excellent knowledge of GDM (Ogu et al., 2019). A similar outcome was found in a studies done by Bandyopadhyay et al. (2011) and Baskar et al. (2019) in the context of India on the low level of knowledge of GDM among study participants.

Majority of the respondents in this study were relatively well educated, However, the results indicate the level of education did not correspond with the awareness of GDM. This findings corresponds with that by Elmekresh et al. (2017) which reported that the level of education of the respondents did not considerably

influence the awareness level among respondents in the contexts of United Arab Emirate (UAE). On the contrary, Ibebuike et al. (2019), Hawley et al. (2019), and Carolan et al. (2010) in the context of Nigeria, American Samoa, and Australia, respectively, observed that women who had tertiary education had a greater insight of GDM. This low level of awareness could be due to the lack of adequate information regarding GDM during ANC.

Furthermore, most of the participants had some understanding of the concept of “sugar in urine” but they could not relate this condition to pre-gestational diabetes or GDM. The information provided by the interviewed participants corresponded to that which was gotten from the HCW who attend to them. It was observed that little emphasis was placed on diabetes in pregnancy as it was considered a less serious and temporary health condition. Thus, detailed lectures were not provided regarding it. This finding was in congruent with that of a study carried out on African women in Sweden which indicated that the health care providers perceived GDM to be a less severe illness that resolves after delivery and this made the patients take the illness with less seriousness (Hjelm, et al., (2018)).

Furthermore, none of the participants noted being directly informed about GDM by the antenatal service HCW. A similar observation was made in a study conducted by Utz et al. (2016) in Morocco where only about 38% of respondents reported receiving GDM-related lectures during ANC classes. Despite 93.4% of participants being asked to carry out blood glucose tests, only 54% of them were enlightened on the purpose of the test. Also, Mukona et al. (2019) in the context of Zimbabwe uncovered that about 81% of survey respondents noted having not received lectures regarding GDM during ANC visits. In the context of Nigeria, Ibebuike et al. (2019) noted only a few participants (16%) learned about GDM from nurses and midwives. However, in this study, none of the participants who had little knowledge of GDM got it from HCW despite the frequent interactions with them. From the study findings, it is evident that policies regarding the quality and content of ANC lectures delivered at the primary healthcare levels as well as frequently educating pregnant women about GDM is urgently required, as seen in South Africa where locally created guidelines to regulate healthcare practices relating to GDM management exist (Muhwava et al., 2018).

Causes of GDM

Majority of the respondents stated that GDM is due to the consumption of excess sugar, thus avoiding sugary food will prevent it from occurring. Similar findings were reported by Rhoads-Baeza and Reis (2010) in Spain where all the respondents thought that consuming a lot of sugar could result in GDM thus avoiding it could prevent

the illness. This was also consistent with [Poth and Carolan's \(2013\)](#) findings in Australia where a large number of the participants stated that avoiding sugar could prevent GDM from occurring.

The findings from this study note that only a few participants could accurately state a particular cause of GDM. Only one participant correctly stated two causes of the disorder. A few of the participants also stated that food high in carbohydrates and starch could result in the disease. Although some of them could state some causes of GDM, they were unsure of it and a few of them could not differentiate between the causes of GDM and T2DM. Further, a few women stated that having a family history could predispose an individual to develop the disorder, however, only one participant identified being overweight and adopting a sedentary lifestyle as a risk factor for the illness. In line with this finding, [Imen et al. \(2018\)](#) reported that 80% of the participants stated that meals high in carbohydrates could result in the development of GDM and only 6% identified being overweight and having a family history as a predisposing factor for developing GDM. Likewise, [Ibebuikwe et al. \(2019\)](#) and [Ogu et al. \(2019\)](#) in Nigeria reported that a small proportion of the respondents were aware that GDM has a firm root in family history and obesity is also a major determinant.

Two of the participants stated that the illness is due to external or supernatural influence, and thus felt that nothing can be done to prevent it. [Rhoads-Baeza and Reis \(2010\)](#) in Spain also reported that a few of the participants believed that fate had a role to play in developing the illness, thus anyone who is predestined to develop the illness will, no matter the preventive measures put in place. Although the risk of GDM can be modified by preventive lifestyle practices, [Akinwaare et al. \(2020\)](#) in the context of Nigeria discovered that majority of the participants believed that their risk of developing GDM was low thus efforts to prevent the condition were minimal. Similar findings were reported in a study carried out in the southwestern part of Nigeria where about 31% of the participants strongly believed that diseases are a result of spiritual influences ([Adegoke, 2008](#)).

Prevention of GDM

Most of the participants were unaware of the need to adopt a healthy lifestyle during pregnancy. Some stated that they ate whatever they felt like eating and when questioned about their daily diet, most of them stated that they consumed a lot of carbohydrates. When they were further questioned if they consciously ensure they consume healthy and nutritious meals, a few of them stated that they consume whatever is available. It was also uncovered from the study that most of the participants did not deliberately ensure that they consumed enough fruits. This was in congruent with the findings

gotten from a study done by [Rhoads-Baeza and Reis \(2010\)](#), where it was observed that most of the participants ingested a lot of high-calorie meals. In like manner, [Poth and Carolan \(2013\)](#) discovered that only one interviewee had an excellent knowledge of what a healthy diet consists of. Likewise, [Ibebuikwe et al. \(2019\)](#) in Nigeria discovered that most of the participants consumed a lot of processed meals.

The cost of adopting a healthy lifestyle significantly influenced some respondents' compliance. Some participants feel that fruits as well as eating healthy meals are too expensive thus making it impossible to consume a lot of them. Similarly, most of the participants stated that they engaged in exercise, however, only a few women deliberately took part in regular physical activities, most of them stated that they engaged in walking. Additionally, some women referred to being engaged in regular house maintenance as a means of exercising. These findings corroborate that of a systematic review of the level of exercise in Africa, which revealed that the rate of regular exercise during pregnancy was low and most of the exercise engaged in is done during routine household chores which are below the approved intensity of 150 min of mild aerobic activities each week during gestation ([ACOG, 2002](#); [Mukona et al., 2016](#)). Related misconceptions regarding the approved level of physical activity during gestation were also obvious in the research by [Poth and Carolan \(2013\)](#), which indicated that few of the participants were not conversant with the recommended level of physical activity. Likewise, [Mukona et al. \(2019\)](#), found that 39% of the respondents considered household chores to be an adequate way of exercising during pregnancy. Contrary to the above findings, [Mbada et al. \(2015\)](#) in the context of Nigeria discovered that majority of pregnant women exercised regularly and about 41% of them engaged in aerobic exercises.

Although some of the participants had positive beliefs regarding regular exercise and consuming healthy meals, however, their practices did not reflect their beliefs. A few of the women, though believed that it is good to consume healthy meals while pregnant, stated that they ate whatever was available while some consumed a lot of carbohydrates. These findings corroborate previous research by [Rhoads-Baeza and Reis \(2010\)](#), [Wilkinson and Tolcher \(2010\)](#), and [Price et al. \(2017\)](#) which revealed that most of the participants ingested a lot of high-calorie meals and that the quality of food they consumed was poor despite that they had a positive attitude towards consuming healthy meals.

The information provided by the interview participants corresponded to that gotten from the HCWs who were interviewed. It was observed that emphasis was more on sugar/glucose in the urine, and less emphasis was placed on diabetes in pregnancy as it was seen as a less serious and temporary health condition. Thus, detailed lectures were not provided regarding it. This therefore provided an answer to the low level of awareness and knowledge noticed among

the participants. From the study, it is evident that knowledge gaps exist in the field of GDM in Nigeria, thus, HCWs should be regularly trained. Thereafter, further research can be done to assess the impact of this training as seen in the CS study done by Patel and Vyas (2018) in India which showed a remarkable difference in GDM knowledge when the health care providers were trained.

A major limitation of this method was the inability to note the nonverbal expressions of the respondents (Block & Erskine, 2012; Jacobsen, 2012) due to the COVID-19 pandemic. Similarly, recruiting only women that had access to telephones was considered a limitation.

Conclusion

The study findings highlight the need for more informed education and awareness on GDM among HCWs in ANC in contexts such as Nigeria. The prioritization of GDM is necessary to avert major risks to both maternal and child health. The low level of awareness and knowledge of GDM among pregnant women attending ANC in low- and middle-income countries like Nigeria is attributed to the inadequacy in the training curriculum of HCWs which tend to be narrowly focused on its biomedical condition. The minimum concern with nuanced understandings of GDM among pregnant women poses a serious health risk to maternal and infant health which may impede the achievement of the SDG targets regarding decreasing maternal and neonatal death as well as minimizing untimely death from NCDs by 2030 (United Nations, 2020) in low- and middle-income countries. Efforts should therefore be geared towards enhancing public health promotion and education at the primary health care level on GDM. Doing this would align with Abdullah et al.'s (2017) argument in emphasizing the importance of enhancing the capacity of health workers, especially nurses, to the prevention of complications arising from chronic illnesses including GDM.

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