**KNOWLEDGE AND PERCEPTION TOWARDS DIABETES MELLITUS IN PREGNANT WOMEN ATTENDING ANTENATAL CLINIC AT PRIMARY HEALTH CARE FACILITIES IN ESAN WEST AND ESAN CENTRAL LOCAL GOVERNMENT AREAS IN EDO STATE, NIGERIA.**

**ABSTRACT**

**BACKGROUND:** Gestational diabetes mellitus (GDM) is diagnosed by elevated blood glucose in pregnancy though the definition has changed repeatedly over the years. Gestational diabetes mellitus (GDM) is defined as glucose intolerance of variable degree with onset or first recognition during pregnancy. The common risk factors of GDM include previous obstetric history of GDM, history of large for gestational age babies, abortions and unexplained stillbirths in the previous pregnancies and family history of both GDM and Type 2DM.

**OBJECTIVES:** This study will therefore play a major role in determining the knowledge, risk perception and dietary practices among pregnant women with diabetes.

**METHODS:** A descriptive cross-sectional study was employed for this research. Using a multistage sampling technique, a two -stage sampling technique was used in choosing PHCs in each LGA. A sample size of 403 was gotten from the PHCs. Data was collected using questionnaire. Data was analyzed using IBM SPSS version 23.0 software for descriptive statistics.

**RESULTS:** It was seen that many participants demonstrated good knowledge (88.3%). Furthermore, good attitude was seen amongst 88% of the participants with a significant value (0.001 as p<0.05) seen in the relationship between occupation, age and knowledge. There was also good correlation between knowledge and attitude as many respondents who displayed good knowledge also showed good attitude.

**CONCLUSION:** The findings of this study suggest that most women that attend Antenatal Care demonstrated good knowledge and attitude towards GDM in pregnancy. This implies that much awareness was gotten from the ANC visits and a view to adhere to health instructions if or when diagnosed.

**KEYWORDS: Gestational, Diabetes, mellitus, antenatal, pregnancy, Primary Health Care**

**1.0 INTRODUCTION**

**1.1 BACKGROUND**

Gestational diabetes mellitus (GDM) is identified by higher-than-normal blood sugar levels that develop during pregnancy [1]. The worldwide occurrence of gestational diabetes mellitus (GDM) ranges significantly, estimated between 1% and 28%, influenced by factors such as population demographics, the approaches used for screening, and the diagnostic standards applied. According to the 2015 report by the International Diabetes Federation (IDF), approximately 16.2% of pregnant women experienced some degree of elevated blood glucose levels, with GDM accounting for roughly 85.1% of these cases. [2]

Gestational diabetes mellitus (GDM) is associated with several well-established risk factors. These include a prior history of GDM, previous pregnancies involving large-for-gestational-age infants, recurrent miscarriages, and unexplained stillbirths. [3] A family history of GDM or type 2 diabetes mellitus also significantly increases the risk. Additionally, weight gain between pregnancies is recognized as a prominent and potentially modifiable risk factor for developing GDM. Among the various perinatal complications linked to GDM, macrosomia—commonly defined as a newborn weighing more than 4 kilograms—is the most frequently reported. This condition heightens the likelihood of delivery complications such as shoulder dystocia and the need for caesarean section [4]. Other complications noted preeclampsia, macrosomia, shoulder dystocia, birth injuries, increased risk of caesarean delivery, hypoglycemia, neonatal jaundice respiratory distress syndrome, polycythemia and hypocalcaemia in newborn [5].

Women who experience gestational diabetes have an estimated 50% chance of progressing to overt type 2- diabetes within 20 years after pregnancy. Consistent antenatal care plays a crucial role in early detection and management of health issues, allowing healthcare providers to implement timely interventions that support both maternal and fetal well-being [6]. Regular monitoring during pregnancy helps reduce the risks of complications such as diabetes-related birth defects, preterm labor, and elevated maternal blood glucose levels, particularly during the critical first trimester [7]. Furthermore, being informed about the symptoms associated with these conditions and maintaining regular prenatal check-ups, along with adhering to a balanced and appropriate diet, can significantly lower the likelihood of adverse outcomes by enabling prompt diagnosis and early treatment [8].

It has been seen in studies that there have been a major challenge accounting for the persistency of Diabetes in Pregnancy. Most women delayed booking because they believed there were no benefits to attending antenatal care during the first trimester of pregnancy [9].

Although several studies have been done on diabetes mellitus, especially within the Nigerian population, there is paucity of information on the knowledge and risk perception among pregnant women regarding diabetes in pregnancy.

Reduction in the prevalence rate of diabetes in pregnancy can be achieved by adoption of healthy lifestyle and dietary practices by pregnant women, proper adherence to antenatal and postnatal care, and formulation of various effective preventive measures. However, this is only possible when there is increased awareness of this condition, as adequate knowledge about a disease translates to better understanding of that disease.

This study will therefore play a major role in determining the knowledge, risk perception and dietary practices among pregnant women with diabetes in these areas; thereby increasing awareness, and decreasing the overall prevalence and associated pregnancy risks of this condition in this obstetric population among women of reproductive age group and pregnant women. It further seeks to describe the attitude towards gestational diabetes among pregnant women attending antenatal care and to assess perceived risk of gestational diabetes in pregnancy.

**METHODOLOGY**

**2.1 STUDY AREA**

The study area was carried out in Primary health centers in Esan west and Esan central local government areas in Edo state. There are 23 primary health centers in Esan west LGA. Services provided by each PHCs to their various community are Antenatal care registrations, antenatal care visits, circumcision, treatment of minor illness, immunization and family planning. Antenatal care services are offered to the community weekly with an average number of 300 attendees monthly.

Irrua is the administrative seat of the Esan Central Local Government Area of Edo State in Nigeria. Irrua and other towns around her are part of the Esan group. It is situated in the western portion of Esanland. The town covers about 80 square kilometers. It shares a common boundary with Agbede to the north, Ewu to the North-west, Ekpoma to the South-West and Uromi to the South-East. There are 16 primary health centers in Esan central LGA. The Services rendered by each PHCs in Esan central to their various community are Antenatal care registrations, antenatal care visits, circumcision, treatment of minor illness, immunization, and family planning. Antenatal care services are offered to the community twice weekly with an average number of 200 attendees.

**2.2 STUDY DESIGN**

A descriptive cross-sectional study was employed for this research.

**2.3 STUDY POPULATION**

The study participants were pregnant women, attending antenatal care in government primary and secondary health facilities in both Esan west and Esan central local government.

**2.3a INCLUSION CRITERIA**

* Pregnant women who give consent to be included in the study
* Pregnant women aged >18 years
* Who reside in the study area.

**2.3b EXCLUSION CRITERIA**

* Pregnant women who were not present on the day of administration of questionnaire
* Those who came in regards of other medical health conditions not relating to diabetes in pregnancy.
* Women in labour and those due for delivery.

**2.4 SAMPLE SIZE ESTIMATION**

Sample size is estimated using Cochran’s formula for cross sectional surveys

Sample size n= Z2Pq =………………...10

 d2

n= Sample size

Z = Standard normal deviation, set at 1.96 to correspond to 95% confidence interval.

P = Prevalence of condition under study taking from the highest value in the literature in previous studies.

q = 1-P

d = Error margin allowed from the study which is a measure of level of accuracy.

For this study;

Z = 1.96

P = 38.2% i.e. 0.382 (The prevalence value in the study on gestational diabetes among women of reproductive age in southern Nigeria is 38.2.0%)

d = 0.05

From the formula above

Sample size n= Z2Pq

 d2

or n= Z2P(1-P)

 d2

n = (1.96)2 × 0.382× (1-0.382)

 (0.05)2

n = 3.8416 × 0.382 × 0.618 =0.9069

 0.0025 0.0025

n = 362.7approximately 363

From the calculation above, the estimated sample size is 363.

Attrition or non-response rate = 10% of sample size

$\frac{363}{1-0.1}$=$\frac{363}{0.9}$ = 403

10% of sample size was added to cover for possible non-response during the course of study. Therefore, the estimated sample size is363 + (10% of363) =363 + 40.3=403.3.

**2.5 SAMPLING TECHNIQUE**

A two -stage sampling technique was used in this study. In the first stage, purposive sampling was used to select one PHC in each LGA based on the criteria of having a high volume of antenatal care attendees. Selection was done with the guidance of the PHC coordinator of the LGA. In the second stage, population proportionate to size was used to allocate the number of respondents required from each facility. Systematic sampling Technique was used in the selection of respondents. The monthly attendance at the antenatal care clinics in the PHCs over months was used to determine the average attendance at each antenatal clinic (with an average of over 300 and 200 attendees attending antenatal clinic monthly in Esan west and Esan central respectively) . This figure was used to determine the sampling interval. In each facility, on each day of the survey, the first respondent was picked randomly, and the sampling interval used to pick other participants till the number of respondents to be recruited in a day is reached. This continued till the sample size for the facility was completed.

**2.6 STUDY INSTRUMENT**

**Questionnaire:** A structured questionnaire was employed for the study

The questionnaire covers the following sections

Section A: Socio demographic data

Section B: Knowledge of diabetes

Section C: Attitude towards Diabetes

Section E: Perceived risk of GDM

**2.7 PRETESTING**

To ensure the reliability, the study will be pretested among pregnant women attending antenatal care at Irrua Specialist Teaching Hospital, who fit into the inclusion criteria. The first draft of questionnaires was based on the literature review on the specific objectives. The questionnaire will be administered to 10% of the sample size (40). The data collected will be analyzed and used to design the standardized structured questionnaire.

**2.8 RELIABITY AND VALIDITY OF MEASUREMENT OF DATA.**

Face validity will be obtained by giving a self-structured questionnaire to the supervisor to check, scrutinize and correct before distribution.

**2.9 SCORING SYSTEM**

A scoring system of 70% and above will be assigned for good knowledge while below 70% will be assigned to poor knowledge.

**2.10 DATA COLLECTION METHOD**

Data was collected using interviewer administered questionnaire.

**2.11 DATA ANALYSIS**

Statistical test of association between proportions will be done by the use of appropriate test of statistics. Data analysis will be carried out using the Statistical Package for the Social Sciences (SPSS) version 23.0 (IBM Corporation, Armonk, Ny, USA). The use of tables and percentages (%) as employed in analyzing the variables of the respondents such as age, sex, marital status etc.

 Statistical level of significance was set at p < 0.05, construction of 95% confidence interval and odds ratio was done where applicable. Association between the dependent and independent variable was also tested using Chi-square. The data was analyzed using the descriptive statistical methods which were represented in frequency distribution tables, percentage and bar chart.

**2.12 ETHICAL CONSIDERATION**

The consent for this research was sought for from the department of Community Medicine Ambrose Alli University Ekpoma. Ethical approval for the study, also was sought for from the Health Research Ethics Committee of Irrua Specialist Teaching Hospital. Informed consent was obtained from the Hospital Research Ethic Committee, Local Government Council, Community head and participants including the head medical practitioner in charge of both health care facilities. The questionnaire was distributed accordingly. A written informed consent was obtained from respondents and explained to those who cannot read and write, the purpose of the research and questionnaire was explained to the respondents who do not understand and they were made to understand that information gotten was strictly confidential, with information gotten stored in files and kept away from unauthorized access and soft copy stored in pass-worded laptops which Was available to only the researcher and used solely for academic purpose.

**3.0 RESULT**

**Table 1a: SOCIODEMOGRAPHIC DATA**

|  |  |  |
| --- | --- | --- |
| **VARIABLE** | **FREQUENCY****(n= 403)** |  **(%)** |
| **AGE**10-20 | 9 | 2.2 |
| 21-30 | 278 | 69.0 |
| 31-40 | 73 | 18.1 |
| 51-60 | 43 | 10.7 |
| Total Mean Age± SD= 35±1.27 | 403 | 100.0 |

**RELIGION**

|  |  |  |
| --- | --- | --- |
| Christians | 352 | 87.3 |
| Muslims | 34 | 8.4 |
| Others | 17 | 4.2 |
| Total | 403 | 100.0 |
| **MARITAL STATUS** |  |  |
| Married | 196 | 48.6 |
| Engaged | 53 | 13.2 |
| Single | 144 | 35.7 |
| Divorced | 10 | 2.5 |
| **ETHNICITY**Esan  | 160 | 39.0 |
| Bini | 45 | 11.3 |
| Etsako | 70 | 17.3 |
| Yoruba | 65 | 16.1 |
| Hausa | 16 | 4.0 |
| Ibo | 47 | 11.7 |
| Total | 403 | 100.0 |

**Table 1b: SOCIODEMOGRAPHIC DATA**

|  |  |  |
| --- | --- | --- |
| **VARIABLE** | **FREQUENCY****(n= 403)** | **PERCENTAGE(%)** |
| **LEVEL OF EDUCATION** |  |  |
| No formal education | 42 | 10.4 |
| Primary | 5 | 1.2 |
| Secondary | 20 | 5.0 |
| Tertiary | 336 | 83.4 |

**OCCUPATION**

|  |  |  |
| --- | --- | --- |
| Teacher | 46 | 11.4 |
| Lawyer | 40 | 9.9 |
| Doctor | 67 | 16.6 |
| Nurse | 28 | 6.9 |
| Engineer | 17 | 4.2 |
| Secretary | 52 | 12.9 |
| Lecturer Others | 10143 | 2.535.3 |
| **PREVIOUS STILLBIRTH OR MISCARRIAGE** |  |  |
| None | 385 | 95.5 |
| <5 | 5 | 1.2 |
| 5-10 | 13 | 3.2 |
| **PARITY** |  |  |
| None | 215 | 53.3 |
| 1 | 21 | 5.2 |
| 2-4 | 148 | 36.7 |
| >5 | 19 | 4.7 |

|  |  |  |
| --- | --- | --- |
| **FAMILY HISTORY OF DIABETES MELLITUS** |  |  |
| Yes | 98 | 24.3 |
| No | 305 | 75.7 |

Fig 1 : Bar Chart showing means of awareness of GDM

Fig 2 : Pie chart displaying Knowledge of GDM amongst women attending the ANC

Fig 3 : Pie chart displaying Attitude of GDM amongst women attending the ANC

**Table 2 : ASSOCIATION BETWEEN SELECTED SOCIO-DEMOGRAHIC DATA AND KNOWLEDGE OF DIABETES AMONG PREGNANT WOMEN**

**VARIABLE FREQUENCY P-VALUE**

 **KNOWLEDGE**

**AGE GOOD POOR TOTAL**

10-20 9 0 9

21-30 228 47 275

31-40 76 0 76 0.001\*

51-60 43 0 43

Total 356 47 403

**MARITAL YES NO TOTAL**

**STATUS**

Married 179 19 198

Engaged 43 9 52

Single 124 19 143 0.265

Divorced 10 0 10

Total 356 47 403

**LEVEL OF YES NO TOTAL**

**EDUCATION**

No formal 32 9 41 **0.058**

education

Primary 5 0 5

Secondary 23 0 23

Tertiary 296 38 334

**Total 356 47 403**

**OCCUPATION** YES NO TOTAL

Teacher 46 0 46

Lawyer 31 9 40 **0.001\***

Doctor 48 18 66

Nurse 28 0 28

Engineer 17 0 17

Secretary 52 0 52

Lecturer 10 0 10

Others 124 20 144

**Total 356 47 403**

**Table 3 : ASSOCIATION BETWEEN ATTITUDE AND KNOWLEDGE OF DIABETES AMONG PREGNANT WOMEN**

ATTITUDE KNOWLEDGE

 POOR GOOD TOTAL P-VALUE

POOR 37 194 231 2.456

GOOD 15 157 172

TOTAL 42 361 403

**Discussion**

Diabetes in pregnancy also known as gestational diabetes is a diabetes a woman can develop during pregnancy. Uncontrolled gestational diabetes can cause problem during delivery, preeclampsia, and can lead to having large baby thus requiring cesarean section.

A cross- sectional study done on the assessment based on the knowledge of diabetes among pregnant women resident at Irrua community, Esan central local government area of Edo state, southern Nigeria, indicates that 88.3% of respondent displayed good knowledge on diabetes in pregnancy . However, (15%) get to know about it through Radio,92.0%of respondents are aware that diabetes can occur in pregnancy, 58.5% have no history of diabetes in their family, 74.5% of respondents believe that gestational diabetes mellitus can affect the baby’s health, 53,3% of participant know that spontaneous abortion is a complication of gestational diabetes, 70.8% believe that diabetes can occur in the first pregnancy, 73% of respondents are unaware that diabetes in previous pregnancy is a risk factor for diabetes in current pregnancy. This was in contrast to the study done in Samosa where fair knowledge was recorded as seen 53% [11] and also in a study done in Saudi Arabia were the findings amongst 457 participants revealed that the overall level of knowledge about GDM was poor, with less than 10% of participants demonstrating adequate awareness. The study also highlighted that over 80% of the participants were unaware of GDM [19]. A similar descriptive cross-sectional household survey involving 2,595 women of reproductive age residing in five local government area in southern Nigeria. The result show that majority (90.6%) had heard about diabetes mellitus, only 38.2% knew that diabetes can occur for the first time in pregnancy [12].

Study carried out on the assessment of the attitude and beliefs of dietary practices in pregnant women resident at Irrua community, shows that a vast majority of respondents (85.3%) would be punctual to antenatal care visit, 88.0% are willing to do a regular blood glucose test, 89.5% agree to keep on monitoring blood glucose level after the pregnancy, also majority of participants believe it is necessary to test for diabetes in pregnancy, 76.0%know that insulin/ drugs are required to treat gestational diabetes. Vast majority of respondents (92.0%) are willing to maintain a good dietary pattern and also, 80.5% are willing to take regular exercise as also seen in a study done in Oyo were results revealed that 65% of the respondents have fair knowledge of nutritional diet during pregnancy while 35% of participants had good knowledge of nutritional diet during pregnancy respectively [13]. It was not surprising to see that the majority showed positive attitude towards the control of GDM in pregnancy. In contrast to a study in Ethiopia were it was seen that 31% of 750 pregnant women demonstrated very poor attitude towards dietary practice in GDM [20]. A prospective qualitative study, semi structured interview conducted with 9 women (ages 23 to 40) at three separate times during pregnancy, at three and fourteen month after delivery at a Swedish in-hospital diabetes clinic, they felt calmer. All but one of them expressed concern for the baby’s wellbeing and regression. Instead, the women were concerned about losing their ability to live a normal life and being forced to make modification of their diets, lifestyle, and need for insulin injection [14].

The cross-sectional assessment on the dietary practices in pregnant women with diabetes, within the community (Irrua) reveal that a vast majority of respondents (97.5%) have heard about nutrition,93.0% believe that balance diet is important during pregnancy,95.5% know about the main food class that makes up a balance diet, about 89.9%know that food is important in fighting infection,68.3% don’t avoid any food item during pregnancy, 75% of respondents believe that rapid weight gain is a risk factor in pregnancy, majority of participants(91.3%) know that diet and exercise play a major role in treatment of gestational diabetes, about 40.5% 0f respondents eat four times daily, 45% skip breakfast,90% eat fresh fruits and vegetables,84% drink adequate fluid daily, 71.5% have iron supplement, and 53% know the main food source of iron and 82.5% don’t drink alcohol. In contrast to a study done in India it was observed that red meat consumption was associated with an increased risk of GDM (aRR = 2.1, 95% CI 1.5, 2.9) after adjusting for age, family history of diabetes and socioeconomic status [16]. In a study done in Cape Town South Africa it was concluded that the dietary intake of women was not optimal and fell short of several nutritional guidelines for pregnant women with hyperglycemia which could culminate to GDM. They strongly held beliefs regarding sugary foods/drinks may contribute to poor adherence to nutritional guidelines among pregnant women with GDM in South Africa [15].

An assessment on the perceived risk among diabetes in pregnant women resident in Irrua community, shows that 88.5% have not been diagnosed of gestational diabetes before, 75% have no potential family history of diabetes, 85.8% have not given birth to an overweight baby before, 89.5% have no unexplainable fetal loss, 95.8% have no history of still birth in the past, 57.8% are aware the rapid weight gain is a risk factor for gestational diabetes, 61% of respondents are aware that mothers whose mother were diabetic are at risk of developing diabetes in pregnancy as compared to a compared to a study done in India where the expectant mothers showed better response compared to the controls when asked whether a person can have diabetes but be unaware of the condition; whether diabetes can harm a person’s body before diagnosis; long term complications of the disease(P<0.05) [17]. A similar study done among 250 pregnant women from Chengdu second people’s hospital from January to June 2018, they were grouped into GDM group (n=48) and non GDM group (n=202). Clinical data and biochemical indicator were compared between both groups and logistic regression analysis was performed to analyze the risk factor for GDM. GDM group was significantly higher than non GDM group in age, pregnancy times, pre-pregnancy body mass index, low density lipoprotein, level of history of diabetes mellitus in first degree relatives. The result of the logistic regression analysis revealed that the aforementioned were risk factor for GDM [18].

**Conclusion**

The incidence of diabetes mellitus is increasing globally at an epidemic proportion, the incidence of occurrence in sub-Saharan Africa was 14% and in Nigeria prevalence was about 0.5-38% and this was mainly accredited to late presentation to antenatal care. Gestational diabetes mellitus is an important marker of pregnancy complications, but is strongly influenced both by individual choices and societal factors, thus significant concerns must be mitigated before being pregnant such as maternal obesity and overweight.

**RECOMMENDATIONS**

In awareness of the increasing global prevalence of diabetes mellitus at an epidemic proportion, various strata of society must work coherently to abate this increasing prevalence

**TO THE GOVERNMENT:** As the majority of the participants in this study had good knowledge of GDM, government should ensure continuous training of health workers, increased GDM awareness campaign as well as women empowerment in a bid to maintain and increase this knowledge

**TO THE HEALTH WORKERS:** As majority (60%) of the participants got to know of this condition through health workers in the hospital, hence, emphasis should be made on these health workers educating people on GDM and its risks as well as possible complications.

**TO THE COMMUNITY:** Community members should have strict adherence to the recommendations of the health workers and government as it concern the management of GDM.

**REFERENCE**

1. Quintanilla Rodriguez BS, Vadakekut ES, Mahdy H. Gestational Diabetes. [Updated 2024 Jul 14]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2025 Jan-. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK545196>
2. Muche, A.A., Olayemi, O.O. & Gete, Y.K. Prevalence and determinants of gestational diabetes mellitus in Africa based on the updated international diagnostic criteria: a systematic review and meta-analysis. Arch Public Health 77, 36 (2019). https://doi.org/10.1186/s13690-019-0362-0
3. Lu, Y., Huang, J., Yan, J. et al. Meta-analysis of risk factors for recurrent gestational diabetes mellitus. BMC Pregnancy Childbirth 25, 257 (2025). <https://doi.org/10.1186/s12884-025-07367-9>
4. Lee J, Lee NK, Moon JH. Gestational Diabetes Mellitus: Mechanisms Underlying Maternal and Fetal Complications. Endocrinol Metab. 2025;40(1):10-25.
5. Martinez, Valerie C. et al Evidence-Based Care Practices for Children Exposed to a Diabetes-Complicated Pregnancy. The Journal for Nurse Practitioners, Volume 21, Issue 1, 105254
6. Noctor E, Dunne FP. Type 2 diabetes after gestational diabetes: The influence of changing diagnostic criteria. *World J Diabetes*. 2015;6(2):234-244. doi:10.4239/wjd.v6.i2.234
7. Hedeager Momsen AM, Høtoft D, Ørtenblad L, et al. Diabetes prevention interventions for women after gestational diabetes mellitus: an overview of reviews. *Endocrinol Diabetes Metab*. 2021;4(3):e00230. Published 2021 Feb 1. doi:10.1002/edm2.230
8. Marshall NE, Abrams B, Barbour LA, et al. The importance of nutrition in pregnancy and lactation: lifelong consequences. *Am J Obstet Gynecol*. 2022;226(5):607-632. doi:10.1016/j.ajog.2021.12.035
9. Myburgh, N., Qwabi, T., Shivambo, L., Ntsie, L., Sokani, A., Maixenchs, M., Choge, I., Mahtab, S., Dangor, Z., & Madhi, S. (2024). Factors affecting antenatal care attendance in Soweto, Johannesburg: The three-delay model. *African journal of primary health care & family medicine*, *16*(1), e1–e9. <https://doi.org/10.4102/phcfm.v16i1.4333>
10. Sample Size Estimation using Yamane and Cochran and Krejcie and Morgan and Green Formulas and Cohen Statistical Power Analysis by G\*Power and Comparisons December 2021. [file:///C:/Users/HP/Downloads/numaamati,+07.pdf](file:///C%3A/Users/HP/Downloads/numaamati%2C%2B07.pdf)
11. Khanpaye A, Madmoli Y, Riahipour B, Mohebifar M, Madmoli M, Mahmoodi R, et al Evaluation of knowledge, attitude and performance regarding gestational diabetes mellitus in Southwest of Iran J Pharm Res Int 2019 28 1–6Cited Here | Google Scholar
12. Price LA, Lock LJ, Archer LE, Ahmed Z. Awareness of Gestational Diabetes and its Risk Factors among Pregnant Women in Samoa. *Hawaii J Med Public Health*. 2017;76(2):48-54.
13. Balogun O. O., Fadupin G. T., and Deniran I. A., “Assessment of Knowledge and Attitude towards Adequate Diet Practices of Pregnant Women Attending Ante-natal Clinic at University College and Adeoyo Maternity Hospitals, Oyo State, Nigeria.” American Journal of Food and Nutrition, vol. 7, no. 1 (2019): 13-18. doi: 10.12691/ajfn-7-1-3
14. Alnaim A Knowledge of gestational diabetes mellitus among prenatal women attending a public health center in Al-Khobar, Saudi Arabia Egypt J Hosp Med 2020 80 560–9[Cited Here](https://journals.lww.com/jfmpc/Fulltext/2022/07000/Awareness_of_gestational_diabetes_mellitus_among.8.aspx#O3-8-8) | [Google Scholar](https://scholar.google.com/scholar_lookup?title=Knowledge+of+gestational+diabetes+mellitus+among+prenatal+women+attending+a+public+health+center+in+Al-Khobar%2c+Saudi+Arabia&publication_year=2020&author=A+Alnaim)
15. Krige, S. M., Booley, S., Levitt, N. S., Chivese, T., Murphy, K., & Harbron, J. (2018). Dietary Intake and Beliefs of Pregnant Women with Gestational Diabetes in Cape Town, South Africa. *Nutrients*, *10*(9), 1183. <https://doi.org/10.3390/nu10091183>
16. Deepa, R., Lewis, M.G., Van Schayck, O.C.P. *et al.* Food habits in pregnancy and its association with gestational diabetes mellitus: results from a prospective cohort study in public hospitals of urban India. *BMC Nutr* **6**, 63 (2020). <https://doi.org/10.1186/s40795-020-00388-x>
17. Biswas, P., Majumdar Das, S., & Das, B. (2018). Knowledge regarding diabetes among expectant mothers attending ante natal clinic of a tertiary care institution of Kolkata: a cross sectional study. *International Journal of Research in Medical Sciences*, *6*(12), 4008–4014. <https://doi.org/10.18203/2320-6012.ijrms20184899>
18. Gyawali, B., Ferrario, A., van Teijlingen, E., & Kallestrup, P. (2016). Challenges in diabetes mellitus type 2 management in Nepal: a literature review. *Global health action*, *9*, 31704. <https://doi.org/10.3402/gha.v9.31704>
19. Ali TM, Keshk EA, Almaqadi OM, et al. Awareness of Gestational Diabetes Mellitus Among Women in the Al-Baha Region, Saudi Arabia. *Cureus*. 2023;15(12):e50163. Published 2023 Dec 8. doi:10.7759/cureus.50163
20. Gebremichael MA, Lema TB. Prevalence and Predictors of Knowledge and Attitude on Optimal Nutrition and Health Among Pregnant Women in Their First Trimester of Pregnancy [published correction appears in Int J Womens Health. 2023 Nov 27;15:1893-1894. doi: 10.2147/IJWH.S450769.]. *Int J Womens Health*. 2023;15:1383-1395. Published 2023 Sep 4. doi:10.2147/IJWH.S415615