**RELATIONSHIP BETWEEN SOCIODEMOGRAPHIC CHARACTERISTICS AND DIETARY HABITES OF PREGNANT WOMEN ATTENDING ATENATAL CARE IN YARIMAN BAKURA SPECIALIST HOSPITAL ZAMFARA STATE**

**Sandra Owoyya Oteh1, Mohammed Auwal Ibrahim1, Sani Ibrahim1, Auwal Adamu1, HarunaAbdullahi1\*, and Mohammed Auwal Saliu1**

**1Department of Biochemistry, Ahmedu Bello University, Zaria, Nigeria**

**\*Corresponding Author: Email: get2haruna@gmail.com**

**ABSTRACT**

Adequate diet does not involve the quantity of food consumed alone; quality and variety also play a role. This study investigated the interplay between dietary habits and sociodemographic characteristics of pregnant women. A cross-sectional study was conducted. A total of 239 pregnant women were enrolled, and a questionnaire was used to collect data on sociodemographic information, medical and obstetric history, anti-malaria drug use, and insecticide-treated net (ITN) use. A combination of a food frequency questionnaire and 24-hour dietary recall was used to assess dietary habits. (53.6%) pregnant women were aged 20 to 25 years (89.6%) belonging to the Hausa ethnic group, (99.6%) of whom were married. (59.1%) had completed secondary education, (68.6%) reported “not working”, (53.8%) had between 1 and 3 living children, (59.1%), and were primiparous, indicating that they had given birth once. , and (50.0%) reported never using supplements. The majority (60.4%) relied on other sources, such as sachet water, for their water supply. (49.4%) of the respondents, a drainage system was installed and (47.2%) used ITNs more than three times a week. (64.8%) Of the women, the women did not meet the minimum dietary diversity (MDD) requirements. Dietary diversity was significantly associated with socioeconomic status (p= 0.05). This study revealed that low socioeconomic status in pregnant women with malaria may be the cause of inappropriate dietary practices. The findings highlight the need for targeted nutritional and socioeconomic interventions in this vulnerable population.

Key Words: Minimum Dietary Diversity, Medical History, Obstetric History, Food Consumption, Socio-economic Status.

**INTRODUCTION**

It has long been acknowledged that populations living in malaria-endemic areas generally live under socioeconomic conditions that lead to poor nutritional status (Shankar 2000). The groups at the highest risk for the adverse effects of poor nutrition, (pregnant women) are also the most affected by poor sociodemographic conditions (Devaki, and Shobha,2022). It has been suspected that nutrition may influence susceptibility to the disease or alter its course, (Shankar 2000, Genton *et al.* 1998).

During pregnancy, there are several changes that put the mother at risk of infection. Dietary habits are a major determinant of healthy living, especially among pregnant women, considering their high need for an adequate diet, which is essential for nourishment of mother and proper fetal growth (Genton *et al* 1998).

Socioeconomic and demographic factors, such as age, education level, income, and water source, have been reported to affect the dietary habits of individuals in a population (Kumera, et, al., 2018, Desta, el, al., 2019, Devaki, and Shobha,2022).

As of 2024, the World Bank reported that 62% and 99.3% of people living in Zamfara State survived for less than $2.15 and $6.85, respectively (World Bank Report, 2024). In 2019, another report showed that 73.98% of the same population lived below the poverty line (Doris, 2022). Despite the high level of agricultural activity, Zamfara State continues to experience an uprise in banditry activities, hence an increase in food insecurity, which is one of the major factors promoting poverty in the region. The effect of sociodemographic factors on the dietary habits of pregnant women living in Zamfara State, using an antenatal clinic as a case study, is a relationship worth studying.

**MATERIALS AND METHOD**

This cross-sectional study. Data were collected during antenatal visits from pregnant women who consented to participate in the study. After collecting informed consent, eligible study participants completed a questionnaire. Enrollment of study participants was performed at the ANC clinic of the Yariman Bakura Specialist Hospital, Gusau. Screening was conducted to determine the eligibility of participants based on the inclusion criteria for the study. A general introduction of the nature of the study was given to pregnant women by the nursing staff at the antenatal care unit during their health talks. Data were collected from 263 pregnant women with malaria. Materials used in this study included validated semi-structured, questionnaire, and writing materials. Data collected from this study were analyzed using SPSS BM software version 21. Sociodemographic characteristics and dietary patterns were summarized using descriptive statistics and charts. Data were presented as mean ± standard deviation.

# **RESULTS**

# **Socio-Demographic Characteristics**

# The results of this study obtained from pregnant women receiving antenatal care at the Yariman Bakura Specialist Hospital in Gusau, Zamfara, are presented as follows, with a total sample size of 239.

Table 1.0: Socio-Demographic Characteristics of pregnant women receiving antenatal care at Yariman Bakura Specialist Hospital, Gusau, Zamfara state (n=239)

|  |  |  |  |
| --- | --- | --- | --- |
| Variables | | Frequency | Percentage (%) |
| Age | < 20 years | 24 | 10.1 |
| 20-25 years | 128 | 53.6 |
| 26-30 years | 61 | 25.3 |
| 31-40 years | 26 | 11.0 |
| > 40 years | 0 | 0.0 |
| **Mean** | **25±5** | |
| Marital Status | Married | 238 | 99.6 |
| Single | 1 | 0.4 |
| Others | 0 | 0.0 |
| Religion | Christianity | 4 | 1.7 |
| Islam | 235 | 98.3 |
| Traditional | 0 | 0.0 |
| Ethnicity/Tribe | Hausa | 208 | 86.9 |
| Fulani | 21 | 8.9 |
| Yoruba | 2 | 0.8 |
| Igbo | 1 | 0.4 |
| Others | 7 | 3.0 |
| Highest Education Level | None | 29 | 12.2 |
| Primary | 21 | 8.9 |
| Secondary | 141 | 59.1 |
| Tertiary | 46 | 19.4 |
| Others | 1 | 0.4 |
| Occupation | Employee | 16 | 6.8 |
| Self-employed | 59 | 24.6 |
| Business | 0 | 0.0 |
| Not Working | 164 | 68.6 |
| Others | 0 | 0.0 |
| Highest Husband Education Level | None | 21 | 8.9 |
| Primary | 6 | 2.5 |
| Secondary | 64 | 26.6 |
| Tertiary | 144 | 60.3 |
| Others | 4 | 1.7 |
| Husband Occupation | Employee | 114 | 47.9 |
| Self-employed | 111 | 46.6 |
| Business | 0 | 0.0 |
| Not Working | 12 | 5.1 |
| Others | 1 | 0.4 |
| Family Type | Monogamy | 173 | 72.5 |
| Polygamy | 66 | 27.5 |
| Average Monthly Income | below N20,000 | 45 | 18.8 |
| N20,000 – N50,000 | 142 | 59.4 |
| N51,000 – N 100,000 | 52 | 21.8 |
| above N100,000 | 0 | 0.0 |

Table 4.2: Obstetric history of pregnant women receiving antenatal care at Yariman Bakura Specialist Hospital, Gusau, Zamfara state (n=239)

|  |  |  |  |
| --- | --- | --- | --- |
| Variables | | Frequency | Percentage (%) |
| Number of Living Children | No Child | 71 | 29.9 |
| 1-3 Children | 129 | 53.8 |
| 4-6 Children | 31 | 12.9 |
| 7-10 Children | 7 | 3.0 |
| 11-15 Children | 0 | 0.0 |
| > 15 Children | 1 | 0.4 |
|  | **Mean** | **2±2** | |
| Age of Last Child (years) | 1 year | 41 | 17.0 |
| 1 Years | 8 | 3.2 |
| 2 Years | 42 | 17.6 |
| 3 Years | 67 | 28.2 |
| 4 Years | 36 | 14.9 |
| 5 Years and above | 46 | 19.1 |
| **Mean** | **3±2** | |
| Birth Order | First Order | 102 | 42.7 |
| Second-Fourth Order | 96 | 40.2 |
| Above the Fourth Oder | 41 | 17.1 |
| Parity | Primiparous | 141 | 59.1 |
|  |  |  |
|  |  |  |
| Multiparous | 98 | 40.9 |
| Intake of supplements | Never | 120 | 50.0 |
| Sometimes | 95 | 39.7 |
| Complete | 24 | 10.3 |

Table 4.3: Medical history of pregnant women receiving antenatal care at Yariman Bakura Specialist Hospital, Gusau, Zamfara state (n=239)

|  |  |  |  |
| --- | --- | --- | --- |
| Variables | | Frequency | Percentage (%) |
| Kidney complications? | Yes | 1 | 0.4 |
| No | 238 | 99.6 |
| Bone complications? | Yes | 0 | 0.0 |
| No | 239 | 100.0 |
| Heart disease? | Yes | 40 | 16.9 |
| No | 199 | 83.1 |
| High blood pressure | Yes | 7 | 3.0 |
| No | 232 | 97.0 |
| Eyes complications? | Yes | 1 | 0.4 |
| No | 238 | 99.6 |
| Arthritis? | Yes | 1 | 0.4 |
| No | 238 | 99.6 |
| Cancer | Yes | 0 | 0.0 |
| No | 239 | 100.0 |
| HIV/AIDS | Yes | 0 | 0.0 |
| No | 239 | 100.0 |
| Diabetes | Yes | 0 | 0.0 |
| No | 239 | 100.0 |
| Do you take anti-malarial medications prescribed by your doctor? | Yes | 85 | 35.4 |
| No | 154 | 64.6 |

Table 4. 4: Household Practices of pregnant women receiving antenatal care at Yariman Bakura Specialist Hospital, Gusau, Zamfara state (n=239)

|  |  |  |  |
| --- | --- | --- | --- |
| Variables | | Frequency | Percentage (%) |
| Source of water | Well | 16 | 6.8 |
| Tape | 78 | 32.8 |
| None | 0 | 0.0 |
| Borehole/treated water | 144 | 60.4 |
| Drainage system | Yes | 118 | 49.4 |
| No | 121 | 50.6 |
| Frequency of ITN use per week | None | 40 | 16.6 |
| 1 time | 4 | 1.7 |
| 2-3 times | 82 | 34.5 |
| >3 times | 113 | 47.2 |

Table 4.5: Eating habits of pregnant women who received antenatal care at Yariman Bakura Specialist Hospital, Gusau, Zamfara state (n=239)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Variables | Never% | Rarely% | Sometimes% | Often% | Always% |
| I eat five meals a day (including 3 main meals and two snacks) | 0(0) | 17(7.2) | 84(35.2) | 22(9.3) | 115(48.3) |
| I do not eat breakfast daily. | 58(24.3) | 52(21.7) | 37(15.3) | 4(1.7) | 88(37) |
| I schedule the time to eat a meal | 49(20.5) | 85(35.5) | 76(31.6) | 1(0.4) | 29(12) |
| I count the amount of food I want to eat before I start eating it. | 52(21.9) | 73(30.5) | 84(35.2) | 5(2.1) | 25(10.3) |
| I eat fried meals a day. | 4(1.8) | 19(7.8) | 114(47.9) | 23(9.6) | 79(32.9) |
| I use margarine or butter in the preparation of meals. | 27(11.1) | 27(11.1) | 103(43.2) | 16(6.8) | 66(27.8) |
| I eat a dessert without restricting the amount | 12(4.8) | 43(18.1) | 99(41.6) | 19(7.8) | 66(27.7) |
| I eat canned foods. | 39(16.4) | 22(9.1) | 107(44.8) | 16(6.7) | 55(23) |
| I eat chickens or birds with skinning. | 12(4.8) | 14(6) | 132(55.4) | 40(16.9) | 40(16.9) |
| I eat junk food such as (Hamburger or Shawarma) | 74(30.9) | 20(8.5) | 96(40) | 25(10.3) | 25(10.3) |
| I prefer to add salt to foods during meals. | 23(9.8) | 19(8) | 141(58.9) | 48(20.2) | 7(3.1) |
| I eat fresh vegetables without cooking daily. | 13(5.5) | 21(8.7) | 127(53) | 72(30.1) | 7(2.7) |
| I eat only one kind of fruit every meal. | 5(2.2) | 22(9.4) | 136(56.9) | 71(29.8) | 4(1.7) |
| I drink approximately 2 L/ or more water or fluids daily. | 6(2.5) | 9(3.7) | 130(54.3) | 87(36.4) | 7(3.1) |
| I take multivitamins as prescribed by my doctor | 66(27.5) | 24(10) | 124(52.1) | 24(10) | 1(0.4) |

Figure 4.1: Food consumed by pregnant women receiving antenatal care at Yariman Bakura Specialist Hospital, Gusau, Zamfara state (n=239)

Table 4: 6: Frequency of food consumption by pregnant women receiving antenatal care at Yariman Bakura Specialist Hospital, Gusau, Zamfara state (n=239)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Food groups | Never | Seldom (<1/month) | 1-3 per month | 1-2 per week | 3-4 per week | Daily |
| Milk and Milk products | 21(8.6) | 5(2.1) | 26(10.7) | 107(44.6) | 79(33.1) | 2(0.9) |
| Poultry and Meat | 9(3.8) | 4(1.7) | 39(16.2) | 114(47.9) | 67(28.2) | 5(2.2) |
| Grains/Cereals | 1(0.4) | 4(1.7) | 27(11.3) | 103(42.9) | 104(43.3) | 1(0.4) |
| Legumes, nuts, and seeds | 4(1.7) | 3(1.3) | 26(10.7) | 121(50.7) | 85(35.6) | 0(0) |
| Roots and tubers | 13(5.6) | 3(1.3) | 30(12.4) | 110(45.9) | 83(34.8) | 0(0) |
| Vegetables | 2(0.9) | 5(2.0) | 19(8.2) | 124(51.9) | 86(36.1) | 2(0.9) |
| Fruits | 0(0) | 1(0.4) | 24(9.9) | 143(59.9) | 69(28.9) | 2(0.9) |
| Eggs and their products | 14(6) | 9(3.9) | 35(14.6) | 131(54.9) | 48(20.2) | 1(0.4) |
| Fish and their products | 21(9) | 4(1.7) | 29(12) | 113(47.4) | 69(29.1) | 2(0.9) |
| Fats and Oils | 1(0.4) | 5(2.2) | 10(4.4) | 110(46.1) | 111(46.5) | 1(0.4) |
| Spices and condiments | 1(0.5) | 7(2.8) | 11(4.7) | 140(58.6) | 79(33.1) | 1(0.5) |
| Beverages | 10(4.1) | 6(2.7) | 24(9.9) | 91(38.1) | 105(43.9) | 3(1.3) |
| Sweets | 32(13.4) | 20(8.3) | 34(14.4) | 111(46.3) | 34(14.4) | 8(3.2) |

Figure 4. 2: Dietary diversity of pregnant women receiving antenatal care at Yariman Bakura Specialist Hospital, Gusau, Zamfara state (n=239)

Table 4.7: Association between Dietary diversity and sociodemographic characteristics of pregnant women receiving antenatal care at Yariman Bakura Specialist Hospital, Gusau, Zamfara, Turkey

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Variables | | Dietary Diversity | | |
| Not Diversified | Diversified | p-value |
| Age | < 20 years | 9(100.0) | 0(.0) | 0.146 |
| 20-25 years | 48(80.0) | 12(20.0) |  |
| 26-30 years | 11(100.0) | 0(.0) |  |
| 31-40 years | 3(100.0) | 0(.0) |  |
| > 40 years | 0(.0) | 0(.0) |  |
| Religion | Christianity | 3(100.0) | 0(.0) | 0.468 |
| Islam | 68(85.0) | 12(15.0) |  |
| Traditional | 0(.0) | 0(.0) |  |
| Ethnicity/Tribe | Hausa | 60(88.2) | 8(11.8) | 0.047\* |
| Fulani | 5(55.6) | 4(44.4) |  |
| Yoruba | 3(100.0) | 0(.0) |  |
| Igbo | 3(100.0) | 0(.0) |  |
| Others | 0(.0) | 0(.0) |  |
| Highest educational level: | None | 11(73.3) | 4(26.7) | 0.045\* |
| Primary | 8(100.0) | 0(.0) |  |
| Secondary | 35(81.4) | 8(18.6) |  |
| Tertiary | 17(100.0) | 0(.0) |  |
| Others | 0(.0) | 0(.0) |  |
| Employment status: | Employee | 2(100.0) | 0(.0) | 0.031\* |
| Self-employed | 17(89.5) | 2(10.5) |  |
| Business | 0(.0) | 0(.0) |  |
| Not Working | 52(83.9) | 10(16.1) |  |
| Others | 0(.0) | 0(.0) |  |
| Highest Husband's educational level: | None | 6(75.0) | 2(25.0) | 0.424 |
| Primary | 3(100.0) | 0(.0) |  |
| Secondary | 24(80.0) | 6(20.0) |  |
| Tertiary | 38(90.5) | 4(9.5) |  |
| Others | 0(.0) | 0(.0) |  |
| Husband's Employment status: | Employee | 30(88.2) | 4(11.8) | 0.161 |
| Self-employed | 41(83.7) | 8(16.3) |  |
| Business | 0(.0) | 0(.0) |  |
| Not Working | 0(.0) | 0(.0) |  |
| Others | 0(.0) | 0(.0) |  |
| Average monthly income (Naira) | below N20,000 | 13(100.0) | 0(.0) | 0.231 |
| N 20,000 – N50,000 | 19(90.5) | 2(9.5) |  |
| N51,000 – N 100,000 | 0(.0) | 0(.0) |  |
| above N100,000 | 0(.0) | 0(.0) |  |
| Family Size | Monogamy | 59(83.1) | 12(16.9) | 0.124 |
| Polygamy | 12(100.0) | 0(.0) |  |
| Dietary Diversity | Diversified | 46(95.8) | 2(4.2) | 0.002\* |
| Not diversified | 25(71.4) | 10(28.6) |  |

\* Chi-square statistics are significant at the .05 level.

**DICUSSION**

A total of 239 women provided their consent and qualified, based on the inclusion criteria, to be enrolled in this study. Mast ofThe mast sizes ofnt participants in this study were between 20 and 25 years (53.6%), and 26-30 (25.3%). This is typical of northern Nigeria, as most pregnant women in their reproductive age are in line with a finding reported in a previous study (Obasanjo et al, 2023). The Zamfara state population is approximately 80% Muslims, and traditionally, marriage is one of the major predictors of childbearing. This is similar to a study carried out by (Michael et al, 2018). The predominance of the Hausa ethnic group is (86.9%) in the study area reflects the local demographics of Zamfara, Nigeria. Hausa are the major ethnic group in this region. Level of education from this study indicates that there was a reasonable proportion of pregnant women with secondary education (59.1%) and tertiary education (19.4%). This is an improvement on the level of attainment of formal education in Zamfara state, which in contrast with a study reported between 2009 and 2010, the Gross Enrollment Ratio (GER) of Senior Secondary School for the girl-child was (6.9%), similar to a work carried out by (Dahiru, and Almustapha, 2022). However, the percentage of pregnant women (12.2%) and their husbands (8.9%) without formal education still calls for concern because it falls short of the Sustainable Development Goals (SDGs) to ensure that all women and men afford quality technical, vocational, and tertiary education, including university (SDG, 2015).

A (53.8%) of the pregnant women had between 1 and 3 children and only (12.8%) had 4 to 6 children. This is in line with a 2023 World Bank report on the fertility rate of Nigerians (World Bank, 2024) and a fall from the findings of a study in 2019, which stated that the fertility rate among northern Nigerian women was (8.02%) (Adebowale, 2019). This also signifies improved maternal health care and neonatal survival in this region. (83%) of the pregnant women had their last child falling into ages 1 and above, compared to the remaining (17%) whose last child was below age 1, indicating better awareness on child spacing and planning among the women. Findings on the intake of supplement in this study showed that only (50%) report to either partial or complete adherence. The remaining (50%) patients did not take supplements at all, which is the same with a work reported by (Ronan, and Halie, 2021). This information indicates that there is either a lack of enlightenment on the importance of its usage, accessibility, or its affordability. (47.2%) of the women used insecticide-treated nets (ITNs) frequently, (more than 3 times a week), and (34.5%) reported moderate usage between 2 and 3 times a week. This indicates good adherence to insecticide-treated net (ITN) utilization, especially with respect to the north, which is the same reported by (Dahiru, and Almustapha, 2022). However, this figure can be improved following the demographic survey report on malaria prevention in 2021, which states that Zamfara had a (66%) ownership of Insecticide Treated Nets (ITN), though falling short of the national target of (80%) household ownership. This differs from the demographic survey report on malaria prevention in 2021 in Zamfara State. The majority (60.4%) of the women use tap, borehole, and treated water, signifying access to portable water in the region, a determinant of maternal and child health, which is similar to work carried out by (Donald, and Elizabeth, 2019)

A superb proportion (97.4%) of pregnant women consumed staple foods which include foods like rice, maize, and cassava, which are a common source of carbohydrates in many diets. The inclusion of bean and peas (59.3%), which are excellent sources of plant-based protein and dietary fiber, improves the folic acid reserve, reduces the risk of spinal cord birth defects, and increases total food energy in the pregnant woman, this similar with a study carried by (Yeung et al, 2023). In summary, findings in this study on food consumption depicts quite a healthy habit with foods such as: Dairy items (43.9%), which can provide essential nutrients like calcium and vitamin D; flesh foods (52.6%), which typically include meat, poultry, or fish, are important sources of high-quality protein and various essential nutrients; dark green leafy vegetables (55.2%), rich in vitamin A, are crucial for maintaining healthy vision and immune function; other vegetables and fruits (43.2%) known for their vitamin A content, are essential for various bodily functions, including maintaining healthy skin and mucous membranes. However, consumption of Nuts and seeds (20.6%), which are nutrient-dense foods rich in healthy fats, proteins, vitamins, and minerals along with; eggs (25.3%), which are a rich source of protein and contain important nutrients like choline and vitamin B12, was poor among the pregnant women. (44.6%) and (33%) of the pregnant women reported consumption of milk and milk products, while (47.9%) and (28.2%) reported consumption of poultry, between 2 to 3 times and above 3 times per week, respectively. This indicates a healthy baby and better maternal health outcome, which is consistent with a study conducted by (Bodo, et, al., 2015). A good proportion of the women also consumed cereals and legumes > 2 times weekly, indicating a reasonable intake of energy and folate. Root vegetables help regulate body metabolism, including glucose levels, blood pressure, and lipid profiles; this survey is in conformity with that of (Tan, et, al, 2022). They also have antioxidant and anti-cancer properties (Tan, et, al, 2022). In general, (35%) pregnant women ate varied diets, whereas the remaining (65%) had a non-diversified diet. A non-diversified diet lacks variety and can lead to nutritional imbalances or deficiencies due to limited food choices. Taking an adequately diversified diet makes it more likely to obtain various minerals, vitamins, and nutrients that can help prevent deficiencies and chronic diseases. Previous studies have shown that the intake of a non-diversified diet significantly increases the rate of low birth weight (Amsalu, et, al., 2022).

# 

**6.2 Conclusion**

This study indicated that most pregnant women attending the Yariman Bakura Specialist Hospital were in between reproductive age and also showed that the socioeconomic status of pregnant women attending the Yariman Bakura Specialist Hospital in Gusau, Zamfara State is low. The dietary pattern of pregnant women is also appropriate. Therefore, we can conclude that the low socioeconomic status of pregnant women in this study had negative effects on their eating habits.

**REFERENCE**

Adebowale, A, S., (2019). Ethnic disparities in fertility and its determinants in Nigeria. *Fertil Res and Pract* **5**, 3 (2019). https://doi.org/10.1186/s40738-019-0055-y

[Amsalu, T, W,](https://pubmed.ncbi.nlm.nih.gov/?term=Wondemagegn%20AT%5BAuthor%5D) [Binalfew, T,](https://pubmed.ncbi.nlm.nih.gov/?term=Tsehay%20B%5BAuthor%5D)[Akiloge, L, M](https://pubmed.ncbi.nlm.nih.gov/?term=Mebiratie%20AL%5BAuthor%5D),and [Ayenew N](https://pubmed.ncbi.nlm.nih.gov/?term=Negesse%20A%5BAuthor%5D)., (2022).Effects of dietary diversification during pregnancy on birth outcomes in east Gojjam, northwest Ethiopia: A prospective cohort study, Front public HEALTH, 2022; 10: 1037714 Published online 2022 Dec 5. doi: [10.3389/fpubh.2022.1037714](https://doi.org/10.3389%2Ffpubh.2022.1037714)

Bodo, C, M, Swen, M, J., and Gerd S., (2015). Milk consumption during pregnancy increases birth weight, a risk factor for the development of diseases of civilization., Published online 2015 Jan 16. doi: [10.1186/s12967-014-0377-9](https://doi.org/10.1186%2Fs12967-014-0377-9)

Desta, M, Akibu, M, Tadese, M, and Tesfaye, M., (2019). Dietary diversity and associated factors among pregnant women attending antenatal clinic in Shashemane, Oromia, Central Ethiopia: a cross-sectional study. *J Nutr Metab.*2019;12:. 2019Top of Form

Bottom-up form

Devaki, G, and Shobha, R.,(2022). Socio-economic and socio-demographic determinants of diet diversity among rural pregnant women from Pune, India. Published online on Jul 5, 2022. doi: [10.1186/s40795-022-00547-2](https://doi.org/10.1186%2Fs40795-022-00547-2). Bio-Medical Central of Nutrition. 2022; 8: 54

Doris, D, S., (2022). Poverty headcount rate in Nigeria, 2019 by state (Zamfara) Published by December 5, 2022

Dahiru, A. S., and J. Almustapha (2022). Appraisal of the Degree of School Effectiveness among Secondary Schools in Zamfara State, Nigeria. Universal Journal of Educational Research, 1(3), 100-105.

DHS, (2021). Nigeria Malaria Indicator Survey. Final Report National Malaria Elimination Program Abuja, Nigeria National Population Commission Abuja, Nigeria. Maryland, USA, November 2022

Donald, U. O., & Elizabeth, O. O. (2019). Drinking water quality and handling practices among women in rural households in the Oshimili North Local Government Area of Delta State, Nigeria. December 2019, [*Ethiopian Journal of Science and Technology*](https://www.researchgate.net/journal/Ethiopian-Journal-of-Science-and-Technology-2312-6019?_tp=eyJjb250ZXh0Ijp7ImZpcnN0UGFnZSI6InB1YmxpY2F0aW9uIiwicGFnZSI6InB1YmxpY2F0aW9uIiwicG9zaXRpb24iOiJwYWdlSGVhZGVyIn19) 12(3):249 – 266. DOI: [10.4314/ejst.v12i3.5](http://dx.doi.org/10.4314/ejst.v12i3.5)

Genton, B., Al-Yaman, F., Ginny, M., Taraika, J., and Alpers, M. P. (1998). Relationship between anthropometry and malaria morbidity and immunity in Papua New Guinean children. America Journal of Clinical Nutrition. Sep;68(3):734-41. doi: 10.1093/ajcn/68.3.734. PMID: 9734755.

Kumera, G, Gedle, D, Alebel, A, Feyera, F, and Eshetie, S., (2018). Undernutrition and its association with socio-demographic, anemia and intestinal parasitic infection among pregnant women attending antenatal care at the University of Gondar Hospital, Northwest Ethiopia. *Maternal Health Neonatol Perinatoogyl.*2018;4(1):1–10. doi: 10.1186/s40748-018-0087-z.

Michal, F, Jonathan, D, K, Bruce, S, Sunthorn, P, Amadou, B, Youssoufa, S, Santara, G, Moussa,T, Sekouba, K, Almahamoudou, M, Oumar, A, Adama, B, D, Kadidia, B, Cisse, Bacary, S, Diarra, Moussa, B, Kanoute, Alassane, D, Patrick, E, D., (2018). Systemic Inflammatory Response to Malaria During Pregnancy Is Associated With Pregnancy Loss and Preterm Delivery in Clinical Infectious Diseases, DOI: [10.1093/cid/cix623](https://doi.org/10.1093/cid/cix623). Clinical Infectious Diseases. 2017 Oct 30;65(10):1729-1735. doi: 10.1093/cid/cix623.

Obasanjo, A, B, Ahinkorah, B, O,and Seidu, A, A, Mohammed, A, Effiong, F. B., and Hagan, J. E. (2023). Predictors of young maternal age at first birth among women of reproductive age in Nigeria. PLoS ONE 18(1): e0279404. https://doi.org/10.1371/journal.pone.0279404

Ronan, L, and Halie, M, R., (2021). Dietary Supplements and Nutraceuticals Under Investigation for COVID-19 Prevention and Treatment. Preprint. 2021 Feb 3: arXiv:2102.02250v1.

SDG, (2015). Sustainable Development Goals

Shankar AH. Nutritional modulation of malaria morbidity and mortality. J Infect Dis. 2000;182 Suppl 1:S37-53. doi: 10.1086/315906. PMID: 10944483.

Tan, S, Y, [Min, K, H](https://pubmed.ncbi.nlm.nih.gov/?term=Htet%20MK%5BAuthor%5D), [Widjaja, L](https://pubmed.ncbi.nlm.nih.gov/?term=Lukito%20W%5BAuthor%5D), [Saptawati, B](https://pubmed.ncbi.nlm.nih.gov/?term=Bardosono%20S%5BAuthor%5D), Rianto, S, [Endang, S, B](https://pubmed.ncbi.nlm.nih.gov/?term=Basuki%20ES%5BAuthor%5D), [Aris, W](https://pubmed.ncbi.nlm.nih.gov/?term=Wibudi%20A%5BAuthor%5D), [Drajat, M](https://pubmed.ncbi.nlm.nih.gov/?term=Martianto%20D%5BAuthor%5D), [Imam, S](https://pubmed.ncbi.nlm.nih.gov/?term=Subekti%20I%5BAuthor%5D), and [Umi, F,](https://pubmed.ncbi.nlm.nih.gov/?term=Fahmida%20U%5BAuthor%5D)(2022). Increased vegetable intake improves glycemic control in adults with type 2 diabetes mellitus: a clustered randomized clinical trial among Indonesian white-collar workers. J Nutr Sci 2022; 11: e49. Published online on June 21, 2022. doi: [10.1017/jns.2022.41](https://doi.org/10.1017%2Fjns.2022.41)

WBR, (2024). World Bank report on the fertility rate of Nigerians among reproductive women. Press Released on March 22, 2023

# WBR, (2024). Deep Structural Reforms Guided by Evidence Are Urgently Needed to Lift Millions of Nigerians Out of Poverty, New World Bank Report. Press Released on March 22, 2022

Yeung, [Krista, S. Crider](https://pubmed.ncbi.nlm.nih.gov/?term=Crider%20KS%5BAuthor%5D), [Yan, P, Q](https://pubmed.ncbi.nlm.nih.gov/?term=Qi%20YP%5BAuthor%5D), [Lorraine, F,](https://pubmed.ncbi.nlm.nih.gov/?term=Yeung%20LF%5BAuthor%5D) [Cara, T. Mai](https://pubmed.ncbi.nlm.nih.gov/?term=Mai%20CT%5BAuthor%5D), [Lauren, H, Z,](https://pubmed.ncbi.nlm.nih.gov/?term=Zauche%20LH%5BAuthor%5D) [Arick, W,](https://pubmed.ncbi.nlm.nih.gov/?term=Wang%20A%5BAuthor%5D) [Kelicia, D,](https://pubmed.ncbi.nlm.nih.gov/?term=Daniels%20K%5BAuthor%5D) and [Jennifer, L, W.,](https://pubmed.ncbi.nlm.nih.gov/?term=Williams%20JL%5BAuthor%5D)(2023). Folic Acid Treatment and the Prevention of Birth Defects: 30 Years of Opportunity and Controversies. [Annu Rev Nutr. 2022 Aug 22; 42: 423–452.](https://www.ncbi.nlm.nih.gov/entrez/eutils/elink.fcgi?dbfrom=pubmed&retmode=ref&cmd=prlinks&id=35995050) doi: [10.1146/annurev-nutr-043020-091647](https://doi.org/10.1146%2Fannurev-nutr-043020-091647)