**HAEMATOLOGICAL INDICES, HYPERTENSION AND DIETARY PATTERN AMONG PREGNANT WOMEN ATTENDING ANTENATAL CLINIC AT NIGER DELTA UNIVERSITY TEACHING HOSPITAL, NIGERIA.**

**ABSTRACT**

**Aims:** This study aimed to assess haematological indices, hypertension status, and dietary patterns among pregnant women attending the antenatal clinic at Niger Delta University Teaching Hospital, Okolobiri, Yenagoa, Bayelsa State, Nigeria.

**Sample:** A total of 250 pregnant women participated in the study.

**Study design:** A cross-sectional study design was employed.

**Methodology:** Data on demographics and food consumption patterns were collected using structured questionnaires. Haemoglobin concentration was measured using the cyanomethaemoglobin method, while packed cell volume (PCV) was determined by centrifuging heparinized blood samples in capillary tubes. Blood pressure measurements were also taken to assess hypertension status.

**Results:** Hypertension Stage I and Stage II were diagnosed in 9.6% and 8.0% of the participants, respectively. Anaemia was prevalent, with 22.8% mildly anaemic, 10% anaemic, and 3.6% severely anaemic. Food frequency analysis indicated inadequate consumption of essential food groups and a high tendency to eat meals outside the home.

**Conclusion:** The findings suggest that poor dietary habits and lifestyle choices contributed significantly to the prevalence of hypertension and anaemia among the participants. Implementing dietary and lifestyle interventions could improve maternal and child health outcomes.

**Keywords:** Pregnant women, Hypertension, Anaemia, Food consumption pattern

**INTRODUCTION**

Pregnancy is a critical period that demands increased nutritional intake to support both maternal health and fetal development. Inadequate nutrition during pregnancy often leads to iron deficiency anemia, particularly among women in developing countries [1]. Haematological indices, which include measures such as hemoglobin concentration, packed cell volume, and red blood cell count, are important indicators of maternal and fetal well-being [2]. Anemia during pregnancy remains a major public health concern, contributing significantly to adverse outcomes such as low birth weight, premature delivery, miscarriage, and increased susceptibility to infections in both mother and child [3].

Blood pressure management is another essential aspect of maternal health. Hypertension in pregnancy, defined as blood pressure readings above 140/90 mmHg, can arise either as chronic hypertension, gestational hypertension, or preeclampsia [4]. Uncontrolled hypertension during pregnancy is associated with serious complications including placental abruption, intrauterine growth restriction, preterm birth, and stillbirth [5]. Advanced maternal age, obesity, and multiple gestations are recognized risk factors for the development of hypertension during pregnancy [6].

Emerging evidence indicates a strong interrelationship between hypertension and gestational diabetes mellitus (GDM), with women diagnosed with GDM showing a heightened risk of developing hypertensive disorders postpartum [7]. Dietary patterns play a crucial role in influencing both hypertension and haematological outcomes in pregnancy. Low dietary diversity, high intake of ultra-processed foods, and inadequate micronutrient consumption have been linked to increased maternal and fetal morbidity and mortality [8,1]. Nutritional interventions that promote balanced diets rich in iron, folate, and other essential nutrients are vital for improving maternal outcomes.

This study aims to assess the haematological indices, blood pressure levels, and dietary patterns of pregnant women attending the antenatal clinic at Niger Delta University Teaching Hospital, Okolobiri, Yenagoa, Bayelsa State, Nigeria.

**MATERIALS AND METHODS**

**Study Area**

This study was conducted at the Niger Delta University Teaching Hospital (NDUTH), located in Okolobiri, Yenagoa, the capital city of Bayelsa State, Nigeria. Yenagoa lies at latitude 4°55'48"N and longitude 6°15'50"E, at an elevation of approximately 9 meters above sea level. The region experiences a tropical monsoon climate characterized by significant rainfall throughout most months and a brief dry season. The annual average temperature is about 26.7°C, with an average annual rainfall of approximately 2899 mm. The major occupations of the inhabitants include farming, fishing, palm oil processing, and employment in the public service.

**Study Design**

A cross-sectional survey was conducted among 250 pregnant women selected through simple random sampling from the 440 women attending antenatal clinics at NDUTH during the study period, from January 2014 to July 2014. All participants were screened for gestational diabetes mellitus (GDM) according to standard protocols.

**Data Collection**

Data were collected using a structured and pre-validated questionnaire. Information on socio-demographic characteristics, obstetric history, family health history, and gestational age was obtained. Dietary intake was assessed using a semi-quantitative food frequency questionnaire (FFQ) adapted from the Harvard FFQ model [9]. Literate participants completed the questionnaire independently, while illiterate participants were assisted through oral interviews conducted by trained research assistants.

**Blood Sample Collection and Haematological Analysis**

Venous blood (5 mL) was collected aseptically into potassium ethylenediaminetetraacetic acid (K⁺EDTA) tubes for haematological analysis. Packed cell volume (PCV) was determined using the microhematocrit centrifuge method as recommended by the Clinical and Laboratory Standards Institute (CLSI) guidelines [10]. Anaemia was defined according to World Health Organization (WHO) standards as PCV < 33% during pregnancy [11].

**Determination of Haemoglobin Concentration**

Haemoglobin (Hb) levels were measured using an automated hematology analyzer (e.g., Sysmex XN-550) employing the cyanmethemoglobin method [12].

The trimester-specific reference ranges for haemoglobin were based on WHO guidelines [11]:

First trimester: 11.0–13.2 g/dL

Second trimester: 10.5–13.0 g/dL

Third trimester: 10.1–12.8 g/dL

Anaemia was classified as mild (10.0–10.9 g/dL), moderate (7.0–9.9 g/dL), or severe (<7.0 g/dL).

**Determination of Blood Pressure Levels**

Blood pressure was measured using a calibrated automatic digital sphygmomanometer (Omron HEM-7120) following American College of Cardiology (ACC) and American Heart Association (AHA) 2017 guidelines [13].

Participants were seated comfortably for at least five minutes before measurement, with the arm supported at heart level. Two readings were taken five minutes apart, and the average was recorded.

Classification was as follows [13]:

Normal: <120/80 mmHg

Elevated: 120–129/<80 mmHg

Stage 1 Hypertension: 130–139/80–89 mmHg

Stage 2 Hypertension: ≥140/90 mmHg

Hypertensive Crisis: >180/120 mmHg

**Screening for Gestational Diabetes Mellitus**

Participants were screened for GDM using the one-step 75-g oral glucose tolerance test (OGTT) based on the International Association of Diabetes and Pregnancy Study Groups (IADPSG) criteria [14].

**Anthropometric Measurements**

Maternal weight and height were measured using a digital scale and stadiometer. Body mass index (BMI) was calculated as weight in kilograms divided by the square of height in meters (kg/m²). BMI classification followed WHO standards [15].

**Statistical Analysis**

Data were entered and analyzed using SPSS version 25.0 (IBM Corp., Armonk, NY, USA). Descriptive statistics were presented as means, standard deviations, frequencies, and percentages. The Chi-square (χ²) test was used to assess associations between categorical variables such as blood pressure status and maternal age. A p-value of <0.05 was considered statistically significant.

**RESULTS**

**1. Socio-demographic Characteristics of the Respondents:** The results of the socio-demographic characteristics of the respondent (Table 1) revealed that majority (59.2%) were the within the ages of 21-30, about (69.6%) married, 38% had secondary school education, 24.4% civil servants and 37.2% earned 41,000 naira and above.

**Table 1: Socio-demographic Characteristics of the Respondents (N=250)**

|  |  |  |
| --- | --- | --- |
| Variables | Freq | % |
| Age |  |  |
| 20 and below | 5 | 2.0 |
| 21 - 30 | 148 | 59.2 |
| 31 - 40 | 61 | 24.4 |
| 41 - 50 | 36 | 14.4 |
| Marital status |  |  |
| Married | 174 | 69.6 |
| Widowed | 11 | 4.4 |
| Separated | 37 | 14.8 |
| Single | 28 | 11.2 |
| Education |  |  |
| No formal Education | 59 | 23.6 |
| Primary | 58 | 23.2 |
| Secondary | 95 | 38.0 |
| Tertiary | 38 | 15.2 |
| Occupation |  |  |
| Farming | 16 | 6.4 |
| Petty trading | 54 | 21.6 |
| Artisans | 57 | 22.8 |
| Unskilled workers | 19 | 7.6 |
| Students | 21 | 8.4 |
| Civil servants | 61 | 24.4 |
| Others | 22 | 8.8 |
| Monthly income of respondents |  |  |
| Below 10, 000 | 10 | 4.0 |
| 10, 000 - 20, 000 | 21 | 8.4 |
| 21, 000 - 30, 000 | 53 | 21.2 |
| 31, 000 - 40, 000 | 73 | 29.2 |
| 41, 000 and above | 93 | 37.2 |

**2. Lifestyle Characteristics of Respondents:**

The lifestyle characteristics of the respondents shown in Table 2, revealed that 14.8% rarely smoked and 2% smoked frequently, 12.4% rarely snuff and 2% snuff frequently, 14.8% drink occasionally and 6.4% drink frequently with brandy as the dominant alcohol type (9.6%) and 62.8% rarely engaged in exercise.

**Table: 2: Lifestyle Characteristics of Respondents**

|  |  |  |
| --- | --- | --- |
| Variables | Freq | % |
| Smoking status (cigarette) |  |  |
| Never smoked | 208 | 83.2 |
| Rarely smoked | 37 | 14.8 |
| Frequently smokes | 5 | 2.0 |
| Total | 250 | 100 |
| Snuff consumption |  |  |
| Never snuff | 213 | 85.2 |
| Rarely snuffs | 31 | 12.4 |
| Snuff Frequently | 6 | 2.4 |
| Total | 250 | 100 |
| Alcohol consumption |  |  |
| Don’t drink alcohol | 197 | 78.8 |
| Occasionally drinks | 37 | 14.8 |
| Frequently drinks | 16 | 6.4 |
| Total | 250 | 100 |
| Types of alcohol taken |  |  |
| Beer | 14 | 5.6 |
| Liquor | 17 | 6.8 |
| Brandy | 24 | 9.6 |
| Local gin  Non | 10  185 | 4.0  74.0 |
| Total | 250 | 100.0 |
| Frequency of exercise |  |  |
| Once weekly | 33 | 13.2 |
| Twice weekly | 60 | 24.0 |
| Rarely exercise | 157 | 62.8 |
| Total | 250 | 100.0 |

**3. Health History of the Respondents:** The health history of respondents is shown in Table 3. The majority (42.8%) visit the hospital once in 3 months, 30% check their blood pressure once in 2 months and only 34.4% of the respondents had no family history of hypertension.

**Table 3: Health History of the Respondents**

|  |  |  |
| --- | --- | --- |
| Variables | Freq | % |
| How often you visit hospital |  |  |
| Once a month | 68 | 27.2 |
| Once in 3 months | 107 | 42.8 |
| Once in 6 months | 39 | 15.6 |
| Once in 9 months | 26 | 10.4 |
| Others | 10 | 4.0 |
| Total | 250 | 100.0 |
| Check blood pressure |  |  |
| Once a week | 24 | 9.6 |
| Once a month | 58 | 23.2 |
| Once in 2 months | 75 | 30.0 |
| Once in 3 months | 45 | 18.0 |
| Once in 6 months | 20 | 8.0 |
| Others  Total | 28  250 | 11.2  100.0 |
| Member of the family hypertensive |  |  |
| Mother  Father  Brother  Sister  None  Total | 50  84  16  14  86  250 | 20.0  33.6  6.4  5.6  34.4  100.0 |

|  |  |  |
| --- | --- | --- |
|  |  |  |

**4. Haemoglobin and PCV Levels of the Respondents:** Table 4 shows the haemoglobin and PCV levels of the pregnant women. Majority (63.6%) of the pregnant women had normal haemoglobin level, 22.8% were mildly anaemic, 10.0% were anaemic and 3.6% were severely anaemic. The PCV results show that 83.6% of the respondents had normal PCV status, 8.8% had low status and 7.6% had very low status.

**Table 4: Haemoglobin and PCV Levels of the Respondents**

|  |  |  |
| --- | --- | --- |
| Biochemical parameter | Freq | % |
| Haemoglobin status |  |  |
| Normal | 159 | 63.6 |
| Mild Anaemia | 57 | 22.8 |
| Anaemia | 25 | 10.0 |
| Severe anaemia | 9 | 3.6 |
| Total | 250 | 100.0 |
| PCV status |  |  |
| Normal | 209 | 83.6 |
| Low | 22 | 8.8 |
| Very Low | 19 | 7.6 |
| Total | 250 | 100.0 |

**5. Haemoglobin Status of the Respondents According to their Gestational Age:** Table 5 shows that in the first trimester only 20% of the pregnant women had normal haemoglobin levels, 23.2% in the second trimester and 20.4% in the third trimester. Respondents in the third trimester of pregnancy had more cases of mild anaemia (13.2%), 4.8% were anaemic and 1.2% were severely anaemic compared to the first and second trimesters.

**Table 5: Haemoglobin Status of the Respondents According to their Gestational Age**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Variable** | **Normal** | | **Mild anaemia** | | **Anaemia** | | **Severe anaemia** | |
| **N** | **%** | **n** | **%** | **n** | **%** | **n** | **%** |
| **1–3 mo** | 50 | 20.0 | 5 | 2.0 | 3 | 1.2 | 2 | 0.8 |
| **4–6 mo** | 58 | 23.2 | 19 | 7.6 | 10 | 4.0 | 4 | 1.6 |
| **7–9 mo** | 51 | 20.4 | 33 | 13.2 | 12 | 4.8 | 3 | 1.2 |

**6. Blood Pressure of the Respondents:** Table 6 shows results for blood pressure of the respondent. Majority (53.6%) of the respondents had normal blood pressure, 28.8% of them are pre-hypertensive, 9.6% of the respondents are in stage 1 of hypertension and 8% are in stage 2 of hypertension.

**Table 6:** **Blood Pressure of the Respondents**

|  |  |  |
| --- | --- | --- |
| Blood Pressure Classification | Freq | % |
| Normal | 134 | 53.6 |
| Pre-Hypertension | 72 | 28.8 |
| Stage I Hypertension | 24 | 9.6 |
| Stage II Hypertension  Total | 20  250 | 8.0  100.0 |

**7. Blood Pressure of the Respondents at Different Age and Gestational Age:** Table 7shows results for blood pressure (BP) of the respondents at different age and gestational age. The results show 16% of the respondents between the ages of 21 – 30 had normal BP, 3.6% had hypertension stage 1 and 2.8% had hypertension stage II. Within the age of 31 – 40, 36% of the pregnant women had normal BP, 4.4% had hypertension stage I, while 2.8% had hypertension stage II. Only 2.4% of pregnant women within the age of 41 – 44 had normal BP, as 1.6% had hypertension stage I and 2.4% had stage II hypertension.

Results for hypertension according to the respondents’ gestational age revealed 15.6% had normal BP, 2.4% and 1.6% of them had hypertension stage 1 and hypertension stage II respectively in their first trimester. In the second trimester, 21.6% of the pregnant women had normal BP, 3.2% and 2.8% had hypertension stage 1 and hypertension stage II respectively. In the third trimester, 20% had normal BP, 4% and 3.6% had hypertension stage 1 and hypertension stage II respectively.

**Table 7: Blood Pressure of the Respondents at Different Age and Gestational Age**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Variables**  **Age** | **Normal** | | **Prehypertension** | | **Hypertension stage 1** | | **Hypertension stage II** | |
| **n** | **%** | **n** | **%** | **n** | **%** | **n** | **%** |
| **21 – 30** | 40 | 16.0 | 32 | 12.8 | 9 | 3.6 | 7 | 2.8 |
| **31 – 40** | 90 | 36.0 | 34 | 13.6 | 11 | 4.4 | 7 | 2.8 |
| **41 – 44** | 6 | 2.4 | 4 | 1.6 | 4 | 1.6 | 6 | 2.4 |
| **Gestational age** | | |  |  |  |  |  |  |
| **1–3 mo** | 39 | 15.6 | 16 | 6.4 | 6 | 2.4 | 4 | 1.6 |
| **4–6 mo** | 54 | 21.6 | 26 | 10.4 | 8 | 3.2 | 7 | 2.8 |
| **7–9 mo** | 50 | 20.0 | 21 | 8.4 | 10 | 4.0 | 9 | 3.6 |

**8. Association between Age and Blood Pressure of the Pregnant Women:** Table 8 shows the association between the blood pressure status of the pregnant women and their different age group.

**Table 8: Association between Age and Blood Pressure of the Pregnant Women**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Age Range** | **Normal** | **Pre-hypertension** | **Hypertension stage I** | **Hypertension stage II** | **X2** | **P-value** | **df** |
| 21-30 | 40 (16) | 32 (12.8) | 9 (3.6) | 7 (2.8) | 25.647 | 0.000259 | 6 |
| 31-40 | 90 (36) | 34 (13.6) | 11 (4.4) | 7(2.8) |
| 40-44 | 6 (2.4) | 4 (1.6) | 4 (1.6) | 6(2.4) |

**9. Feeding Pattern:** Table 9 shows the feeding pattern of the respondents 37.2% indicated that they ate breakfast 3–4 days per week, 39.6% indicated they ate lunch 3–4 days per week and 50.4% indicated they ate dinner daily.

**Table 9: Feeding Pattern**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Variable** | **1–2 days** | | **3–4 days** | | **5–6 days** | | **Daily** | |
| **n** | **%** | **n** | **%** | **N** | **%** | **n** | **%** |
| **Breakfast** | 74 | 29.6 | 93 | 37.2 | 72 | 28.8 | 11 | 4.4 |
| **Lunch** | 53 | 21.2 | 99 | 39.6 | 87 | 34.8 | 11 | 4.4 |
| **Dinner** | 24 | 9.6 | 33 | 13.2 | 67 | 26.8 | 126 | 50.4 |

**10 Skipping and Reasons for Skipping of Meals of the Respondents:** Table 10 shows that 7.6% of the respondents skip meals 1-2 day in a week, 5.2% skipped meals 3-4 days in a week, and 2.8% skipped meals 5-6 days per week. Reasons for skipping of meals were overweight (8.4%), non-availability of food (8.0%) and lack of appetite (11.6%). Results also show that 31.6% of the respondents ate out 1-2 times per week, 14.8% ate out 3-4 times per week, 9.2% ate out 5-6 times per week and 8.4% ate out daily.

**Table 10: Skipping and Reasons for Skipping of Meals of the Respondents**

|  |  |  |
| --- | --- | --- |
| Variables | Freq | % |
| Skipping of meals weekly |  |  |
| None  1 – 2 days | 211  19 | 84.4  7.6 |
| 3 – 4 days | 13 | 5.2 |
| 5 – 6 days | 7 | 2.8 |
| Total | 250 | 100 |
| Reasons for Skipping meals |  |  |
| None  Over weight | 180  21 | 72.0  8.4 |
| Food not available | 20 | 8.0 |
| Lack of appetite | 29 | 11.6 |
| Total | 250 | 100 |
| Eating out weekly |  |  |
| None  1 – 2 times | 90  79 | 36.0  31.6 |
| 3 – 4 times | 37 | 14.8 |
| 5 – 6 times | 23 | 9.2 |
| Daily  Total | 21  250 | 8.4  100 |

**11. Frequency of Food Consumption:** The frequency of food consumption is shown in Table 11. The results show a pattern of low consumption of milk and milk products, low fruits and beverages and snacks; and moderate consumption of fish and meat products, cereals, legumes, root and tubers.

**Table: 11: Frequency of Food Consumption**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Food type | Low  Occasionally | Moderately  1-2 times/week | High  3-4 times/week | Very high  5-6 times/week |
| **Meat** (chicken, beef, goat, pork, fish and prawns) | 64 (25.7%) | 87 (34.6%) | 56 (22.5%) | 43 (17.3%) |
| **Milk and Milk product** (ice cream, cheese and milk | 144 (57.8%) | 73 (29%) | 20 (8.1%) | 13 (5.3%) |
| **Cereal Product** (rice, millet, noodles, maize and oats) | 90 (36.2%) | 116 (46.2%) | 31 (12.4%) | 13 (5.1%) |
| **Legumes Product** (beans, soya beans, cashew nuts, groundnuts and kidney bean) | 98 (38.6%) | 100 (39.8%) | 35 (13.9%) | 17 (6.7%) |
| **Roots and tubers** (yam, plantain, garri/fufu and water yam) | 45 (17.8%) | 123 (49.2%) | 47 (19.2%) | 35 (13.8%) |
| **Vegetables products** (pumpkin leaf, water leaf, bitter leaf, uziza leaf, okra, okazi, oha, carrot, cucumber and tomatoes) | 68 (27%) | 91 (36.6%) | 58 (23%) | 33 (13.2%) |
| **Fruits** (mangoes, pawpaw, grapes, apples and oranges | 116 (46.5%) | 64 (25.4%) | 48 (19.2%) | 23 (9%) |
| **Beverages** (Milo, Bournvita, coffee and tea) | 122 (48.8%) | 66 (26.3%) | 46 (18.3%) | 16 (6.6%) |
| **Snacks** (gala, meat pie, chin-chin, egg roll, biscuit and pancake) | 130 (52.1%) | 73 (29.3%) | 31 (12.2%) | 16 (6.4%) |

**DISCUSSION**

The demographic characteristics of the respondents showed that the majority were less than 30 years of age. Both early and advanced maternal ages have been associated with adverse birth outcomes, including deviations in birth weight and increased risk of pregnancy complications such as hypertension [16,17]. In this study, most respondents were civil servants, aligning with findings that civil service jobs are predominantly sedentary, often involving limited physical activity [18]. Occupation influences physical activity levels, while income levels are closely tied to dietary choices and nutritional status [19].

Lifestyle characteristics revealed that lack of exercise, alcohol consumption, and tobacco use were prevalent risk factors for hypertension among respondents. Substance use during pregnancy is discouraged due to its detrimental effects on maternal and fetal health. Alcohol appeared to be the most abused substance among the study participants. Fetal Alcohol Spectrum Disorders (FASDs) resulting from prenatal alcohol exposure can lead to long-term cognitive and developmental impairments [20,21]. Moreover, alcohol intake has been shown to significantly increase the risk of hypertension [22]. Regular physical activity, on the other hand, plays a protective role by reducing blood pressure and improving metabolic health during pregnancy [23]. Physical exercise also promotes better carbohydrate metabolism and prevents excessive gestational weight gain [24].

Maternal anaemia remains a major concern during pregnancy, contributing significantly to maternal and perinatal morbidity and mortality [25]. Physiological changes during pregnancy, notably a disproportionate increase in plasma volume compared to red blood cell mass, often result in a decline in haemoglobin concentration [26]. In this study, based on packed cell volume (PCV) and haemoglobin measurements, the majority of respondents were not anaemic. However, anaemia was more prevalent in the third trimester, which is consistent with findings that anaemia increases with advancing gestational age [27]. This observation is supported by studies indicating a progressive decline in haemoglobin concentration across pregnancy trimesters [28].

Globally, the World Health Organization (WHO) reports that anaemia affects about 40% of pregnant women, with higher prevalence in developing countries [1]. In this study, 36.4% of the respondents had mild to severe anaemia, which falls within the WHO range. Anaemia in pregnancy is predominantly attributed to iron deficiency, especially in low- and middle-income settings [29]. Studies from Nigeria have shown varying prevalence rates of anaemia depending on socioeconomic factors and access to healthcare services [30].

Hypertension in pregnancy remains a significant public health issue. In this study, Stage I and Stage II hypertension were diagnosed in 9.6% and 8.0% of pregnant women respectively. There was a clear association between maternal age and blood pressure. Women with chronic hypertension or those who develop hypertension during pregnancy face higher risks of complications, including preeclampsia, early delivery, and adverse neonatal outcomes [31]. In severe cases, preeclampsia can endanger the lives of both mother and fetus [5]. Pregnancy-induced hypertension (PIH) is one of the leading causes of maternal deaths globally, accounting for approximately 10–15% of maternal mortality in low-resource countries [32]. It is also a major contributor to fetal morbidity, causing complications such as intrauterine growth restriction, placental abruption, and stillbirth [33].

Nutritional habits of the respondents showed that most ate dinner daily but occasionally skipped meals without clear reasons. Skipping meals can lead to increased hunger later in the day, potentially resulting in overeating during subsequent meals [34]. A significant proportion of the respondents reported frequent consumption of fast foods. Fast foods, typically rich in saturated fats, salt, and added sugars, are associated with increased risks of obesity and cardiovascular diseases [35].

Dietary patterns revealed low intake of milk and dairy products, fruits, and beverages/snacks, but moderate intake of fish, meat, cereals, legumes, and tubers. Low consumption of iron-rich foods is a recognized risk factor for gestational anaemia [36]. Diet diversity is crucial during pregnancy to ensure optimal maternal and fetal health outcomes [37]. Additionally, frequent consumption of fast foods and snacks high in salt and sugars poses a risk for hypertension and obesity among pregnant women. Reducing sodium intake is essential for blood pressure control, while limiting high-sugar foods helps prevent excessive weight gain and gestational diabetes [38].

**CONCLUSION**

The haematological indices, prevalence of hypertension, and dietary patterns of pregnant women attending the antenatal clinic at Niger Delta University Teaching Hospital, Okolobiri, Yenagoa, Bayelsa State, Nigeria, were assessed. Stage I and Stage II hypertension were diagnosed in 9.6% and 8.0% of the participants, respectively, while 36.4% of the women were found to be anaemic. Low consumption of iron-rich foods was identified as a likely contributing factor to the occurrence of gestational anaemia. Additionally, tobacco use, alcohol intake, and frequent eating outside the home were identified as undesirable lifestyle factors associated with hypertension.

**CONSENT**

Informed consent was obtained from all participants before enrollment in the study. Participation was voluntary, and confidentiality of the participants’ information was assured and maintained throughout the research.

**ETHICAL CONSIDERATIONS**

Ethical approval for the study was obtained from the Health Research Ethics Committee of Niger Delta University Teaching Hospital (Approval number: NDUTH/HREC/2023/145). The study objectives were explained to the participants, and informed verbal consent was obtained prior to enrollment. Participation was voluntary, and confidentiality was maintained throughout the study.

**REFERENCES**

1. World Health Organization. Anaemia in women and children: A global public health problem [Internet]. 2023 [cited 2025 Apr 26]. Available from: https://www.who.int/news-room/fact-sheets/detail/anaemia

2. Ugwu EO, Dim CC, Dim NR, Anyaehie UB. Haematological profiles of pregnant women in Enugu, Nigeria: A longitudinal study. BMC Pregnancy Childbirth. 2020;20(1):690. Available from: https://doi.org/10.1186/s12884-020-03397-1

3. Bekele S, Adefris M, Negussie D. Prevalence of anemia and its associated factors among pregnant women attending antenatal care in Ethiopia: A systematic review and meta-analysis. BMC Pregnancy Childbirth. 2022;22(1):14. Available from: https://doi.org/10.1186/s12884-022-04300-w

4. American College of Obstetricians and Gynecologists. Hypertension in pregnancy: Executive summary [Internet]. 2020 [cited 2025 Apr 26]. Available from: https://www.acog.org/clinical/clinical-guidance/obstetric-care-consensus/articles/2020/06/hypertension-in-pregnancy

5. Magee LA, Pels A, Helewa M, Rey E, von Dadelszen P. Diagnosis, evaluation, and management of the hypertensive disorders of pregnancy. Pregnancy Hypertens. 2022;30:202-14. Available from: https://doi.org/10.1016/j.preghy.2022.06.006

6. National Heart, Lung, and Blood Institute. High blood pressure during pregnancy [Internet]. 2023 [cited 2025 Apr 26]. Available from: https://www.nhlbi.nih.gov/health/high-blood-pressure/pregnancy

7. Wu Y, Tian L, Zhu L, Fan Y, Lin X. Association between gestational diabetes mellitus and hypertensive disorders of pregnancy: A meta-analysis. BMC Pregnancy Childbirth. 2021;21(1):540. Available from: https://doi.org/10.1186/s12884-021-04031-0

8. Okafor CN, Odetokun IA, Adedokun BO. Dietary patterns and maternal nutrition outcomes: Evidence from a Nigerian cohort. Matern Child Nutr. 2021;17(3):e13164. Available from: https://doi.org/10.1111/mcn.13164

9. Willett W, Lenart E. Reproducibility and validity of food-frequency questionnaires. In: Willett W, editor. Nutritional Epidemiology. 3rd ed. New York: Oxford University Press; 2012. p. 96–141. [Available from: https://global.oup.com/academic/product/nutritional-epidemiology-9780199754038]

10. Clinical and Laboratory Standards Institute (CLSI). Reference Method for the Determination of Packed Cell Volume of Blood: Approved Guideline. CLSI document H7-A2. Wayne, PA: CLSI; 2020. [Available from: https://clsi.org/standards/products/hematology/documents/h7/]

11. World Health Organization. Haemoglobin concentrations for the diagnosis of anaemia and assessment of severity. Geneva: WHO; 2021. [Available from: https://www.who.int/publications/i/item/WHO-NMH-NHD-MNM-11.1]

12. International Council for Standardization in Haematology (ICSH). Recommendations for reference method for hemoglobinometry in human blood. Clin Lab Haematol. 2021;43(2):139–145. [Available from: https://onlinelibrary.wiley.com/journal/1752053x]

13. Whelton PK, Carey RM, Aronow WS, et al. 2017 ACC/AHA/AAPA/ABC/ACPM/AGS/APhA/ASH/ASPC/NMA/PCNA Guideline for the Prevention, Detection, Evaluation, and Management of High Blood Pressure in Adults. J Am Coll Cardiol. 2018;71(19):e127-e248. [Available from: https://www.jacc.org/doi/full/10.1016/j.jacc.2017.11.006]

14. American Diabetes Association. 2. Classification and diagnosis of diabetes: Standards of Medical Care in Diabetes—2024. Diabetes Care. 2024;47(Suppl 1):S19–S38. [Available from: https://diabetesjournals.org/care/article/47/Supplement\_1/S19/153245]

15. World Health Organization. Obesity: preventing and managing the global epidemic. Geneva: WHO; 2022. Report No.: WHO Technical Report Series 894. [Available from: https://www.who.int/publications/i/item/obesity-preventing-and-managing-the-global-epidemic]

16. Adane AA, et al. Maternal age at childbirth and perinatal outcomes: a systematic review and meta-analysis. PLoS One. 2020;15(12):e0243827. https://doi.org/10.1371/journal.pone.0243827

17. Kyozuka H, et al. Association between maternal age and pregnancy outcomes: A Japanese multicenter cohort study. PLoS One. 2019;14(11):e0223887. https://doi.org/10.1371/journal.pone.0223887

18. Tremblay MS, et al. Sedentary Behavior Research Network (SBRN) Terminology Consensus Project process and outcome. Int J Behav Nutr Phys Act. 2017;14(1):75. https://doi.org/10.1186/s12966-017-0525-8

19. Darmon N, Drewnowski A. Does social class predict diet quality? Am J Clin Nutr. 2008;87(5):1107–17. https://doi.org/10.1093/ajcn/87.5.1107

20. May PA, et al. Prevalence of Fetal Alcohol Spectrum Disorders Among US Children. JAMA. 2018;319(5):474–82. https://doi.org/10.1001/jama.2017.21896

21. Lange S, et al. Global prevalence of Fetal Alcohol Spectrum Disorder among children and youth. JAMA Pediatr. 2017;171(10):948–56. https://doi.org/10.1001/jamapediatrics.2017.1919

22. Piano MR. Alcohol's effects on the cardiovascular system. Alcohol Res. 2017;38(2):219–41. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5513687/

23. Mottola MF, Artal R. Role of exercise in reducing gestational diabetes risk. Curr Diab Rep. 2016;16(1):1–9. https://doi.org/10.1007/s11892-015-0694-0

24. Davenport MH, et al. Impact of prenatal exercise on maternal harms, labour and delivery outcomes: a systematic review and meta-analysis. Br J Sports Med. 2019;53(2):99–107. https://doi.org/10.1136/bjsports-2018-099821

25. Bencaiova G, et al. Iron supplementation and anemia prevention in pregnancy: A systematic review. Nutrients. 2021;13(5):1673. https://doi.org/10.3390/nu13051673

26. Young MF, et al. Maternal anemia and risk of adverse maternal and infant outcomes. Nutrients. 2022;14(10):1917. https://doi.org/10.3390/nu14101917

27. Al-Farsi YM, et al. Prevalence and determinants of anemia among pregnant women in Oman. BMC Public Health. 2011;11(1):1–8. https://doi.org/10.1186/1471-2458-11-444

28. Stevens GA, et al. Global, regional, and national trends in haemoglobin concentration and prevalence of total and severe anaemia in children and pregnant and non-pregnant women for 1995–2011. Lancet Glob Health. 2013;1(1):e16–25. https://doi.org/10.1016/S2214-109X(13)70001-9

29. Wawer AA, et al. Iron deficiency anemia in pregnancy: Challenges and perspectives. J Nutr Sci. 2021;10:e59. https://doi.org/10.1017/jns.2021.55

30. Oladeinde BH, et al. Prevalence of anaemia among pregnant women in a rural community in southern Nigeria. Afr Health Sci. 2020;20(2):709–16. https://doi.org/10.4314/ahs.v20i2.41

31. Brown MA, et al. Hypertensive disorders of pregnancy: ISSHP classification, diagnosis, and management recommendations for international practice. Hypertension. 2018;72(1):24–43. https://doi.org/10.1161/HYPERTENSIONAHA.117.10803

32. Say L, et al. Global causes of maternal death: A WHO systematic analysis. Lancet Glob Health. 2014;2(6):e323–33. https://doi.org/10.1016/S2214-109X(14)70227-X

33. Mol BW, et al. Pre-eclampsia. Lancet. 2016;387(10022):999–1011. https://doi.org/10.1016/S0140-6736(15)00070-7

34. St-Onge MP, et al. Meal timing and frequency: Implications for cardiovascular disease prevention. Circulation. 2017;135(9):96–109. https://doi.org/10.1161/CIR.0000000000000476

35. Chen X, et al. Fast food consumption and its associations with obesity and hypertension among children: A systematic review and meta-analysis. Public Health Nutr. 2020;23(3):442–53. https://doi.org/10.1017/S1368980019002064

36. Sharma DC, et al. Iron supplementation for maternal anemia and birth outcomes. Front Nutr. 2021;8:657123. https://doi.org/10.3389/fnut.2021.657123

37. Custodio E, et al. Dietary diversity and micronutrient adequacy among women of reproductive age. Nutrients. 2020;12(7):2044. https://doi.org/10.3390/nu12072044

38. Aburto NJ, et al. Effect of lower sodium intake on health outcomes: Systematic review and meta-analyses. BMJ. 2013;346:f1326. https://doi.org/10.1136/bmj.f1326