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Association of Gestational Hypertension with Dietary Pattern of Pregnant Women attending Antenatal at Federal Medical Centre (FMC), Keffi, Nasarawa State, Nigeria.

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Abstract

Gestational hypertension (GH) is a leading cause of maternal and fetal morbidity and mortality. Maternal nutrition is a critical modifiable risk factor for gestational hypertension. Understanding dietary patterns and their association with GH is essential for developing targeted preventive strategies. This study aimed to determine the prevalence of gestational hypertension, the association between dietary patterns and gestational hypertension among pregnant women at the Federal Medical Centre, Keffi. A cross-sectional study was conducted among 240 pregnant women with a gestational age of 20 weeks and above. Data were collected using a structured questionnaire, including a food frequency questionnaire (FFQ). Blood pressure was measured using a sphygmomanometer. Forty-seven food types were grouped into 12 categories and analyzed. Dietary patterns were classified into low, moderate, and high consumption of the food groups. Data were analyzed using SPSS version 22, with descriptive statistics (frequency and standard deviation), chi-square tests; significance was set at $p < 0.05$, and logistic regression was performed to determine the effects. This study found the prevalence of gestational hypertension to be 55 (22.9 %). The general dietary pattern was characterized by moderate to high consumption of cereals, meat, and oils, but low consumption of dairy, legumes, fruits, and vegetables. Significant associations ($p < 0.05$) were found between gestational hypertension and high consumption of beef, confectionery, dairy products, cereals, candies/chocolate, dairy products, and beverages/soft drinks. A moderate intake of roots and tubers was also associated with hypertension. Comparing the significant diet with hypertension, OR (95 % CI) shows 3.94 (1.95 - 8.10), 2.09 (0.89-4.95), 13.05 (4.25 - 40.11), 2.38 (1.05 – 5.43), 2.95 (1.30 – 6.67), 8.75 (1.71 – 44.72) and 3.25 (1.27 – 8.29) for high consumption of beef, fat and oil, confectioneries, cereals, candies and chocolate, dairies and beverages/soft drink respectively and low consumption of roots and tubers as 0.41 (0.22 – 0.75). The prevalence of gestational hypertension to be 55 (22.9 %). Gestational hypertension is significantly associated with diets high in beef, processed foods, and sugary items, while fish, legumes, poultry, fruit, and vegetables do not have any significance with gestational hypertension. The use of foods such as fish, legumes, poultry, fruit, and vegetables should be encouraged, and also integrate nutrition education by nutrition professionals into routine antenatal care in order to mitigate the risk.

INTRODUCTION

Pregnancy is a critical period during which maternal nutrition plays a key role in determining the health status of both the mother and fetus, and the energy and nutrients needed to meet the demands of the developing fetus are more than the usual amount ^[1]. Adequate nutrition during the gestational period helps in fetal development and growth, thereby producing a good pregnancy outcome. Pregnancy is associated with the consumption of different food choices, which may cause a pregnant woman to have nutritional and metabolic disorders. Inappropriate diet and lifestyle pose a health risk to pregnant women, which includes gestational hypertension and preeclampsia. Hypertensive disorders of pregnancy, which include gestational hypertension, chronic hypertension, preeclampsia, and eclampsia, are a top cause of maternal and fetal morbidity, mortality, hospitalization, and resource utilization ^[5]. According to the World Health Organization (WHO) ^[6], hypertension in pregnancy exists when a systolic blood pressure is 140 mmHg or higher and the diastolic pressure is 90mmHg or higher, taking in two consecutive readings of four hours apart ^[7,8]. The onset is at the later stage of pregnancy (from twenty weeks and above gestational age) without any features of preeclampsia or proteinuria, and the blood pressure becomes normal after the fetus has been delivered ^[9]. Gestational hypertension is a significant component of hypertensive disorders ^[10], and it is a critical modifiable factor that influences the risk of developing hypertensive disorders during pregnancy ^[11]. Some women with pregnancy-induced hypertension can develop chronic hypertension in the future ^[12]. Gestational hypertension can be severe in pregnancy, leading to Preeclampsia, which is also referred to as toxemia, and it affects about 6-8% of pregnant women ^[13].

Dietary pattern of an individual refers to the quantities, variety, proportion, or combination of foods and drinks typically consumed ^[14,15]. Dietary patterns have received reasonable attention because nutrients (foods/drinks) are not consumed as single nutrients in isolation but consumed in combinations and have a tendency to interact ^[16,17]. Thus, evaluating the intake pattern of foods/drinks provides a good understanding of diets and provides additional knowledge of the relationship between dietary intake and health; it also makes it more readily available for dietary recommendations ^[18, 19]. This study aimed to determine the association of maternal dietary pattern with gestational hypertension among pregnant women attending the antenatal clinic of Federal Medical Centre, Keffi, Nasarawa State, Nigeria. In order to achieve the aim, the prevalence of gestational hypertension in the study area will be determined. This study will serve as a guide to preventive and/or therapeutic measures in pregnancy and thus enhance good pregnancy outcomes.

Study Design

A cross-sectional study was conducted at the antenatal clinic of Federal Medical Centre, Keffi, Nasarawa State. Keffi is an ancient urban settlement in the north-central zone of Nigeria. All pregnant woman attending the antenatal clinic during the time of this study was recruited, provided they gave their consent and met the inclusion criteria. The sample size of 240 was calculated using the Cochrane formula ^[20], and the prevalence used is found in Abuja, which is the closest ^[21]. Pregnant women with a gestational age above 20 weeks were recruited; out of 278 recruited patients, 38 were excluded, and data from 240 were collected. Those with chronic hypertension, eclampsia, HIV, sickle cell disease, or who were critically ill were excluded. All participants provided written informed consent (Appendix I) before commencing the studies.

Data Collection

Data was collected using a structured questionnaire which included socio-demographic details, obstetric history, and a food frequency questionnaire (FFQ). Blood pressure was measured using a standard sphygmomanometer. Urinalysis was done for all participants, and patients with preeclampsia were excluded.

Statistical Analysis

The food frequency questionnaire has a list of forty-three (43) foods, which were sub-grouped into twelve (12) and were further classified into three (3) patterns of consumption, which are low (0-2 times weekly), moderate (3-5 times weekly), and high (6 times or above) for various food groups.

The descriptive analysis was done to determine the proportion of hypertensive participants, and the results were presented in percentages; thus, the prevalence of gestational hypertension was determined. A Pearson Chi-square test analysis was carried out to determine the association of the dietary patterns and gestational hypertension, while a multivariate binary logistic regression was done to determine the effect of diets on gestational hypertension. The result was presented using adjusted odds ratio (OR) at 95 % confidence interval (CI). The level of statistical significance was set at $p < 0.05$ for both chi-square and regression analyses.

Ethical Approval

This is an institution-based study done in a hospital; the study also involves the collection of body fluid (urine), and therefore an ethical approval is needed to protect patients' dignity, rights, welfare and ensure the research is conducted ethically.

An ethical clearance was collected at FMC, Keffi, after a presentation to the hospital's ethical committee, and clearance is attached as Appendix IV.

Results

The mean age of participants was 29.94 ± 5.09 years. Most were married 228 (95.0%), had tertiary education 133 (55.4%) and practice Islamic religion 156 (64.2 %), other ethnicity apart from the three major ethnic groups [Hausa: 64 (26.7%), Yoruba: 15 (6.3 %) and Igbo: 33 (13.8%)] was 128 (53.3%), 155 (64.6) stays in urban region and those earning below ₦70,000 monthly are 154 (64.2 %) as detailed in Table I.

The prevalence of gestational hypertension was 22.9% (55/240) Figure I, and the general dietary pattern of the participants as in Table II, revealed varied dietary practices among the participants, high consumption of cereals, fat & oils, and beef, but low intake of roots and tubers, dairy, legumes, fruits, and vegetables low consumption of cereals (62.5 %), confectionaries (47.1 %), poultry (47.5 %). Chi-square analysis (Table III) revealed significant associations ($p < 0.05$)

between gestational hypertension and high consumption of beef, fat and oil, cereals, confectionery, candies/chocolate, dairy products, and beverages/soft drinks. A moderate intake of roots and tubers was also associated with hypertension. Comparing the significant diet with hypertension, OR (95 % CI) shows 3.94 (1.95 - 8.10: beef), 2.09 (0.89-4.95: fat and oil), 13.05 (4.25 - 40.11: confectionaries), 2.38 (1.05 – 5.43: cereals), 2.95 (1.30 – 6.67: candies and chocolates), 8.75 (1.71 – 44.72: dairies) and 3.25 (1.27 – 8.29: beverage/soft drink) for high consumptions and 0.41 (0.22 – 0.75: root and tubers) significant with low consumptions. See Table IV for details.

Table I: Socio-demographic Characteristics of the study Participants

Variables	Frequency	Percentage
Age		
<20	3	1.3
20 – 24	37	15.4
25 – 29	85	35.4
30 – 34	75	31.3
35 – 39	33	13.8
40 – 44	5	2.1
45+	2	0.8
Mean (SD); Min, Max	29.94 (5.09); 19.00, 46.00	
Marital status		
Single	7	2.9
Married	228	95.0
Divorced	4	1.7
Widowed	1	0.4
Education		
Primary	14	5.8
Secondary	93	38.8

Tertiary	133	55.4
Occupation		
Skilled	103	42.9
Unskilled	34	14.2
Unemployed	42	17.5
Housewife	61	25.4
Income (in Naira)		
<70,000	154	64.2
70,000 & above	86	35.8
Median (IQR); Q1, Q3	50,000 (80,000); 20,000, 100,000	
Religion		
Christianity	84	35.8
Islam	156	64.2
Ethnicity		
Hausa	64	26.7
Igbo	33	13.8
Yoruba	15	6.3
Others	128	53.3
Residence		
Rural	85	35.4
Urban	155	64.6

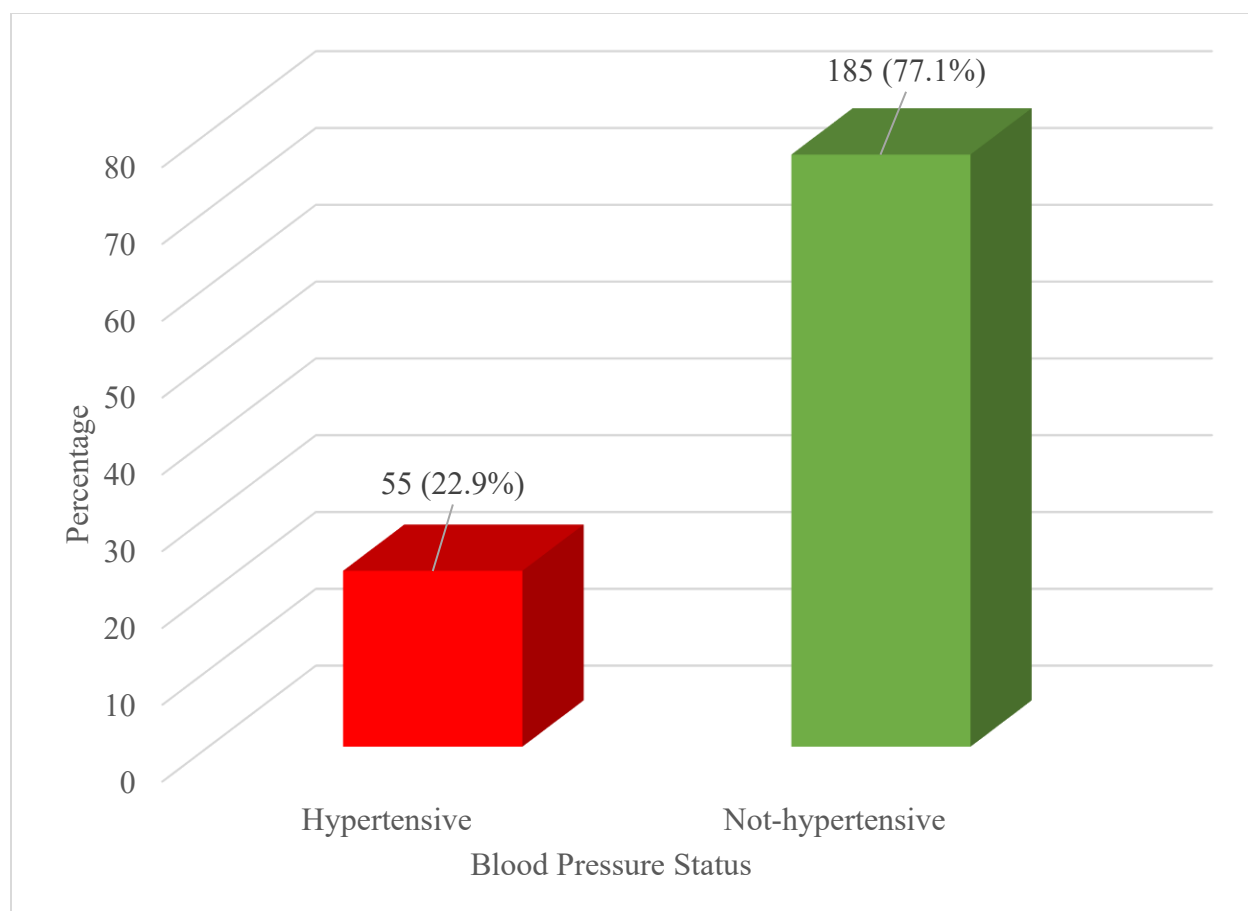


Figure 1.1: Prevalence of Gestational Hypertension

Table II: General Dietary Pattern

Food groups	Diet pattern		
	Low N (%)	Moderate N (%)	High N (%)
Roots and tubers	150 (62.5)	88 (36.7)	2 (0.8)

Beef	40 (16.7)	108 (45.5)	92 (38.3)
Fruits and vegetables	74 (30.8)	156 (65.0)	10 (4.2)
Fat and oil	102 (45.2)	110 (45.8)	28 (11.6)
Fish	61 (25.4)	108 (45.0)	71 (29.6)
Confectionaries	113 (47.1)	107 (44.6)	20 (8.3)
Poultry	114 (47.5)	86 (35.8)	40 (16.7)
Legumes	137 (57.1)	96 (40.0)	7 (2.9)
Cereals	40 (16.7)	171 (71.3)	29 (12.0)
Candies and chocolate	106 (44.2)	96 (40.0)	38 (15.8)
Dairies	133 (55.4)	98 (40.8)	9 (3.8)
Beverages & soft drinks	99 (41.3)	119 (49.6)	22 (9.2)

Table III: Association of Dietary Pattern and Hypertension.

Food groups	Hypertensive (55) N (%)	Not hypertensive (185) N (%)	Total (240) N (%)	χ^2	p-value
Roots and tubers				9.167	0.010
Low	25 (45.5)	125 (67.6)	150 (62.5)		
Moderate	29 (52.7)	59 (31.9)	88 (36.7)		
High	1 (1.8)	1 (0.5)	2 (0.8)		
Beef				16.990	0.000
Low	7 (12.7)	33 (17.8)	40 (16.7)		
Moderate	14 (25.5)	94 (50.8)	108 (45.0)		
High	34 (61.8)	58 (31.4)	92 (38.3)		
Fruits and vegetables				5.023	0.081
Low	11 (20.0)	63 (34.1)	74 (30.8)		
Moderate	40 (72.7)	116 (62.7)	156 (65.0)		
High	4 (7.3)	6 (3.2)	10 (4.2)		

Fat and oil				11.920	0.003
Low	14 (25.5)	88 (47.6)	102 (42.5)		
Moderate	29 (52.7)	81 (43.8)	110 (45.8)		
High	12 (21.8)	16 (8.6)	28 (11.6)		
Fish				0.357	0.837
Low	13 (23.6)	48 (25.9)	61 (25.4)		
Moderate	24 (43.6)	84 (54.4)	108 (45.0)		
High	18 (32.7)	53 (28.7)	71 (29.6)		
Confectionaries				33.540	0.000
Low	20 (36.4)	93 (50.3)	113 (47.1)		
Moderate	20 (36.4)	87 (47.0)	107 (44.6)		
High	15 (27.2)	5 (2.7)	20 (8.3)		
Poultry				2.598	0.273
Low	23 (41.8)	91 (49.2)	114 (47.5)		
Moderate	19 (34.6)	67 (36.2)	86 (35.8)		
High	13 (23.6)	27 (14.6)	40 (16.7)		
Legumes				5.276	0.071
Low	24 (43.6)	113 (61.1)	137 (57.1)		
Moderate	29 (52.7)	67 (36.2)	96 (40.0)		
High	2 (3.7)	5 (2.7)	7 (2.9)		
Cereals				9.375	0.009
Low	4 (7.3)	36 (18.9)	40 (16.7)		
Moderate	39 (70.9)	132 (68.1)	171 (71.3)		
High	12 (21.8)	17 (13.0)	29 (12.0)		
Candies and chocolate				9.435	0.009
Low	20 (36.4)	86 (46.5)	106 (44.2)		
Moderate	19 (34.5)	77 (41.6)	96 (40.0)		
High	16 (29.1)	22 (11.9)	38 (15.8)		
Dairies				21.780	0.000
Low	20 (36.4)	113 (61.1)	133 (55.4)		
Moderate	28 (50.9)	70 (37.8)	98 (40.8)		
High	7 (12.7)	2 (1.1)	9 (3.8)		
Beverages & soft drinks				11.720	0.003
Low	16 (29.1)	83 (44.9)	99 (41.3)		

Moderate	28 (50.9)	91 (49.2)	119 (49.6)
High	11 (20.0)	11 (5.9)	22 (9.2)

Table IV: Effect of diet pattern on gestational hypertension.

	OR	95% CI for OR	p-value
Root and tubers			
Low	0.41	0.22 – 0.75	0.004
High	2.03	0.12 – 33.70	1.000
Moderate	RC		
Beef			
Low	1.42	0.53 – 3.83	0.662
High	3.94	1.95 – 8.10	<0.001
Moderate	RC		
Fat and oil			
Low	0.44	0.22 – 0.90	0.034
High	2.09	0.89 – 4.95	0.141
Moderate	RC		
Confectioneries			
Low	0.94	0.47 – 1.86	0.987
High	13.05	4.25 – 40.11	<0.001
Moderate	RC		
Cereals			
Low	0.38	0.13 – 1.12	0.111
High	2.38	1.05 – 5.43	0.034
Moderate	RC		
Candies & chocolate			
Low	0.94	0.47 – 1.90	0.868
High	2.95	1.30 – 6.67	0.015
Moderate	RC		
Dairies			
Low	0.44	0.23 – 0.84	0.019

High	8.75	1.71 – 44.72	0.008
Moderate	RC		
Beverages & soft drinks			
Low	0.63	0.32 – 1.24	0.238
High	3.25	1.27 – 8.29	0.022
Moderate	RC		

Predicted: Hypertensive

OR: Odds Ratio

RC: Reference Category

Discussion

The 22.9% prevalence of GH found in this study is higher than rates reported in many parts of Nigeria, 19.4 % was reported in a case control study done at University of Abuja Teaching Hospital [21], a retrospective study on hypertensive disorders in pregnancy which lasted four years in federal medical centre Yenogoa got 15.2 % [22], a study at Usman Danfodiyo University Teaching Hospital Sokoto reported 9.7% [23], Babcock University Teaching Hospital, Ilisan-Remo, Ogun State Nigeria reported 15.6 % in a retrospective descriptive study done over a period of five (5) years [24], Enugu reported (5.9 %) in a study done in six selected state hospital spread wide across the state [25] but lower than a cross sectional study done in Nigerian tertiary health facilities (Fifty-four referral level facilities) which showed the prevalence of gestational hypertension to be 49.8 % [26] while 35.3 % in a prospective cohort study in Ado-Ekiti (Ekiti State University Teaching hospital), Ido-Ekiti (Federal Medical Centre) and Ibadan (University College Hospital & Adeoyo Maternity Hospital) [27], and 31.4 % in Ile-Ife(State Hospital Oke- Ogbo) [28]. The studies were done in tertiary and secondary institutions and at different locations across the country. This elevated prevalence could be influenced by regional dietary factors, genetic predispositions, or other local environmental and socioeconomic determinants that warrant further investigation.

Though pregnancy state is characterized with consumption of various food choices with various nutrients and compositions [29,30], high consumption of beef, cereals, confectionaries, beverages/soft drinks is highly significantly associated to gestational hypertension and biologically plausible, as such diets are linked to increased inflammation, oxidative stress, and endothelial dysfunction which are key pathways in the pathogenesis of hypertension [31]. Although there are various risk factors of hypertension, diets have been found in various studies to be a modifiable risk factor of hypertension [31, 32]. Thus, the diet pattern should be modified to include other food groups that are not significantly associated with gestational hypertension and still provide an adequate diet to meet the recommended daily allowance for a pregnant woman [33, 34].

The observed dietary pattern, significant with hypertensive participants, is high in energy-dense foods but low in micronutrient-rich foods like fruits and vegetables, aligns with patterns implicated in hypertension pathogenesis [35]. The strong associations with processed, sugary, and high-fat foods suggest that dietary modification could be a powerful tool for prevention [36].

The finding on dairy intake may be explained by the consumption of high-fat (unpasteurized milk, especially fura-de-nunu), high-salt dairy variants common in the local diet in Nasarawa state and especially Keffi metropolis [37], which could negate the beneficial effects of sodium and potassium, as reducing Sodium and increasing potassium may lower the risk of cardiovascular disease [38].

The monthly average income of participants with 64.2% earning < #70,000 may also affect the dietary pattern of the participants due to the cost of food [39].

Conclusion

The prevalence of gestational hypertension among pregnant women in Keffi is 29.2 % and this is significantly associated with a dietary pattern characterized by high consumption of beef, confectionery, certain dairy products, cereals, candies, and sugary beverages. Diet modification into patterns that are not significantly associated with gestational hypertension will help. And one of the major places of contact with pregnant women is the antenatal clinic. Integrating targeted nutritional education and counseling by nutrition experts into routine antenatal care is recommended to promote balanced diets and reduce the risk of hypertensive disorders in pregnancy.

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APPENDIX I

PATIENT CONSENT FORM

I am Mrs Adeleke-Ajagbe, Victoria O., a M.Sc. student of Nutrition and Dietetics, Bingham University, Karu. I want to research “Association of Gestational Hypertension with Dietary Pattern of Pregnant women attending antenatal at FMC, Keffi”

I wish to solicit your participation in this research. It will be carried out for free. If you give consent to participate in this study, you will be asked some questions and also examined at intervals during the study period. It will also involve urine sample collection, which will be used for protein and glucose assessment. The test result and examination findings will be made known to you, and you will be advised accordingly.

The study is safe. It has no harmful effect, and participation is voluntary. You may wish to withdraw from the study at any point in time without prejudice to future treatment. Any information you give will be treated as confidential, even after the study period.

You may ask further questions about the study and any procedure that is not clear to you

08130895591; fesivic4u@yahoo.com

CONSENT:

I _____ (initial only) have been duly informed about the study in a language I understand. I realize the benefit of participating in the study and hereby give my consent.

Thumbprint/signature of participant

Signature of researcher

APPENDIX II

Patient Questionnaire

SERIAL NUMBER: _____ PHONE NUMBER: _____

SECTION A: SOCIO-DEMOGRAPHIC DATA

1. Age in years (as last birthday)

2. Marital status

Single ☐

Married ☐

Divorced ☐

Widowed ☐

Seperated ☐

3. Highest education qualification obtained

Primary ☐ Secondary ☐ Tertiary ☐ No formal education ☐

4. Occupation (specify): _____

Skilled ☐ Unskilled ☐ Unemployed ☐ Employed ☐

5. Religion

Christianity, ☐ Islam, ☐ Traditional, ☐ Others (specify) ☐

6. Ethnic Group

Hausa ☐ Igbo ☐ Yoruba ☐ Others (Specify) ☐

7. Place of Residence

Rural ☐ Urban ☐

- Obstetric history

Number of previous pregnancies, Number of successful deliveries, Last child's birth in years

- Present obstetric history: Last menstrual period starting date _____

SECTION B: RISK FACTORS

- History

History of hypertension in previous pregnancy: Yes (): No ()

History of hypertension before pregnancy: Yes (): No ()

History of diabetes: Yes (): No ()

- Parity
- Inter-pregnancy interval
- Activity level Nil () moderate () Very active ()
- Other general information

Personal monthly income: Household monthly income

History of smoking cigarettes: Yes (): No ()

History of alcohol consumption: Yes (): No ()

HIV: Positive () Negative ()

- Assessment of blood pressure

Diastolic

Systolic

- Assessment of obesity

Height _____ Weight _____

Body mass index (BMI) (Kg/m²):

Mid upper arm circumference (MUAC): _____

- Urinalysis:

Protein present: Yes () No ()

Glucose present: Yes () No ()

APPENDIX III

FOOD CONSUMPTION FREQUENCY QUESTIONNAIRE

Food groups	never	Servings/ day	Servings/ week	Servings/month	Serving/year

Meat					
Fish					
Eggs					
Pulses					
White beans					
Green beans					
Red beans					
Cereals					
Rice					
Bread					
Paster(noodles, spaggetti, pizza)					
Potatoes					
Yam					
Tuwo (rice)					
Tuwo (maize)					
Dairy product					
Milk					
Youghurt					
Cheese					
Pudding/fan					
Fats					
Butter					
Margerine					

Mayonnaise					
Oil					
Vegetables: Cooked vegetables					
Uncooked vegetables					
Fruits Fresh fruit					
Canned fruit					
Sweets Sugar					
Chocolate					
Cookies					
Cakes					
Pasteries					
Beverages Water					
Sweetened beverages (sweetened cocoa)					
Grain beverages (kunu)					
Beer					
Wine					
Distilled alcohol (whisky, gin)					

Locally brewed(burukutu, pito)					
Soft drink					
Sobo drink					
Cassava and cassava products					
Garri					
Cassava flakes					
Boiled cassava					
Cassava flour					

Appendix IV

FEDERAL MEDICAL CENTRE

P.M.B. 044

KEFFI NASARAWA STATE,

HEALTH RESEARCH ETHICS COMMITTEE

☎ 047-620020, 620095, 08033970028

Website: <http://www.fmckeffi.net>

E-mail: fmc.keffi@gmail.com, info@fmckeffi.net



FMH-Ref No: C.5187/76 IT
17th February, 2025

Our Ref: FMC/KF/HREC/02665/25

ADELEKE-AJAGBE, VICTORIA OLUBORI,
DEPARTMENT OF BIOCHEMISTRY (NUTRITION AND DIETETICS)
BINGHAM UNIVERSITY, KARU,
NASARAWA STATE.

RE: ETHICAL CLEARANCE TO CONDUCT RESEARCH

Your application for ethical clearance dated 4th February, 2025 refers.
I write to convey full ethical approval for you to embark on the said research study.

Title: ASSOCIATION OF MATERNAL DIETARY PATTERN WITH
GESTATIONAL HYPERTENSION AND OBESITY AMONG PREGNANT
WOMEN ATTENDING ANTENATAL CLINIC AT FEDERAL MEDICAL
CENTER, KEFFI NASARAWA STATE,

This follows a successful defense of your research proposal during the Committee's
ethical screening interview held on the 13th February, 2025.

You are however expected to adhere strictly to the internationally acceptable ethical
standards governing the conduct of research. Accordingly, all rights and
Privileges of the volunteering participants must be respected.
No form of alteration shall be made on this approved protocol without the express
permission of the Committee.

Extracts of your findings should be forwarded to our Committee at the end of the
research work for filing and/or possible intervention via our official email address:
fmckeffihrec@gmail.com

Thank you.

