Geophagia, nutrition and health of women with pregnancy-induced hypertension

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Abstract

Background: Calcium is a major nutrient implicated in pregnancy-induced hypertension (PIH). Aside dietary sources, geophagia has been reported to provide calcium needed to prevent PIH. These soils are shown to contain significant amount of heavy metals which have been associated with hypertension.

Objective: The aim of this study was to determine the relationship between geophagia and PIH, assess the dietary intakes and health of participants.

Methods: This study was a case-control involving 30 women with PIH and 70 normotensive pregnant women.

Results: Geophagia was not significantly associated with PIH. Women with PIH practicing geophagia recorded significantly low levels of haemoglobin, calcium and ferritin. Hypertensives recorded impaired fasting blood glucose (5.77±1.71mmol/L, p=0.051), higher levels of urea (3.60±1.29 mmol/L, p=0.000) and creatinine (382.67±11.66 μmol/L, p=0.000). Percentage intakes of macronutrients for normotensives were within the Adequate Macronutrient Distribution Range and PIH group recorded higher intakes of carbohydrate (72.75±16.16 %), lower protein (9.77±5.61 %) and fat (17.15±11.99%). Dietary calcium intakes in both groups were lower than recommended (< 1,000 mg/day).

Conclusion: In this study, geophagia during pregnancy is not directly associated with PIH but is detrimental to maternal health. The pregnant women in this study had considerably low intakes of energy and nutrients. There is a need for measures to ensure adequate maternal nutrition for a positive health and pregnancy outcomes.

Keywords: Nutrition, pregnancy-induced hypertension, health, geophagia, supplementation, calcium, ferritin.

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Introduction

Nutrients requirement during pregnancy increases with the stage of pregnancy to meet the nutrient demands for the growth of the foetus and prepare the mother for lactation. The nutrient requirement is met from the selection of healthier foods. Food cravings are common during pregnancy, aside that is a craving and ingestion of non-food substances such as ice, soil, soft stones, etc. which is commonly termed as pica[1,2]. A common form of pica is the ingestion of soil, termed geophagia. Studies show that these soils contain traces of calcium, iron, zinc, magnesium, potassium, copper and manganese, however, the bioavailability of these minerals cannot be guaranteed and hence its nutritional significance[3,4]. These soils may contain heavy metals such as lead, cadmium, arsenic etc. which when introduced into the body, can be detrimental. More importantly exposure to lead during pregnancy has

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been associated with the development of pregnancy-induced hypertension[5].

Calcium is a major nutrient associated with hypertension during pregnancies, and the most documented[6,7]. Studies indicate that mothers with low dietary intakes of calcium have increased risk of pregnancy-induced hypertensive disorders[6]. Several clinical trials suggest that women receiving supplements of calcium have lower blood pressure, hence calcium supplements being used as a form of intervention in women diagnosed with pre-eclampsia[8,9]. This is however true among populations with low calcium intakes[10]. Studies by Eiley and Katz[11]. hypothesized that the ingestion of geophagic clay during pregnancy may provide the calcium needed to improve maternal calcium status as well as reduce the risk of hypertension in pregnancy. The aim of this study was to determine the relationship between geophagia and hypertensive disorders of pregnancy, and assess dietary intakes and health outcome of participants.

Subjects and methods

Subjects

The case-control study was conducted at the Obstetrics and Gynaecology unit of the Komfo Anokye Teaching Hospital in the Kumasi Metropolis of Ghana. Pregnant women with singleton pregnancy between the ages of 20 and 40 years with gestational age of 20 weeks or more were eligible participants for the study. Pregnant women with medical conditions such as diabetes, pre-existing hypertension, autoimmune disease and kidney or liver diseases and systemic diseases were excluded. The cases were 30 pregnant women with pregnancy-induced hypertension without proteinuria. The control groups were 70 normotensive pregnant women. The groups were also matched for weight and body mass index to control for confounding variables.

Sample size calculation

The sample size was determined using Cochrane's formula; $N= Z^2 p (1-p)/d^2$ where N is the sample size, Z is the standard score for the confidence interval of 95% which is 1.96. P, the average prevalence of hypertension complicating pregnancy in Ghana is 1.75%[12], d is marginal error which is 5%. $N = z^2 p (1- p) / d^2$

$$N= 1.96^2 * 0.0175 (1-0.0175)/0.05^2$$

$$N= 26.42$$

The estimated minimum sample size for women with hypertension was therefore, 26.

Blood pressure measurement

Blood pressure measurement was done in accordance with recommendations by the American Heart Association using a digital sphygmomanometer (Omron, Japan). A replicate measurement was taken for each participant and the mean value recorded as the blood pressure. The systolic and diastolic blood pressure was measured.

Routine urine examination

As part of antenatal routine examination, pregnant women visiting the facility reported with 5-10ml of the freshly voided early morning urine in clean, easy access and leak proof containers. Test strips (Combi 10 SGL, Yercon Diagnostic Co. Ltd. China) were dipped into urine samples and removed. After 5-10 seconds, the strips were observed for colour change.

Dietary assessment

A two-day 24-hour recall was used to assess the nutrient intakes and analyzed with the West African Food Composition Table[13]. The food frequency questionnaire was used to assess the habitual intakes of participants from food groups such as whole-grains, animal proteins, plant proteins, fruits, vegetables and dairy products.

Anthropometric assessment

Anthropometric measurements including pregnancy weight, body mass index, mid upper arm circumference (MUAC), body fat and visceral fat percentage were assessed. Mid Upper-arm Circumference was measured with a tape measure. The heights of pregnant women were measured by standing vertical, without footwear on a stadiometer. The Bio impedance analyser (Omron, Japan) was used to calculate the weight, body fat percentage and visceral fat. BMI was calculated using the formula weight (kg)/height^2 (m^2)

Biochemical assessment

Upon recruitment, a volume of 7 ml of venous blood samples were collected from participants by a phlebotomist after an overnight fast (8-12 hours). The blood samples were apportioned into 3 suitable test-tubes namely the fluoride tube, the ethylenediaminetetra-acetic acid (EDTA) tube and the gel activator tube for fasting blood glucose, full blood count and kidney function test (urea and creatinine), serum calcium and ferritin respectively. Full blood Count analysed with Sysmex XP-300 Haematology Analyzer (North America), fasting blood glucose with Randox (RXmonzaTM, United Kingdom), urea, creatinine and calcium with Biolabo Diagnostics (Kenza BiochemistryTM, France) and serum ferritin with Mindray (MR-96A, China). All determinations were performed according to manufacturers' instructions.

Data analysis

Data was entered and stored in Microsoft Excel and analyzed using SPSS version 22.0 (IBM Inc. Chicago). Categorical variables were analyzed using Chi-square and Fischer's test whilst continuous variables were analyzed using the unpaired t-test. Data was represented as means ± standard deviation. Pearson's correlation was performed to determine the relationship between variables. Risk factors of hypertension were estimated by odds ratio. In all statistical tests, p- value <0. 05 were considered significant.

Ethical consideration

Approval was sought from the Committee on Human Research, Publication and Ethics of the Kwame Nkrumah University of Science and Technology (CHRPE/AP/002/17), and the Research and Development Office of Komfo Anokye Teaching Hospital (RD/CR16/243). Participation was voluntary and evidenced by a written consent.

Results

The population of respondents was 70 normotensive pregnant women and 30 women with PIH. There were significant differences in their ages, marital status and age of gestation. Seventy percent of normotensives were between 25-35 years, 87.2% were married and 80% were in their 3rd trimesters of pregnancy, compared to PIH women with 43.3%, 66.7% and 100% respectively. Table 1 shows the socio-demographic and obstetric characteristics of participants.

Table 1: Distribution of socio-demographic and obstetric characteristics of respondents

Characteristics	Normotensives (n=70)		Hypertensive (n=30)		p value
	n	%	n	%	
Age					
<25years	5	7.1	6	20	**0.029**
25-35 years	49	70	13	43.3	
>35 years	16	22.9	11	36.7	
Marital Status					
Single	8	11.4	10	33.3	**0.029**
Married	61	87.2	20	66.7	
Separated/Divorced	1	1.4	0	0	
Occupation					
Employed	26	37.2	10	33.3	0.057
Trader	32	45.7	8	26.7	
Student	0	0	2	6.7	
Unemployed	12	17.1	10	33.3	
Parity					
Nulliparous	3	4.3	4	13.3	0.267
Primiparous	18	25.7	7	23.3	
Multiparous	49	70	19	63.3	
Family History of Hypertension					
Yes	20	28.6	5	16.7	0.157
No	50	71.4	25	83.3	
Age of gestation					
2nd Trimester	14	20	0	0	**0.004**
3rd Trimester	56	80	30	100	

Categorical data is represented as percentages.

Table 2 compares the mean age, blood pressure and anthropometries of participants. Systolic blood pressures of normotensive pregnant women were within the normal range (115.87±14.75 mmHg) and also lower than in the hypertensive group, with blood pressure within the range for diagnosing hypertension (145.97±22.75 mmHg, p = 0.000). Likewise, diastolic pressure for normotensives was 70.63±11.65 mmHg while that of hypertensive group was 93.73±14.23 (p = 0.000). There was no statistically significant difference in the mean age, weight, BMI, and visceral fat percentage. However, body fat percentage was significantly higher among normotensives (41.27±5.82) than the hypertensive group (31.49±11.19, p= 0.000).

Table 2: Comparison of mean age, blood pressure and anthropometries of participants

Parameter	Normotensives	Hypertensive	P-value
Systolic Pressure	115.87±14.75	145.97±22.75	**0.000**
Diastolic Pressure	70.63±11.65	93.73±14.23	**0.000**
Age (year)	31.61±4.92	31.67±8.12	0.974
MUAC (cm)	31.50±4.11	32.15±6.33	0.606
Weight (kg)	75.26±14.32	76.58±18.57	0.730
Body Mass Index (kg/m^2)	29.65±4.74	30.44±7.75	0.607
Body Fat Percentage (%)	41.26±5.82	31.49±11.19	**0.000**
Visceral Fat (%)	7.01±1.56	5.97±2.70	0.054

MUAC Mid-upper arm Circumference

Table 3 shows the effect of geophagia on blood pressure and biochemical parameters of participants. There were significant differences in diastolic pressure, urea, creatinine and WBC between normotensives and hypertensives practicing geophagia (HG). HG group recorded significantly low levels of haemoglobin (8.35±1.91g/dL), haematocrit (28.45±5.38%), (14.89±3.73 ng/mL) and total calcium (7.05±1.05mg/dL) than hypertensives without geophagia (HN). Total calcium levels among normotensives without geophagia (NN) were lower than the reference range, but normal among those practicing geophagia within the group.

Table 3: The effect of geophagia on maternal blood pressure and biochemical parameters

	Normotensive		**Hypertensive**		**P-value**		
Parameter	**None (NN)**	**Geophagia (NG)**	**None (HN)**	**Geophagia (HG)**	**NN+NG**	**HN+HG**	**NG+HG**
Systolic (mmHg)	116.12±15.64	114.77±10.41	146.29±21.4	144.67±29.85	0.706	0.904	0.057
Diastolic (mmHg)	71.68±12.05	66.00±8.62	95.50±14.59	86.67±11.00	0.060	0.132	**0.004**
FBG (mmol/L)	5.00±1.15	5.47±1.01	5.82±1.89	5.53±0.67	0.154	0.544	0.873
Urea (mmol/L)	2.58±0.55	2.95±0.63	3.63±1.27	3.48±1.51	0.072	0.838	**0.000**
Creatinine (µmol/L)	38.64±5.18	38.88±4.67	387.17±12.03	365.01±7.29	0.868	0.577	**0.000**
WBC (X10^3/µL)	2.85±1.28	3.10±1.25	10.19±3.41	10.75±2.16	0.526	0.628	**0.000**
RBC (X10^6/µL)	3.88±0.63	3.83±0.54	3.97±0.72	3.70±0.67	0.743	0.398	0.684
Hb (g/dL)	10.65±1.87	9.78±1.70	10.73±1.67	8.35±1.91	0.119	**0.026**	0.150
Hct (%)	36.95±6.35	33.85±4.99	34.71±5.47	28.45±5.38	0.068	**0.035**	0.067
MCV (fL)	95.37±8.48	88.88±10.09	88.04±6.67	77.43±9.71	**0.047**	**0.043**	**0.040**
MCH (pg/cell)	27.89±2.58	25.70±3.73	27.08±2.80	22.72±4.13	0.063	**0.048**	0.166
MCHC (g/dL)	29.27±1.92	28.86±2.09	30.95±1.11	29.22±1.97	0.529	0.085	0.728
Plt (X10^3/µL)	201.54±84.40	227.23±82.69	198.13±69.82	273.17±71.56	0.327	0.052	0.241
Lym (X10^3/µL)	1.84±1.03	2.08±0.57	2.00±0.74	2.12±0.63	0.246	0.716	0.918
Neut (X10^3/µL)	1.01±0.87	1.02±1.00	7.34±2.99	7.67±2.62	0.992	0.760	**0.000**
Ferritin (ng/mL)	51.15±6.00	50.44±8.57	80.94±65.56	14.89±3.73	0.978	**0.000**	**0.000**
Calcium (mg/dL)	7.19±2.34	9.26±5.84	8.22±1.41	7.05±1.05	0.233	**0.047**	0.210

FBG, Fasting Blood Glucose; Hb, Haemoglobin; WBC, White Blood Cell; RBC, Red Blood Cell; Hct, Hematocrit; MCV, Mean Corpuscular Volume; MCH, Mean Corpuscular Hemoglobin; MCHC, Mean Corpuscular Hemoglobin Concentration.

Table 4 shows the association of some dietary practices with pregnancy-induced hypertension. Geophagia and energy drink intake did not significantly increase the risk of developing hypertension in pregnancy. Coffee intake increased the risk of hypertension by 4 times (OR, 4.10; 95% CI: 2.10 – 8.00, p = 0.004). Women who had received a form of nutrient supplement during pregnancy were at a reduced risk of hypertension by 67.3% (OR, 0.33; 95% CI: 0.17 – 0.61, p = 0.017).

Table 4 Association of dietary practices with hypertension in pregnancy

Characteristics	Normotensives		Hypertensives			
	(n=70)	%	(n=30)	%	P-value	OR (95% CI)
Geophagia						
Yes	13	18.6	6	20	0.535	1.09 (0.54-2.21)
No	57	81.4	24	80		
Energy drinks						
Yes	19	27.10	10	33.3	0.346	1.34 (0.73-2.46)
No	51	72.90	20	66.7		
Total	70	100	30	100		
Coffee						
Yes	11	15.7	13	43.3	**0.004**	4.10 (2.10-8.00)
No	59	84.3	17	56.7		
Nutrient Supplement						
Yes	56	80	17	56.7	**0.017**	0.33 (0.17-0.61)
No	14	20	13	43.3		

OR, Odds Ration. Nutrient supplements received include folic acid, iron, zinc and multivitamin.

Table 5 compares the mean nutrient intakes of participants with recommended intakes. The general intake of energy, minerals and anti-oxidant micronutrients nutrients for the entire population was poor, however, normotensives recorded healthier intakes than the hypertensive group. Percentage intakes of carbohydrates, protein and fat among normotensives were within the adequate macronutrient distribution range. There were significant differences in the percentage intakes of carbohydrate, protein and fat between normotensive and hypertensive pregnant women (p = 0.003, 0.006, and 0.007 respectively). Hypertensive group had higher percentage intakes of carbohydrate, i.e. 72.75±16.16, and lower percentage intakes of protein and fat (9.77±5.61 and 17.15±11.99 respectively).

Table 5 Compares the macro and micronutrient intakes of participants

Dietary Intake	RDA/AI/ AMDR	Normotensive	Hypertensive	P-value
Energy	N/A	1755.63±795.95	1261.81±640.42	0.002
Protein (g/d)	71	54.22±22.15**	36.06±27.98*	0.003
% Protein	10-35	13.13±4.50**	9.77±5.61*	0.006
Animal Protein (%)	N/A	42.76±20.28	29.51±28.15	0.024
Cereal Protein (%)	N/A	31.30±21.11	45.60±33.80	0.038
Legume Protein (%)	N/A	10.07±1.42	10.24±1.49	0.185
Fat (g/d)	ND	47.11±25.83	38.49±28.93	0.004
% Fat	20-35	24.30±9.70**	17.15±11.99*	0.007
Carbohydrate (g/d)	175	267.65±108.32***	223.32±106.66***	0.063
% Carbohydrate	45-65	62.56±9.97**	72.75±16.16***	0.003
Fiber (g/d)	28	21.95±10.10**	14.22±9.41*	0.001
Calcium (mg/d)	1,000	309.36±156.40*	174.98±146.07*	0.000
Iron (mg/d)	27	11.79±6.79*	6.67±4.61*	0.000
Magnesium (mg/d)	360	299.10±104.93**	207.14±120.85*	0.001
Zinc (mg/d)	11	7.61±3.57**	5.16±3.89*	0.005
Selenium (µg/d)	60	75.01±34.39***	53.59±40.34**	0.014
Vitamin A (µg/d)	770	218.34±27.91*	72.45±67.46*	0.000
Vitamin C (mg/d)	85	101.94±63.82***	45.16±37.66*	0.000
Vitamin E (mg/d)	15	6.49±4.34*	3.35±1.78*	0.001
Folate (µg/d)	600	338.36±204.32*	138.40±121.78*	0.000

Recommended Daily Allowances (RDA); Adequate Intakes (AI); Adequate Macronutrient Distribution Range (AMDR); ND, not determined; N/A, not Applicable. *<70% RDA/AI, **70-100%RDA/AI,***>100%RDA/AI

Table 6 compares mean haematological and biochemical data of normotensive and hypertensive pregnant women. The mean fasting blood glucose level was within the normal range among normotensives (5.08±1.13 mmol/L) but hypertensives recorded impaired fasting blood glucose (5.77±1.71 mm/L) although the differences between the groups were not statistically significant. For serum parameters, urea and creatinine was within the normal range for normotensives, and significantly higher among hypertensives (p = 0.000). For total calcium and ferritin levels, normal readings were recorded for both groups.

Table 6 Comparison of mean haematological and biochemical data of normotensive and hypertensive pregnant women

Parameter	Normal Range	Normotensives	Hypertensives	P-value
FBG (mmol/L)	3.9-5.6	5.08±1.13	5.77±1.71	0.051
Hb (g/dL)	9.5-15.0	10.49±1.86	10.26±1.95	0.575
WBC (X 10^9/L)	5.9-16.9	2.90±1.27	10.30±3.17	**0.000**
Hct (%)	28.0-40.0	36.37±6.21	33.46±5.93	**0.031**
MCV (fL)	81-99	94.16±9.09	85.92±8.37	**0.000**
MCHC (g/dL)	31.7-35.7	29.19±1.95	30.61±1.46	**0.000**
Neutrophils (X10^9/L)	3.9-13.1	1.01±0.91	7.41±2.80	**0.000**
Urea (mmol/L)	0.75-2.75	2.65±0.58	3.60±1.29	**0.000**
Creatinine (µmol/L)	35-80	35.97±5.06	382.67±11.17	**0.000**
Calcium (mg/dL)	8.2-9.7	7.57±3.32	7.98±1.41	0.389
Ferritin (ng/mL)	0-116	51.02±48.71	67.73±64.29	0.240

FBG, Fasting Blood Glucose; Hb, Haemoglobin; WBC, White Blood Cell; RBC, Red Blood Cell; Hct, Hematocrit; MCV, Mean Corpuscular Volume; MCH, Mean Corpuscular Hemoglobin; MCHC, Mean Corpuscular Hemoglobin Concentration.

Discussion

Hypertension in pregnancy, if not properly managed, can lead to foetal and maternal morbidity, and it is known to be a leading cause of maternal deaths[14]. This study assessed maternal dietary intakes and investigated the association of some practices with PIH, and how these are able to influence their general well-being.

In this case-control study, there was no significant difference in the family history of hypertension, parity, mean age, BMI, and MUAC between women with PIH and normotensives. A study by Owiredu et al[15] reports that marital status or nulliparity does not increase the risk of hypertension (aOR 1.8; 95% CI 0.8-4.0) but women with a family history of hypertension were 10 times at risk of developing hypertension in pregnancy than those without history (95% CI 1.2-12.2). Ephraim et al[16] in Ghana reported higher indices of obesity and high blood pressure among women with PIH with BMI correlating positively with systolic blood pressure ($r=0.575$, $p < 0.01$). According to Valensise et al[17] on the total body water and extracellular water among pregnant women showed that women with gestational hypertension had higher intracellular fluids due to fluid retention hence their increased weight may be due to water retention. Also, the reduced body fat percentage can be explained by their very low intakes of energy and therefore reduced store of energy.

Poor nutritional intakes were observed in the overall study population, however, normotensives had higher energy intakes than hypertensives. The low intakes of energy have also been reported in other studies among women with PIH and this has been attributed conceivably as a response to their present condition rather than the cause[6]. Dietary fibre intakes among normotensives were 21.95±10.10g/d and 14.22±9.41 g/d for hypertensives. A prospective cohort study by Qiu et al[18] shows that women who consume diet containing at least 21.2g of total fibre per day were at a 67% reduced risk of developing hypertension in pregnancy than those consuming less than 11.9d/day (RR = 0.33; 95% CI = 0.14-0.79) in addition to a reduction in triglycerides by 11.9mg/dL and improving HDL-cholesterol[19,20,21].

A prospective cohort study conducted in Denmark on dietary intakes during pregnancy and the risk of hypertension, concluded that calcium, magnesium, folate, vitamin C, D, E or milk, did not affect the risk of hypertension[22]. Another prospective study in USA by Morris et al[23] also found no association between nutrition and hypertensive disorders of pregnancy. A decreased calcium intake signals the parathyroid gland to secrete parathyroid hormone. This hormone, together with vitamin D, leads to an increase in intracellular calcium by causing cell membrane permeability. The influx of calcium ions in the intracellular space leads to an increase in vascular smooth muscle contraction, and thus, an elevation in blood pressure[24]. Recommendations by the World Health Organization[25] for the prevention and treatment of hypertension in pregnancy, is to administer 1.5-2.0g of elemental calcium to pregnant women in areas where dietary intakes of calcium are low. Magnesium also plays a role in blood pressure regulation by stimulating the release of prostacyclin, a potent vasodilator, from endothelial cells which inhibits the activation of platelets for blood clots to increase blood pressure[26,27].

Dietary anti-oxidant micronutrients have been shown to play a key role in endothelial function and the prevention of oxidative stress, which has been shown to be involved in PIH[28,29,30,31]. A randomized placebo-controlled double-blind study in Brazil by Spinnato et al[32] and in USA by Roberts et al[33] on the benefits of antioxidant supplementation (1,000 mg vitamin C and 400IU vitamin E) among pregnant women with PIH without proteinuria did not show any beneficial effect. However, among women with low anti-oxidant intake, supplementation with antioxidant micronutrients is protective against hypertensive disorders[34]. From this study, the total study population recorded poor nutrient intakes which is a possible explanation as to why supplementation in this study showed to reduce the risk of hypertension by 67% (OR 0.33, 95% CI 0.17-0.61). A greater percentage of hypertensives reported to take in coffee than the normotensives ($p = 0.017$) and this showed to increase the risk of hypertension by 4 times (OR 4.1, 95% CI 2.1-8). Another study in Ethiopia showed that coffee intake during pregnancy increased the risk of hypertension, OR= 2.16, 95% CI = 1.32-3.53[35].

For both hypertensive and normotensive groups, serum calcium levels were lower than the reference ranges (8.2-9.7 mg/dL), with the PIH women having higher levels than normotensives, although not statistically significant. Serum levels were higher among hypertensives, although did not reach statistical significance. A study by Biswas et al[36] reported that serum ferritin levels were significantly higher among hypertensives (90.41±37.39 ng/mL) than normotensives (25.71±11.38 ng/mL), with ferritin levels correlating positively with systolic ($r = 0.5079$, p-value = 0.004) and diastolic ($r = 0.0660$, p-value = 0.729) blood pressure. Serum ferritin is a reliable indicator for iron stores among healthy individuals, where low concentrations may indicate iron deficiency, however, among unhealthy individuals, and an increased level of ferritin signifies cellular damage or haemolysis[37]. High ferritin levels in pregnancy especially in the third trimester have been associated with poor pregnancy outcomes[37]. The low level of ferritin in healthy pregnancy is explained by the high foetal demand for iron in the third trimester for blood cell production[38].

The abnormally elevated levels of urea and creatinine among hypertensives signifies impaired kidney function, which when not managed, may lead to chronic kidney disease[39,40]. This shows that high blood pressure is harmful to the health and functioning of the kidney. Also, the impaired fasting blood glucose levels among women with PIH may result in gestational diabetes, given blood glucose levels are not monitored and controlled. Owiredu[41] reported that women with PIH are at risk of metabolic syndrome.

Iron deficiency anaemia has been widely reported among pregnant women practicing geophagia[42]. In this study population, there was no significant effect of geophagia among normotensives, however, pregnant women practicing geophagia within the hypertensive group had significantly low levels of haemoglobin, haematocrit and ferritin levels. These parameters are indicators of iron deficiency which may complicate maternal disease condition, affect foetal health, lead to low birth weight infants and result in complication during delivery[43,44]. Low levels of calcium among the hypertensive group practicing geophagia may result in a further increase in blood pressure and lead to poor pregnancy outcomes.

Conclusion

In this study, the practice of geophagia during pregnancy is not associated with pregnancy-induced hypertension, however, this practice is detrimental to maternal health, especially those with pregnancy-induced hypertension. Women with PIH have altered haematology parameters, impaired fasting blood glucose and impaired kidney function, hence, have an increased risk of pregnancy and health complications such as anaemia and chronic kidney disease. Pregnant women under study had considerably low intakes of energy and micronutrients which is crucial in the third trimester as foetal demands for nutrients are increased.

Recommendations

During antenatal visits, pregnant women should be made aware of some dietary practices which are harmful during pregnancy, and increase education regarding the benefit of adequate nutrition.

Nutrient supplementation should be administered to pregnant women, especially those living in low socioeconomic areas to supplement dietary intakes.

A prospective cohort study of maternal dietary intakes in the entire pregnancy period should be conducted as well as blood biomarkers of nutrients to properly determine the role of nutrients in the development of hypertension in pregnancy.

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Conflict of interest

None to declare.

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