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Pitout JDD, Church DL, Gregson DB, Chow BL, McCracken M, Mulvey M, Laupland KB (2007). Molecular epidemiology of CTXM-producing *Escherichia coli* in the Calgary Health Region: emergence of CTX-M-15-producing isolates. *Antimicrob. Agents Chemother.* 51: 1281-1286.

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# International Journal of Nutrition and Metabolism

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*Full Length Research Paper*

## Dietary habits of pregnant women in Ogun-East Senatorial Zone, Ogun State, Nigeria: A comparative study

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Poor maternal nutrition in pregnancy leads to increased morbidity and negative pregnancy outcomes including low birth weight and peri-natal mortality. Pregnancy places extra demands on the body systems of pregnant women, necessitating optimal intake of essential nutrients. Rural and urban disparities in nutritional status have been documented in literature. A cross-sectional comparative assessment of the dietary intake of 720 pregnant women accessing antenatal care at selected rural and urban primary health centers, in Ogun State, was carried out using multi-stage sampling technique. Data was collected using semi-structured, interviewer-administered questionnaires and 24 h dietary recall forms. Data was analyzed using statistical package for social sciences (SPSS) version 15.00 and total intake assessment software. Relevant inferential statistics were calculated. The mean intake of most nutrients was significantly higher ( $p < 0.05$ ) among the rural women than their urban counterparts, except for Vitamin A, Zinc and Iron. There was no significant difference ( $p > 0.05$ ) in the types of vegetables consumed by rural and urban respondents. The types of snacks consumed were significantly different ( $p = 0.032$ ), but there was no difference ( $p = 0.652$ ) in frequency of snack consumption between both groups. The rural women had higher nutrient consumption compared to their urban counterparts. Continuous nutrition education will go a long way in ensuring adequate nutrient intake among pregnant women.

**Key words:** Diet, intake, pregnant, Ogun.

### INTRODUCTION

Pregnancy is a celebrated state in many sub-Saharan African cultures, because it heralds the coming of a newborn into the world. However, many of these communities

have undesirable maternal and child health indices, due to a variety of factors, including poor maternal nutritional status. Dietary factors, including presence or absence of

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food restrictions, overall quality of the diet, feeding habits, dietary indiscretions, as well as inadequate knowledge of nutrition, are well documented independent variables, associated with pregnancy outcome and maternal weight gain in pregnancy (Campbell and Campbell, 2008). It is universally accepted that under nutrition can have drastic and wide-ranging effects on women and children, if not managed optimally. When it does occur in the severe form, usually as a result of food shortage, very high levels of morbidity and mortality are recorded (Picot et al., 2012).

Maternal diets during pregnancy have gained a lot of attention over the years. This is due to the recognition of the increased physiologic, metabolic and nutritional demand placed on the pregnant woman by her gravidity. The dietary intake of pregnant women needs to provide energy and nutrients for the mother, as well as the foetus (King, 2000). Studies have shown that inadequate dietary intake in pregnancy can lead to unfavorable outcomes. Insufficient intake of dietary and supplemental iron can lead to iron deficiency anaemia, with its attendant consequences, including an added risk for morbidity and labour complications (Scholl and Hediger, 1994; Yip, 2000; Scholl and Reilly, 2000).

Several studies assessing the dietary intake and feeding habits of pregnant women have been carried out in sub-Saharan African countries. A study in South Africa documented the top ten food items most often consumed by pregnant women in the descending order, which include: fresh milk, tea, coffee, cold drinks, maize meal, fruit juice, bread rolls, magou (a fermented non-alcoholic drink), rice and sugar (Kersa, 2004). Huybregts et al. (2009) in rural Houde district, Burkina Faso, assessed the dietary behaviour, food and nutrient intake of pregnant women, using qualitative (in-depth interviews) and 24-h dietary recall methods. Most respondents reported dietary restrictions during pregnancy, but no consistent pattern of avoided food types was found. The mean nutrient intakes were found to be insufficient compared with the recommended dietary allowance.

The dietary practices and nutrient intakes of 279 pregnant women accessing antenatal care at Korle-Bu Teaching Hospital and Osu maternity home, was assessed with the aid of interview guides and 24 h dietary recall forms, by researchers in Accra, Ghana. The effect of socio-demographic factors on nutrient intakes of the pregnant women and the potential changes in dietary habits were studied. The mean energy, vitamin B12, folic acid, iron and zinc intakes were found to be inadequate compared with the recommended daily intakes. The contributions of macronutrients to total caloric intake were: protein (13.3%), fat (34.7%) and carbohydrate (52.1%). There was a significant association between educational level and mean protein intake ( $p < 0.001$ ) as well as between income levels and mean protein intake ( $p < 0.001$ ) and zinc ( $p < 0.02$ ). Dietary restrictions were present in 48.8% of respondents; pica in 57.3% and cravings in 67.7%

of the pregnant women studied (Koryo-Dabrah et al., 2012).

Superstitions and nutrition of pregnant women in Nwangele LGA of Imo State, Nigeria, were studied, showing 15% of study participants adhering to traditional beliefs about nutrition and feeding practices in pregnancy. They held onto the food taboos handed down from generation to generation, including prohibition of grass cutter meat; cassava (fufu) meals; spaghetti (pasta); noodles; cocoa beverages; eggs and snail (Madiforo, 2010). Ojofeitimi et al. (2008) studied the dietary intake of 840 pregnant women from rural and urban LGAs in Osun State. Inadequate dietary energy intake was noted in about 75% of the pregnant women studied; while protein intake was generally adequate for most study participants, averaging about 65%. The source of dietary protein was mainly of plant origin. Approximately 70% of the women studied had inadequate dietary intake of Vitamin C; folate intake was inadequate in only 28% of the study participants, signifying that over 71% had adequate dietary intake of folic acid.

In other parts of the developing world, the situation is not very different. Maternal micronutrient deficiencies are widespread in Pakistan and many countries of the Southeast Asian sub-continent. These are potentially associated with maternal under-nutrition and intra-uterine growth retardation. Intervention strategies have therefore consisted of administration of iron-folic acid supplements and other micronutrients during pregnancy (Tesfahun, 2009). The dietary assessment of 284 pregnant women in Maku, Western Iran, revealed a higher nutrient intake among rural women than their urban counterparts. Mean consumption of grains and dairy products was much higher in rural women compared to the urban respondents. Urban women consumed 140 g of fruits, compared to 248 g from rural women. The average energy consumption as a percentage of the total calories ingested is: 66, 23 and 11% from carbohydrates, fats and protein among urban pregnant women. For the rural women, 68% carbohydrate; 20% fats and 12% protein constituted the energy consumption as a part of the overall caloric intake. The vitamin D, Iron and calcium intake of rural women was significantly higher than their urban counterparts. However, intake of folate, vitamin A and D, iron, calcium, phosphorous, zinc, were inadequate (Esmailzadeh et al., 2008).

A study of the energy and protein consumption of pregnant women, in Vararian district of India, showed the difference in energy consumption between rural and urban women. The diets of rural women were found to be significantly lower in energy ( $1842.11 \pm 209.07$  kcal) compared with those of their urban counterparts ( $1905 \pm 253.60$  kcal). These implied that rural women consumed 87.72% of the RDA, while the urban women consumed 90.75% of the RDA. Similarly, protein consumption was 77.12 and 87.38% of the RDA for rural and urban pregnant women, respectively. Maximum consumption of

energy and protein was noted to be during the second trimester, after which a decline was evident (Mehrotra and Tiwari, 2009).

Pathak et al. (2004) assessed the diets of pregnant women, in a rural district of Haryana State, India and found almost 20% of respondents consuming less than 50% of the recommended total calories. About 99% of the pregnant women consumed less than 50% of the recommended dietary allowance (RDA) for folic acid; 86.2% consumed less than 50% of the RDA for zinc; 75.4% consumed less than 50% of the RDA for iron; 23.6% consumed less than 50% of the RDA for copper and 3.9% consumed less than 50% of the RDA for magnesium. Consumption of food groups rich in micro-nutrients, including pulses, vegetables, fruits, nuts and oil seeds, as well as animal foods, was infrequent. Rural-urban differences in nutritional status, including nutrient intake and haematological parameters are well documented in literature (Mehrotra and Tiwari, 2009; Esmailzadeh et al., 2008; Okwu et al., 2007). According to the Nigeria Demographic and Health Survey, conducted in 2008, the micronutrient consumption pattern of mothers in urban areas was better than the intake of rural women (NPC/ICF Macro, 2009).

A healthy and well-nourished woman bears healthy children, who grow to be healthy adolescents and adults. The nutrient intake of pregnant women therefore has various consequences on the health and wellbeing of children, households, communities and the nation at large, particularly in sub-Saharan Africa, where it is a great determinant of survival and quality of life for the offspring (Shrimpton, 2006). This study therefore assessed the dietary habits of pregnant women in rural and urban areas of Ogun State, Nigeria.

## METHODOLOGY

A cross-sectional comparative study was carried out among pregnant women utilizing ante-natal care services at selected primary health centres (PHCs) in rural and urban areas of Ogun state, southwest Nigeria, between 4th December, 2012 and 6th May, 2013. Ogun state serves as a transit zone between the southwest and other regions of the country, with the capital in Abeokuta. It is bounded in the north by Oyo and Osun states, in the east by Ondo state, in the south by Lagos state and in the west by the Republic of Benin. Only women fully resident in the state were recruited into the study. Using a formula for the comparison of two independent proportions:

$$N = \frac{(Z_{1-\alpha/2} + Z_{1-\beta})^2 [P_1(1-P_1) + P_2(1-P_2)]}{(P_1 - P_2)^2}$$

$$N = \frac{(1.96 + 0.84)^2 [0.3(0.7) + (0.2)(0.8)]}{(0.3 - 0.2)^2}$$

$$N = 290.008$$

Taking into account a 20% non-response rate, incompletely-filled questionnaires and other unforeseen challenges with data collection, the calculated sample size (N) was rounded up to 360, per group. A total of 720 pregnant women were studied in all. Multi stage sampling technique was used to select study participants. The first stage involved the selection of Sagamu LGA as the urban study location from the two existing urban LGAs and Remo-North LGA as the rural study location from the six rural LGAs, by simple

random sampling. Odogbolu LGA is classified as semi-urban and was not included in the sampling frame. The second stage of sampling involved the selection of two wards from each of the selected LGAs by simple random sampling. Ode-Remo primary Health Care (PHC) and Ipara PHC, located within the selected wards, constituted the rural study sites. Makun PHC and Sabo PHC, both located within the two selected wards, constituted the urban study sites. Therefore, a total of four Primary Health Centres was utilized for the study in both LGAs.

Each of the selected urban PHCs had an average weekly attendance of 55 pregnant clients. The rural PHCs had an average weekly attendance of 35 pregnant clients. All pregnant women accessing antenatal care, aged between 18 and 49 years, without chronic medical conditions, constituted the sampling frame. The study participants were selected using systematic random sampling technique. A sampling fraction of 1/3 was obtained and therefore an interval of 3 was used in the urban PHCs, while an interval of 2 was used following the calculation of a sampling fraction of 1/2 in the rural PHCs.

Interviewer-administered semi-structured questionnaires were used to collect data on respondents' socio-demographic characteristics, dietary practices and intake. The questionnaire was adapted from the National Food Consumption and Nutrition Survey and previously published research works. It was pretested in Ikenne and Ijebu-Ode LGAs, which are similar to the study locations in Ogun East senatorial district. Dietary intake was assessed using a modified food frequency questionnaire and a 24-h dietary recall form, which formed an integral part of the semi-structured, interviewer-administered questionnaire. The dietary recall form had been used for a nationwide food consumption survey a few years back (Maziya-Dixon et al., 2004).

Data analysis was done using the IBM statistical package for the social sciences (SPSS) version 14.00. Proportions, means and frequencies were calculated, presented as tables and charts, and compared between the two groups using the appropriate statistical tests. Chi square test and Fisher's exact test were used to test for association between categorical variables, while t-test was used for comparison of means. Level of significance was placed at  $p = 0.05$ . The caloric values of the dietary intake of participants were obtained using the validated total dietary intake assessment software, after the estimated weight of each consumed food item was recorded, as described in previous dietary surveys (Maziya-Dixon et al., 2004; Ojofeitimi et al., 2008). The findings were compared between the rural and urban groups, as well as with the recommended nutrient intake (RNI). The RNI refers to the daily intake that meets the nutrient requirements of almost all apparently healthy individuals in an age - and sex - specific population group. It is set at the estimated average requirement (EAR) plus two standard deviations (Allen et al., 2006).

Ethical approval was obtained from the Ogun State Primary Health Care Board, Ogun State Ministry of Health, as well as the Health Research and Ethics Committee of Olabisi Onabanjo University Teaching Hospital, Sagamu. Participants' informed consent was obtained verbally and by thumb printing, prior to the commencement of the study. Strict confidentiality was ensured throughout the course of the research. Participants were free to withdraw from the study, if they deemed it necessary and were assured that such would not affect the quality of care received at the facility.

## RESULTS

### Socio-demographic characteristics of respondents

Respondents were aged between 18 and 49 years, with a mean age of  $28.14 \pm 5.49$  years for rural women and  $28.38$

**Table 1.** Vegetable consumption pattern of respondents.

Vegetable	Rural (n=360)	Urban (n=360)	Test statistic
	Frequency (%)	Frequency (%)	
Bitter leaf	10 (2.8)	9 (2.5)	$\chi^2=9.695$ ; $p=0.138$ .
Igbo (African egg plant)	14 (3.8)	9 (2.5)	
Ewedu (long-fruited vegetable)	6 (1.7)	6 (1.7)	
Soko ( <i>Celosia argentea</i> )	96 (26.7)	78 (21.7)	
Tete (African spinach)	19 (5.3)	22 (6.1)	
Ugwu (Fluted pumpkin)	98 (27.2)	82 (22.7)	
Gbure (Water leaf)	117 (32.5)	154 (42.8)	

28.38 ± 5.53 years for urban respondents. There was no significant difference ( $p > 0.05$ ) between both means. The mean parity of rural respondents was 3.13 ± 2.2, while that of urban respondents was 3.32 ± 2.3. There was no significant difference ( $p = 0.329$ ) between both means. Only 28.3% of rural respondents compared with 23.3% of urban respondents were primiparous.

### Type of housing

Many respondents (41.8% rural; 42.1% urban) lived in single room accommodation. Very few lived in bungalows and detached houses, with 1.9% of rural women and 0.5% of urban women reporting residence in such.

### Type of vegetable consumed

Gbure (water leaf) was the vegetable mostly consumed by respondents in rural (32.5%) and urban (42.8%) locations. This was closely followed by *Celosia argentea*, from the family Amaranthaceae, locally known as Soko. Ewedu (*Corchorus olitorius*), also known as the long-fruited vegetable, was the least consumed by respondents (1.7%) in both rural and urban areas. There was no significant difference ( $p = 0.138$ ) between the types of vegetable consumed by both groups of women (Table 1).

### Consumption of snacks

Many respondents in the rural areas (34.7%) and their urban counterparts (36.4%) ate snacks occasionally. Only 10.0% of rural women and 8.3% of urban women ate snacks daily. About a fifth of rural (19.2%) and urban (20.3%) ate snacks about three or more days in a week. There was no significant difference ( $p = 0.652$ ) in the frequency of snack consumption between rural and urban women. An equal proportion (7.6%) of rural and urban women consumed doughnuts. Majority (41.2%) of the rural women as well as their urban counterparts (48.2%) ate meat pie. Only 10.3% of rural respondents and 6.9% of the urban respondents ate egg rolls regularly; the

readily-affordable cupcakes were consumed by 11.6% of rural women compared with 3.6% of their urban counterparts. There was a significant difference ( $p = 0.032$ ) between the type of snacks eaten by rural and urban respondents.

### Respondents' food taboos

Fewer respondents in the rural areas (16.1%) had food taboos compared with those (19.4%) in the urban areas. There was no significant difference ( $p = 0.242$ ) between rural and urban respondents regarding possession of food taboos. There was no significant difference ( $p = 0.935$ ) between the type of food taboos practiced by rural and urban pregnant women. Many women in rural areas (29.3%) and their urban counterparts (28.5%) did not consume Okra because it was tabooed in their belief systems, as well as plantain (Table 2).

### Food preparation and storage practices

Many rural respondents (61.9%) and their urban counterparts (67.8%) parboiled rice during food preparation. There was no significant difference ( $p = 0.101$ ) in the prevalence of this practice between rural and urban participants. Blanching of vegetables was practiced by a majority of respondents in rural (75.0%) and urban (77.5%) locations. Covered plastic containers were the most frequently used food storage facility by the rural (43.3%) and urban (44.4%) respondents for their non-perishable foods. Only 3.6% of rural respondents and 2.8% of urban women reported storing food items in open bowls. There was no significant difference in food storage practices between rural and urban respondents (Table 3).

### Respondents' nutrient intake

There was a statistically significant difference ( $p < 0.05$ ) between the nutrient intakes of rural and urban respondents. Rural respondents had higher values of nutrient intake compared with their urban respondents except for

**Table 2.** Food taboos.

Presence of food taboos	Location		Test statistic
	Rural (n=360)	Urban (n=360)	
	Frequency (%)	Frequency (%)	
Yes	58 (16.1)	70 (19.4)	$\chi^2=1.368$ ; p=0.242
No	302 (83.9)	290 (80.6)	

  

Type of food taboos	n=58	n=70	Test statistic
	Frequency (%)	Frequency (%)	
	Beans	8 (13.8)	
Egg	8 (13.8)	12 (17.1)	
Fish	10 (17.2)	12 (17.1)	
Okra	17 (29.3)	20 (28.5)	
Plantain	15 (25.9)	17 (24.3)	

**Table 3.** Food preparation and storage practices.

Parboiling of rice	Location		Test statistic
	Rural (n=360)	Urban (n=360)	
	Frequency (%)	Frequency (%)	
Yes	223 (61.9)	244 (67.8)	$\chi^2=2.087$ ; p=0.101
No	137 (38.1)	116 (32.2)	

  

Blanching of vegetables			
Yes	270 (75.0)	279 (77.5)	$\chi^2=0.621$ ; p=0.431
No	90 (25.0)	81 (22.5)	

  

Food storage method			
Kitchen floor	47 (13.1)	37 (10.3)	$\chi^2=2.778$ ; p=0.596
Sacks	60 (16.7)	72 (20.0)	
Covered plastic containers	156 (43.3)	160 (44.4)	
Polythene bags	84 (23.3)	81 (22.5)	
Open bowls	13 (3.6)	10 (2.8)	

except for vitamin A, measured as retinol equivalents, which had a significantly higher ( $p < 0.001$ ) value among urban participants in comparison to their rural counterparts. There was no significant difference ( $p > 0.05$ ) in Iron and Zinc intake between the rural and urban respondents (Table 4). There was no significant difference ( $p > 0.05$ ) between the macronutrient and micronutrient intakes, as percentages of the RNI, among rural and urban women. A significant difference ( $p = 0.000$ ) in the intake of mineral elements was found between rural and urban women, using a two-way ANOVA test (Table 5).

## DISCUSSION

The pattern of vegetable consumption among respondents showed a preference for dark-green leafy vegetables, consistent with findings from previous studies

in Calabar and Plateau, Nigeria (Williams et al., 2009; Badi et al., 2012). The specific vegetables consumed however, differed from those documented by researchers from various parts of Nigeria. *Telfavia occidentalis*, locally known as Ilong Ubong, *Talinum triangulare* and *Gnetum africanum*, locally known as Afang, were widely consumed in the south-south region of the country (Williams et al., 2009). Badi et al. (2012) found *Amaranthus sp.*, okra, garden egg and lettuce to be the most commonly consumed among Berom pregnant women. The vegetables less consumed in this study were different from findings from the other studies. The mineral and vitamin contents of these commonly-consumed vegetables are documented to be adequate in various literatures (Onwordi et al., 2009; Williams et al., 2009; Badi et al., 2012).

Very few respondents had a daily snacking habit, with rural women having a higher proportion (10%) than their

**Table 4.** Respondents' nutrient intake.

Variable	Location		t-value	p-value
	Rural	Urban		
	Mean			
<b>Macronutrient</b>				
Energy (kcal)	1,939.0 ± 69.8	1,729.8 ± 68.9	3.10	0.002
Protein (g)	77.5 ± 3.62	68.3 ± 3.44	2.68	0.008
Carbohydrate (g)	275.4 ± 60.79	238.2 ± 29.68	3.74	<0.001
Fat (g)	56.0 ± 3.24	54.1 ± 3.19	0.61	0.540
<b>Vitamin</b>				
Vitamin A (R E)	404.9 ± 36.52	608.2 ± 61.78	4.12	<0.001
Vitamin C (µg)	138.4 ± 37.0	65.5 ± 52.4	11.17	<0.001
Folic Acid (µg)	332.8 ± 24.46	260.4 ± 21.38	3.40	0.001
<b>Mineral element</b>				
Calcium (mg)	288.6 ± 27.10	225.5 ± 20.77	3.84	<0.001
Iron (mg)	16.7 ± 6.38	15.9 ± 5.88	0.18	0.875
Phosphorus (mg)	1071.1 ± 65.96	893.6 ± 73.17	2.04	0.042
Zinc (mg)	11.4 ± 6.32	10.5 ± 5.64	1.55	0.121
Sodium (mg)	151.0 ± 11.83	124.1 ± 11.69	2.36	0.019

**Table 5.** Nutrient intake as a percentage of RNI.

Variable	Location		Test statistic
	Rural (n=360)	Urban (n=360)	
	% RNI	% RNI	
<b>Macronutrient</b>			
Energy	76.0	67.8	F=6.58; p=0.078.
Protein	109.2	96.2	
Carbohydrate	157.4	136.1	
Fat	162.8	98.5	
<b>Vitamin</b>			
Vitamin A	54.0	81.1	F=1.01; p=0.497.
Vitamin C	162.8	77.1	
Folic Acid	83.2	65.1	
<b>Mineral element</b>			
Calcium	28.9	22.6	F=111.19; p=0.000.
Iron	61.9	58.9	
Phosphorus	153.0	127.7	
Zinc	103.6	95.4	
Sodium	50.3	41.4	

urban counterparts (8.3%). More than 15.0% of respondents did not take any form of snacks, with more rural women (19.2%) reporting avoidance of snacks than their urban counterparts (15.8%). This could signify the occurrence of some form of food craving among the

study participants, since 80.8 and 84.2% of rural and urban respondents, respectively consumed snacks at varying levels of regularity. These findings are similar to those of researchers in Korle-Bu, Ghana and South Africa, where snacking was well documented among the

pregnant women (Kersa, 2004; Koryo-Dabrah et al., 2012). The top four snacks consumed by both groups of women were: meat pie; sausage rolls; biscuits and egg rolls. These food items are flour-based products, which are often energy-dense, but of sub-optimal nutritive value. This is consistent with findings of poor food habits among pregnant women in developing countries, especially in South Asia and sub-Saharan Africa (King, 2000; Huybregts et al., 2009; Pathhak et al., 2004; ORC Macro, 2005).

In this study, frequency of snack consumption was not significantly associated ( $p = 0.652$ ) with respondents' location. However there was a significant difference ( $p = 0.032$ ) between the type of snacks consumed by rural and urban study participants. This study however, did not specifically investigate the presence or absence of food cravings among respondents, unlike the Korle-Bu study where 67.7% of the pregnant women experienced some form of cravings (Koryo-Dabrah et al., 2012).

Food taboos and avoidance have been reported among pregnant women in many communities, with the consequent inadequate nutrient intake. Several factors have been associated with adherence to food taboos including primigravidity; teenage pregnancy; lack of formal education; low household income, signifying low socio-economic status and a low body mass index (Oni and Tukur, 2012). Among respondents, only 16.1% of rural women and 19.4% of urban women had food taboos. These include: beans, egg, fish, okra and plantain. This is similar to findings in Nwangele, Imo State, Nigeria, rural Houde district of Burkina Faso and Korle-Bu, Ghana where pregnant women reported having food taboos (Huybregts et al., 2009; Koryo-Dabrah et al., 2012; Madiforo, 2010). The food types avoided in Ghana, Imo and in this study are mainly of the same classes (proteins and vegetables), even though the specific foods differed (Koryo-Dabrah et al., 2012; Madiforo, 2010). This is slightly different from another study in a rural Nigerian community, where the foods mainly avoided in pregnancy, were from the protein-rich meat group, due to socio-cultural beliefs that favored starchy foods above others. In addition, vegetables were adjudged most nutritious in pregnancy, in contrast to this study in which some of them were avoided (Ebomoyi, 1998). No consistent pattern of food avoidance was observed in Burkina Faso in contrast to a hospital-based Asian study in which 12.5% of respondents avoided oily foods and 10.4% restricted their potato intake (Ali et al., 2004; Huybregts et al., 2009). The proportion of women with food restrictions was far higher (63.7%) in Pondicherry, India, Korle-Bu, Ghana (48.8%) and Burkina Faso, than in this study (Patil et al., 2010; Koryo-Dabrah et al., 2012; Huybregts et al., 2009). There was no significant difference ( $p = 0.935$ ) between the foods avoided by the rural and urban respondents in this study.

Some food preparation practices which have been well documented in literature, to affect the nutritional value of

foods, were studied among respondents. A large proportion (67.8%) of urban respondents parboiled their rice grains, while preparing meals, compared with an almost equal proportion (61.9%) of rural women. An even higher percentage of rural (75.0%) and urban (77.5%) pregnant women blanched vegetables by immersing them in boiling water for 10 min or more and then decanting the fluid before cooking the vegetables. These findings are similar to those in medical literature, where women engaged in several food preparation practices known to compromise the nutritive value of the foods consumed (World Bank, 1994; ORC Macro, 2005; Ajose et al., 2004). They however differ from research findings among pregnant Berom women in northern Nigeria, where 8% fried vegetables, 17% ate them raw, 5% boiled them and 70% steamed the vegetables only, before consumption (Badi et al., 2012).

Food storage practices among respondents were sub-optimal. Only 43.3% of rural women and 44.4% of their urban counterparts stored their non-perishable foodstuff in covered plastic containers, while 3.6% of rural and 2.8% of urban respondents stored their foods in open bowls. The risks associated with storage of food in open bowls, on the kitchen floor (13.1% rural; 10.3% urban) and polythene bags have been emphasized over the years, particularly as regards pest control, food poisoning and Lassa fever prevention.

The mean intake of almost all nutrients was significantly higher ( $p < 0.05$ ) among rural respondents than their urban counterparts. The only exception to this was the vitamin A intake of respondents measured as the retinol equivalent (Carotene), which was significantly higher ( $p = 0.001$ ) among urban participants compared with the rural women. This is similar to findings from the Nigeria Demographic and Health Survey (NPC/ICF Macro, 2009) and could result from urban women having greater access to vitamin A-fortified foods, which are often better regulated at urban areas. These findings are also consistent with those from a comparative study among pregnant women in Western Iran, where the mean nutrient consumption of rural women was significantly higher than their urban counterparts (Esmailzadeh et al., 2008). They however differ from those reported by researchers in India, where rural women consumed diets significantly lower in energy than their urban counterparts, in addition to a lower consumption of protein (Mehrotra and Tiwari, 2009). The mean energy, vitamin A, folic acid, calcium, iron and sodium intake of both rural and urban respondents were below the recommended nutrient intake values. However, the mean protein, vitamin C and zinc intakes of rural participants were adequate, but were not up to the RNI among urban participants. This is similar to findings from other studies carried out in Nigeria, Ghana, Burkina Faso and some Asian countries (Huybregts et al., 2009; Koryo-Dabrah et al., 2012; Ojofeitimi et al., 2008; Chang et al., 2009; Esmailzadeh et al., 2008; Mehrotra and Tiwari, 2009).



Diets and staple foods in sub-Saharan Africa are often deficient in macronutrients and micronutrients, leading to multi-nutrient malnutrition and micronutrient deficiencies. These are often complicated by a high burden of preventable infectious diseases and helminthes infestations, with dire consequences among children and pregnant women (Brahin and Coulter, 2003; Abrahams et al., 2011). The World Health Organization advocates for community-specific interventions, aimed at improving the nutrient intake of pregnant women and the girl child, with a view to optimize their nutritional status (World Health Organization (WHO), 2012).

## Conclusion

The dietary habits of pregnant women studied were sub-optimal, with rural women having higher nutrient intakes than their urban counterparts. Food taboos were more prevalent among urban respondents than their rural counterparts. Culturally-sensitive, community-level interventions, involving opinion leaders, should be instituted by the health department of each LGA, to address food restrictions and taboos in pregnancy.

## Conflict of interest

Authors declare that there are no conflicts of interest

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