NFS Journal 5 (2016) 1–4

Contents lists available at ScienceDirect

NFS Journal

journal homepage: http://www.journals.elsevier.com/nfs-journal/

Trends and consequences of consumption of food and non-food items (pica) by pregnant women in Western Kenya

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ARTICLE INFO

Article history:
Received 15 June 2016
Received in revised form 8 August 2016
Accepted 7 September 2016
Available online 14 September 2016

Keywords:
Pica
Craving
Aversion
Geophagia
Lithophagia
Pregnancy

ABSTRACT

Pregnancy is a memorable experience for every woman and it comes with many changes which include cravings for food and non-food items. The aim of this study was to explore the change in diet in terms of pica, food craving and aversions which occur during pregnancy. Two hundred and two pregnant women were interviewed. Food craving was reported by 73.8% of the study participants and nearly half (48.7%) had food aversions. Foods craved most were maize meal (12.5%), mangoes (9.5%), ripe banana (8.3%), beef (7.6%) and fish (5.7%). Foods avoided most were small fish (omena) (15.2%), beef (12.6%), kale (11.9%) and fish in general (10.6%). Eggs, tea and milk were also avoided. Reasons given for avoiding certain foods were: to prevent nausea (45.8%), vomiting (21.9%) and heartburn (10.4%). Other reasons given were unpleasant smell/taste and stomach ache. Pica prevalence was at 27.4%, with consumption of soil and soft stones being frequently reported. There was a highly significant association between level of education ($p = 0.02$) and history of child death/still birth ($p = 0.01$) with pica. Food cravings, aversions and pica practices should be assessed in antenatal care of pregnant women. Attention should be paid to pregnant women who have had a history of child death and women with low education level.

1. Introduction

Pregnancy is an important stage which can influence the wellbeing of future generations. In this period there is a change in maternal nutrition which contributes to the general health of the mother and child [1–3]. Pregnancy sometimes comes with the desire to consume non-food items commonly referred to as 'pica' [4]. Pica has puzzled researchers for a long time. It cuts across different cultures and religion. There are different forms of pica. The materials consumed also vary widely, from intake of clay or dirt (geophagia), ice or freezer frost (pagophagia), stones (lithophagia), ashes, charcoal, soap, pieces of papers, paint chips, chalk and many other non food materials [5–8]. Pica may sometimes be found in relation to micronutrient deficiency [6] but whether it is a cause or a result of the deficiency is not well understood. Other proposed causes of pica are gastrointestinal difficulties, reaction to stress, hunger and cultural belief [9]. On micronutrient deficiency, some studies have reported associated of pica with increased anemia, low plasma zinc level, low hematocrit (Hct) and low haemoglobin (Hb). This cannot completely explain whether or not pica is related to micronutrient deficiencies, but it does imply that pica is a risk for these deficiencies, all of which affect the health and wellbeing of an individual [6,8,10]. Food craving, a strong desire for a specific food, is common, especially in pregnant women. Food craving may be related to change in hormonal levels, as a response to elevated nutritional needs, cultural factors and the presence of a specific desired ingredient in the craved food. Food aversion which is also common could be a protective function for the mother and fetus from food toxins [11]. Food aversions can be made consciously or unconsciously. It is considered a physiological mechanism where one learns to distinguish safe and toxic foods. During pregnancy, the human perceptual systems become more sensitive and certain food, smells and tastes are avoided. This frequently triggers pregnancy sickness like nausea and vomiting [12].

Food is supposed to provide nutrients for growth and general wellbeing of the mother and child therefore, understanding pica, food cravings and aversions during pregnancy is important [4]. The aim of the study was to estimate the prevalence and risk factors of pica and to assess the foods that are craved and avoided during pregnancy. This would help when formulating nutritional advice for pregnant women on better food choices.

2. Materials and methods

2.1. Study design

A cross-sectional survey was carried out in a rural–urban population in Kakamega district Hospital from November 2014 to January 2015.

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http://dx.doi.org/10.1016/j.nfs.2016.09.001

Two hundred and two pregnant women were randomly selected from the health care center as they came for the antenatal visit.

Sample size was determined from a rule of thumb where ≥200 subjects are considered a fair representation in a study [13–15].

A face to face interview was conducted with a detailed questionnaire on dietary habits, demographic and socio-economic characteristics including maternal age, marital status, education level and occupational status. Obstetric information including pregnancy stage, the history of stillbirths, Hb level and intake of iron and folic acid supplements (IFAS). Research permission was obtained from the National Council of Science and Technology, Nairobi, Kenya and ethically approval by Kakamega District Hospital.

2.2. Statistics

Statistical analyses were performed using SPSS version 23.0 (IBM, New York, USA). Normality of continuous variables was checked by Kolmogorov–Smirnov test. The not-normally distributed continuous variables were analyzed using Mann–Whitney test, while categorical variables were tested by Chi'square or Fisher exact test. Odds ratios for the predictors of pica were determined by binary logistic regressions. Statistical significance was set at $p \leq 0.05$.

3. Results

Two hundred and two pregnant women participated in the study. They lived in households which were mostly headed by male (80%). The mean age of the participants was 25.7 ± 5.1 (15–44) years. Most of the respondents were married (87%) and 11% single. The education level of 32% of the pregnant women was primary school, 34% went to secondary school and 34% at college/post secondary training. The main source of livelihood was employment (37%), small business (26%) casual labour (18%) and farming (4%).

Food craving was reported by 73.8% of the participants. Out of these, 27.9% craved one food while 72% craved more than one food. Food cravings were reported to be highest (48.9%) in the second trimester than in the third trimester (27.6%) and first trimesters (23.4%). Nearly half of the respondents (48.7%) had aversion to one (19.3%) or more foods (29.4%) in the pregnancy.

Most of the foods craved for were starch 'maize', followed by animal protein (beef, fish, eggs, milk) and fruits (mangoes, bananas) and others as shown in Table 1. The most common foods avoided were small fish (omena), beef, kale, fish, tea and rice (Table 2). Cravings were common during the first (30.6%) and second trimester (41.8%).

Table 1
Types of food craved for by the pregnant women at that particular time and frequency of response (N = 143).

Specific food	Count	Percent (%)
Maize meal (ugali)	33	12.5
Mangoes	25	9.5
Mixture of maize and beans (kienyeji/githeri)	25	9.5
Banana	22	8.3
Rice	21	8.0
Beef	20	7.6
Fish	15	5.7
Tea	13	4.9
Fried Irish potatoes (chips)	12	4.5
Chicken	10	3.8
Milk	10	3.8
Beans	9	3.4
Sweet potato	9	3.4
Flat bread (chapatti)	9	3.4
Soft drink (soda)	8	3.0
Kale (sukuma wiki)	8	3.0
Bread	8	3.0
African nightshade (managu)	7	2.7

Table 2
A list of the food which were commonly avoided by the pregnant women either one or combination of many foods at a time and the total percentage. (N = 98).

Specific foods	Count	Percent (%)
Small fish (sardine/omena)	23	15.2
Beef	19	12.6
Kale (sukuma wiki)	18	11.9
Fish	16	10.6
Tea	9	6.0
Rice	8	5.3
Maize meal (ugali)	8	5.3
Milk	7	4.6
Mandazi-wheat flour product, deep fried	7	4.6
Eggs	6	4.0
Flat bread (chapatti)	5	3.3
Green gram (ndengu)	5	3.3
Bread	5	3.3
Mixture of maize and beans (githeri)	5	3.3
Cabbage	5	3.3
Cowpea (kunde)	5	3.3

Most of the women who had food aversion claimed it gave them nausea (45.8%), caused them to vomit (21.9%), gave them heartburns (10.4%), had no appetite for that food (5.2%), general dislike (4.1%), dislike of smell (3.1%) or caused stomach ache (3.1%), only 2.0%. had no reason for aversion.

Pica prevalence among the pregnant women was at 27.4%. Nearly half of the participants reported the use of soft stones for their pica practice, followed by house construction soil (33.9%) and termite soil (11.3%) as shown in Table 3.

There was no significant association between pica practice with women dietary diversity (WDDs), food cravings, food aversions, gender of the household head, marital status of the respondent and others as shown in Table 4. Pica practices were shown to be more prevalent among women with lower education level (below and equal to primary school) than that of higher education level ($p = 0.013$). Pica practice was also high in women with a history of child death/still birth and the association was significant ($p = 0.001$). Although there was no association between iron supplementation and pica, most of the pregnant women reported taking iron supplementation (89.8%).

Logistic regression analysis with forward selection was performed to investigate predictors of pica practices. The variables included in the analysis were gender of the household head, food craved, food aversion, child death, IFAS and Education level. The model was significant at $p \leq 0.05$. History of child death/still birth ($p = 0.00$) and college/post secondary education level ($p = 0.03$) were significant as shown in Table 5. Women with recorded child death had 4.9 times higher risk of practicing pica and college/post secondary education level had a 3.2 protective effect against pica practices.

The mean Hb level of the study population was 11.13 ± 1.58 g/dl. Hb levels in different pregnancy stages with and without pica are shown in Table 6. Only in the third trimester were Hb levels significantly lower in the pica group than the non pica group. Although the mean Hb level in the second trimester was 0.88 g/dl lower in the pica group, the difference was not statistically significant.

Table 3
Non food items mentioned by the interviewed pregnant women, which were used for pica practice (N = 53).

Non-food item (N)	%
Market stones-soft stones	43.4
House construction soil	33.9
Termite soil	11.3
Stones and soils	5.6
Charcoal	3.7
Ash	1.8

Table 4
Association between different characteristics that may influence pica consumption during pregnancy, with or without pica (N = 202)[1].

Variables	With-pica practices N(%)	Without-pica practices N(%)	p value
Male headed household	45 (81.8)	113 (76.9)	0.448
Age of respondent			
15–24	26 (47.3)	58 (39.5)	0.316
25–44	29 (52.7)	89 (60.5)	
Marital status			
Single/widowed/separated	4 (7.3)	21 (14.3)	0.178
Married	51 (92.7)	121 (85.7)	
Education respondent			
Primary school	24(44.4)	41 (27.9)	0.013*
Secondary school	20 (37.0)	48 (32.70)	
College/university	10 (18.5)	58 (39.5)	
Occupation of head of household			
Farming	3 (37.50)	5 (62.50)	
Casual labour	14 (38.89)	22 (61.11)	
Business	14 (27.45)	37 (72.55)	
Employment	18 (24.66)	55 (75.34)	
none	2 (14.29)	12 (85.71)	
Food cravings	43 (78.2)	100 (68.0)	0.158
Stage of pregnancy			
First trimester	12 (21.8)	46 (31.3)	0.351
Second trimester	31 (56.4)	68 (46.3)	
Third trimester	12(21.8)	33 (22.4)	
Child death	12 (21.8)	7 (4.8)	0.000*
Iron and folate supplementation (IFAS)	49 (89.1)	125 (85.0)	0.458
Food aversions	26 (47.3)	72 (49.0)	0.829
WDDS			
≤4	41(74.5)	118(80.3)	0.376
>4	14(25.5)	29(19.7)	

Data analysis using Chi'square or Fischer exact test, significant level at $p < 0.05$.

4. Discussion

In our study, results showed that 74% of all pregnant women reported some type of food craving. This was prominent by the end of the first trimester showing an increase during the second trimester and reduction in the third trimester. These results agree with previous studies in the US and the UK showing that cravings are common during the second trimester [16,17]. Cravings for starchy foods (maize, rice), for fruits (mangoes, bananas) and for protein (beef, fish, milk, beans) seemed to be common. This observation also held true in surveyed individuals where carbohydrates, animal proteins and fruits were commonly craved [11,18]. The increased fetus demands lead to increased requirements for most nutrients [19]. In this case, the food craved for were high in energy, B vitamins, iron, magnesium and vitamin A which are important during pregnancy for the fetus development. Food aversion was reported in 49% of the pregnant women which was relatively lower than in Tanzania and Ethiopia [8,18]. In our study foods avoided included small fish (omena), beef, kale, fish and tea. This was during the first and at the beginning of the second trimester which are the peak periods for the fetus development. Aversion has been noted to be in foods that have a bitter taste. This can be found in plant based foods which could have high toxins and strong smell found in meat, fish and dairy product indicating possible bacterial contamination. Reasons given for food avoidance were the feeling of nausea, vomiting, heartburn, no appetite, and dislike of taste or smell of the food. This corresponds with similar studies done in Tanzania Iran and Ethiopia [4,8,18]. Vomiting could be a way of removing the toxins already consumed from the stomach whereas nausea and the other reasons could be a mechanism to avoid future intake of toxins. Food aversions, nausea and vomiting could be a defense mechanism for the woman to avoid intake of foods high in toxins that can cause child defects and abortion. [12].

Table 5
Showing variables included in the logistic model with pica as the dependent variable.

Variables	p-Value	OR	95% CI	
			Lower	Upper
Child death	0.003*	4.831	1.731	13.486
Education level				
Primary education	0.827	0.919	0.432	1.954
College/post secondary training	0.033*	2.545	1.079	6.007

Results are from Binary logistic regression, *OR* odds ratio, *CI* Confidence interval, and *significant level at $p < 0.05$.

Table 6
Maternal haemoglobin levels (HB) during pregnancy periods in pregnant women with and without pica (mean. ± standard deviation, N = 176).

Variables	Trimester pregnancy	With pica	Without pica	p-Value
Hb (g/dl)	I	11.29 ± 1.6 (12)	11.37 ± 1.49 (40)	(0.654) NS
	II	10.74 ± 2.3 (27)	11.62 ± 1.3 (55)	(0.771)NS
	III	10.32 ± 1.07 (11)	11.30 ± 1.4 (31)	(0.032)*

Data analysis using Mann–Whitney test significant level at $p < 0.05$.

Pica has been reported to be together with foods but not exclusively, its prevalence tends to vary. African countries record high pica intake in pregnant women, in Nigeria 50–64% [20–22], South Africa 38–70% [23,24], Tanzania 63.7% [8] and Ghana 47% [25]. The prevalence of pica in Iran was reported to be 8.3–17.5% [4,7]. In Denmark, the prevalence was 0.02% [26] and in Great Britain, there were no cases of pica reported only food cravings. In our study the pica prevalence was at 27.4% which was lower than in most African countries but higher than Iran and European countries. Our findings are definitely lower compared to other Kenyan studies in which the prevalence was between 42.8 and 74.0% [10,22,27]. The increase in the education level of the women could be a contributing factor. As reported there was an association between the education level of the pregnant woman and pica. Women of education above post secondary/college showed 3.2 times protective effect against pica. This has been found in similar studies in Iran [7] and USA [28]. This may suggest that education may be a predictor of pica practice, thus higher education increases awareness on complications associated with pica. Government projects which have increased awareness on consumption of iron and folic supplements in pregnant women also may have a role in lowering the number of participants practicing pica.

Consumption of soil (geophagia) was noted to be a common form of pica (45.2%). There were two main types depending on the source. One was house construction soil, where the women would remove the part of the wall and crush it to a powder. Some even joked that they had removed so much soil from the walls that their house was almost coming down. The other type of soil was from 'termite mounds' formed by termites. Soil consumption has been reported as a common pica practice in Tanzania [8] and also in Kumasi Ghana [25] among pregnant women. Consumption of soft stones (lithophagia) was also observed in our study, to the tune of 43.4% of our study population. Lithophagia has also been reported in previous studies done in western Kenya [22] and the coastal part [10] as well as in an antenatal clinic in Nairobi [27]. Soft stones commonly referred to as market stones have over the years become very accessible and available for sale to both pregnant and non-pregnant women in open air market and sometimes they are well packaged for sale in high-end markets (supermarkets). There was also consumption of ash (1.8%) although in small amounts; many pregnant women believed that it provided some help in easing heartburn. During an earlier conducted focus group discussion, most women believed that ingestion of earth benefited them when pregnant, in that the red earth had properties that might prevent anemia. In other countries geophagia during pregnancy is believed to supplement the diet

with essential nutrients, prevent vomiting, treatment of diarrhea, cured swollen legs and absorb toxins. It is also believed to benefit the fetal growth and giving birth to beautiful babies [29,30].

Studies have shown that ingested clay-rich soils absorb unwanted intestinal substances, inhibiting the growth of harmful bacteria therefore, promoting good digestion and boosting immune systems [29].

Studies on its *in vitro* bioavailability have not been conclusive. Some have shown the ingested soil can potentially release minerals like iron, copper, manganese, chromium and nickel. However, the ingested soil doesn't supply a significant amount of iron [31]. In contrast, others have shown that ingested soils reduced the absorption of bioavailable nutrients especially iron, copper and zinc which is already available in the foods. [32,33]. Our study showed that pica practice is an inhibiting factor of Hb levels. Hb levels were lower in a group with pica practice than ones without.

In conclusion food cravings, aversions and pica practices should be assessed in antenatal care of pregnant women. Attention should be paid to pregnant women who have had a history of child death and women with lower education level. Geophagia and pagophagia were found to be common. In our case no benefits were found, so pica practices should be discouraged. The positive association between history of child death/still birth and pica practice should be investigated further by looking at pica practice duration and frequency before conception, during pregnancy and lactation.

Acknowledgement

We sincerely thank the investigators at Kakamega District Hospital who helped in collecting the data. We also thank all the pregnant women who participated in this study. This research was supported by the Dr. Hermann Eiselen PhD grant from the Foundation Fiat Panis as a part of doctoral thesis of L.W.K supported by the German Academic Exchange Service (DAAD)/Food Security Centre scholarship program with funds of the Federal Ministry of Economic Cooperation and Development (BMZ), Germany. The authors declare no conflict of interest.

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