

Covariates of Pica among Pregnant Women Attending Antenatal Care at Kawempe Hospital, Kampala, Uganda: A Cross-Sectional Study

Olivia Nakiyemba,¹ Susan Obore,² Milton Musaba,³ Julius Wandabwa,³ and Paul Kiondo^{1*}

¹Department of Obstetrics and Gynaecology, Makerere University College of Health Sciences, Kampala, Uganda; ²Department of Obstetrics and Gynaecology, Mulago Hospital, Kampala, Uganda; ³Faculty of Health Sciences, Department of Obstetrics and Gynaecology, Busitema University, Mbale, Uganda

Abstract. Pica is the craving and purposive eating of nonfood items. It is common worldwide and presents among vulnerable populations like children and pregnant women. Its etiology and health consequences are not well understood. The aim of this study was to determine the prevalence and covariates of pica among pregnant women attending antenatal clinic at Kawempe hospital in Uganda. We conducted a cross-sectional study from July 2019 to December 2019. Participants in this study were 307 pregnant women who had come to attend antenatal clinic at the hospital. The prevalence of pica was computed. Bivariate and multivariable analysis was done to establish the factors that were independently associated with pica. The prevalence of pica was 57%. The most common type of pica was geophagia (eating clay and sand) followed by pagophagia (eating ice). Of the women who practiced pica, half consumed the nonfood items daily. Factors independently associated with pica were being in the third trimester (adjusted OR [aOR]: 3.60; 95% CI: 1.36–9.48) and having nausea in pregnancy (aOR: 2.11; 95% CI: 1.20–3.70). At Kawempe hospital, pica is common among women who attend the antenatal clinic and is associated with having nausea in pregnancy and being in the third trimester. Health workers need to counsel pregnant women about the dangers of pica so as to reduce helminth infections and micronutrient deficiency associated with it.

INTRODUCTION

Pica is the craving and purposive ingestion of nonfood items.¹ It is commonly observed in children and pregnant women but has also been reported in other vulnerable populations.² Three main types of pica have been documented. These are geophagia, which is the compulsive eating of soil- or earth-rich items like clay or pottery, pagophagia, which is compulsive eating of ice or freezer frost, and amylophagia, which is compulsive eating of starches including raw rice and flour.¹ Pica is as old as humankind and has been reported in many parts of the world,^{1,3,4} yet its etiology and health consequences are not clearly understood. Its prevalence ranges from 0.02% to 74%.^{2,5} This may be due to regional differences, ethnicity, cultural practices, educational level, socioeconomic status (SES), nondisclosure, and the diagnostic criteria used in the different studies.²

Three main theories have been proposed about the causes of pica. These include pica as an adaptive or beneficial behavior, as a nonadaptive behavior, and as a protective behavior in response to compromised immunity. There is a strong association between pica and low hemoglobin, iron and zinc concentrations.⁶ Thus, many scientists have hypothesized that pica is a response to micronutrient deficiency to supplement a deficient diet.⁷ Indeed, some soils have high concentration of certain nutrients like iron, calcium, and zinc although its bioavailability has not been fully elucidated.⁸ Alternatively, pica is a maladaptive behavior, as an epiphenomenon to micronutrient deficiency (zinc, iron, calcium, etc.). It may lead to increase in helminthic infections,⁹ lead poisoning, and hyperkalemia.^{10,11} It may reduce absorption of essential medicines and

nutrients.¹² This may negatively affect maternal well-being, fetal growth, and development.

Pica may also be protective in populations with developing or compromised immunity as seen in children and pregnant women.¹³ Consumption of pica may be protective by enhancing the integrity of the intestinal mucosa against harmful chemicals and pathogens.^{1,14} It may also adsorb pathogens for elimination from the gut.¹ Pica may improve immunological activity, induce nutritional immunity, and introduce beneficial bacteria to the gut.¹⁵ Pica substances especially geophagic earths contain alkaline substances that make them useful antacids and some contain minerals that are effective in reducing nausea and vomiting.^{16–18} This has been hypothesized as a way of protecting a vulnerable population like women and children from or reduce the effects of infection.

Only one prior study has examined geophagy among pregnant women in Uganda.¹⁹ They found that geophagy was practiced by pregnant women, nonpregnant women, and men. They also found that it was in pregnancy that excessive amounts of various types of soil were consumed. The consumption of soil was mainly due to craving and alleviating the gastrointestinal upsets. Geophagia was found to be widespread and socially acceptable especially in pregnant women. This study was qualitative in nature and had a small sample size. The study was not able to establish the magnitude of geophagia and its covariates in Uganda.

Therefore, our study sought to determine the prevalence of pica among pregnant women attending antenatal clinic at Kawempe national referral hospital in Uganda. Our first objective was to examine the association between anemia and pica practice. Our second objective was determining the most significant sociodemographic, medical, and obstetric covariates of pica in this group of pregnant women. We hypothesized that anemia in pregnant women in our study will be associated with greater odds of pica practice and that gastrointestinal upset and advanced gestational age will be associated with greater odds of pica.

*Address correspondence to Paul Kiondo, Makerere University College of Health Sciences, Department of Obstetrics and Gynaecology, P.O. Box 7072, Kampala, Uganda E-mail: kiondop@yahoo.com

MATERIALS AND METHODS

Study design and setting. This was a cross-sectional study conducted between July and December 2019 at Kawempe hospital. Kawempe hospital is a national referral hospital for Uganda and a teaching hospital for Makerere University College of Health Sciences. On average, 300 pregnant women attend antenatal clinic every week at the hospital. In Uganda, 97% of the women attend antenatal clinic at least once during pregnancy.²⁰ Participants in this study were pregnant women who had come to attend antenatal clinic at the hospital. The women included in this study were aged 18–45 years and were at any gestational age of pregnancy. Women were excluded from the study if they were critically ill or unconscious. The sample size for this study was calculated using a formula for comparing two proportions.²¹ We used a proportion of 60.3% as was found for pregnancy complication in a study in Iran.²² Using the above proportion, a power of 80%, and CI of 95%, we obtained a sample size of 307 participants assuming a nonresponse rate of 10%.

Pregnant women who had come to attend the clinic were given information about the study by research assistants who were qualified midwives. The women who accepted to join the study were checked for eligibility. Eligible participants were selected using systematic sampling in which every seventh woman was recruited into the study. The women were taken through an informed consent procedure and gave a written informed consent. Eligible women were interviewed using an interviewer-administered questionnaire. The questionnaires were in English and Luganda, which is a local language spoken by most women in that region. Women who did not understand any of these two languages were excluded from the study. To ensure privacy, each woman was interviewed alone in a side room and the interview lasted between 30 and 45 minutes.

Data collection. The information collected was on sociodemographic characteristics, medical and obstetrical factors, and nutritional factors. The sociodemographic factors included information on age, marital status, educational level, monthly income, occupation, religion, and SES. Socioeconomic status was measured as a score based on ownership of household assets and amenities. We used principal components analysis (PCA) to calculate the SES index score from an asset list consisting of 25 items (household assets, type of building materials used, and access to sanitary facilities). The first principal component accounts for the largest variability in the data set, and was used on the basis for generating the SES index score. The scores were generated from the Eigen vectors (scores), which are the weighted contribution of each variable to the first principal component. Eigen vector scores were then computed for each individual, and used to generate SES categories, which were labeled as low, middle, and high.

Obstetric history included information on weeks of amenorrhea, parity, pregnancy symptoms, and complications in pregnancy. Nutritional factors included information on dietary patterns and types pica consumed.

Pica was defined as a persistent desire to eat uncooked food or nonfood substances for at least 1 month. The questions asked to the women were: *What substances have you heard that people like to eat that are not normal food? What is the type of uncooked or nonfood substance is desired or eaten? Have you ever eaten this substance during this pregnancy in the last 1 month? If the answer to the above question is yes,*

what type of nonfood substance do you crave for or consume? How often do you consume the above nonfood substance?

The women were asked about the clinical characteristics in this present pregnancy like nausea, vomiting, loss of appetite, abdominal pain, constipation and diarrhea. They were asked if they had experienced these symptoms in the last 1 month. They were asked about any complications they had experienced during this pregnancy. The complications asked were; vaginal bleeding in pregnancy, urinary tract infections, malaria, hypertension and varicose veins. These were confirmed by checking the women's medical records. Blood was drawn from the respondents for complete blood count. Hemoglobin level of < 11 g/dL was taken as anemia.

Analysis. The data collected were double entered into EPI-DATA version 4.2 statistical software package and transferred to STATA version 13 for analysis. The prevalence of pica was calculated as number of women who consume pica divided by the total number of women enrolled in the study. Categorical variables were summarized as proportions and compared between groups using χ^2 test. Continuous variables were summarized as means and SDs. They were then converted to categorical variables and compared as earlier.

To determine the relationship between each predictor variable and pica, bivariate logistic regression was done. The results are presented as crude ratios with 95% CI. Variables with a *P* value of 0.2 or less and age were entered into multivariable regression model and adjusted. Age was included because it is a known risk factor. Backward elimination method was used to obtain a stable model. Results are presented as adjusted ORs with 95% CIs.

Ethical considerations. Ethical approval of the study was sought from the Makerere University School of Medicine Research and Ethics Committee (SOMREC), Kawempe National Referral Hospital, and the National Council for Science and Technology in Uganda. Informed consent was sought from the participants. The data were deidentified and only numbers appeared on the clinical record forms.

RESULTS

Background characteristics of study participants. A total of 307 women were included in the study. The sociodemographic characteristics of the pregnant women are shown in Table 1.

The mean age of the women was 26.5 with SD of 5.4 years with range of 18–45 years. Majority of the women were married, had attained secondary school education level and above, were pregnant for the second time or more and were in their third trimester.

Out of the 307 women, 19.2% presented with anemia and 15.3% reported complications during pregnancy. The complications that were reported in the last 1 month included bleeding, urinary tract infections, hypertension, malaria, varicose veins, and preeclampsia. The details of the clinical characteristics are shown in Table 1.

Prevalence of pica among pregnant women attending antenatal clinic at Kawempe National Referral Hospital. The prevalence of pica among pregnant women attending antenatal clinic at Kawempe National Referral Hospital was 57% (175/307).

The various nonfood substances consumed by are women with pica included clay (106, 60.6%), soil (31, 17.7%), ice (26, 14.9%), charcoal (5, 2.9%), chalk (4, 2.3%), and sand (3, 1.7%).

TABLE 1
Sociodemographic and clinical characteristics of pregnant women attending antenatal clinic at Kawempe National Referral Hospital

Variable	Frequency (N = 307)	Percentage
Age		
17–24 years	125	40.7
25–30 years	112	36.5
31 years and above	70	22.8
Marital status		
Single	28	9.1
Married	279	90.9
Education level		
Primary or less	65	21.2
Secondary and above	242	78.81
Occupation		
Housewife/unemployed	132	43.0
Nonprofessional	130	42.3
Professional	45	14.7
Socioeconomic status		
Low	122	39.7
Middle	63	20.5
High	122	39.7
Gravidity		
Prime gravida	109	35.5
Two to three	126	41.0
Four and above	72	23.5
Trimester		
First	22	7.2
Second	95	30.9
Third	190	61.9
Nausea		
Yes	87	28.3
Abdominal pain		
Yes	87	28.3
Constipation		
Yes	41	13.3
Loss of appetite		
Yes	71	23.1
Diarrhea		
Yes	27	8.8
Vomiting		
Yes	43	14.0
Complications during pregnancy		
Yes	47	15.3
Presence of anemia		
Yes	59	19.2
Use of iron supplements		
Yes	282	91.9

The most consumed nonfood substance was clay. None of the study participants reported amylophagia. Majority of the women, 93 (49.2%), consumed these nonfood substances almost every day, whereas only 2 (0.81%) women consumed these substances rarely. There were 72 (38.1%) women who consumed these substances two to three times a week and 22 (11.6%) consumed once a week.

Bivariate and multivariable analysis. The factors associated with pica among women attending antenatal clinic at Kawempe hospital at bivariate analysis are shown in Table 2. The factors were constipation, being on the third trimester, and having nausea in pregnancy.

Factors independently associated with pica among pregnant women attending the antenatal clinic at Kawempe national referral hospital at multivariable analysis are shown in Table 3. These factors were being in the third trimester and having nausea in pregnancy.

Being in the third trimester of pregnancy was associated with 3.6 times the odds (95% CI: 1.36–9.48) of engaging in pica compared with women in their first trimester and having

nausea in pregnancy was associated with 2.1 times odds (95% CI: 1.20–3.70) of practicing pica compared with women without nausea during pregnancy.

DISCUSSION

The prevalence of pica in our study was 57% and was lower than what has been reported in other studies in East Africa^{3,23} and elsewhere in Africa.²⁴ However, it was higher than what was found in Sudan²⁵ and Iran.²² Nevertheless, it is still a public health problem as half of the pregnant women in our study consumed nonfood items, which might have adverse maternal and neonatal outcomes. The prevalence of pica could have been higher but there might have been under reporting of the practice since some women may not report the vice because of fear of repercussions from the health staff. The health workers counseled women who admitted practicing pica to stop the practice due to health concerns and were offered iron supplements. Iron supplements are routinely given to pregnant women as recommended by the WHO,²⁶ because most pregnant women in Uganda are iron deficient and anemic.^{27,28} Other women considered pica in pregnancy to be normal due to cultural reasons as was found by Huebl and others¹⁹ in a study in northern Uganda and did not bother to report the practice nor seek medical advice.

Geophagia was the most common type of pica reported in this study with most women consuming clay followed by dark soil. This is similar what was found by Boadu et al.²⁹ in Ghanaian women although most women in this study consumed white clay followed by red clay. Similarly, Ahmed et al.,²⁵ Kariuki et al.,³⁰ and Miller et al.¹³ found geophagy as the most common form of pica with most women consuming clay. This was probably because soil was what they can readily access, in western communities pagophagia was more common.

Pagophagia was the second most common form of pica reported in our study. This is similar to what was found by Boadu et al.²⁹ in Ghana, Ahmed et al.²⁵ in Sudan, and Aminu et al.³¹ in Nigeria. However, it differs from what was found by Ezzeddin et al.²² and Bhatia et al.³² in which pagophagia was the most form of pica used by the women. Although most women in our study were educated the preference of geophagia over pagophagia may be due the fact that electricity is expensive and most households lacked assets like fridges. Cultural beliefs promote the eating of soil as opposed to ice because it is readily available as was found in a study in Uganda.¹⁹ Unlike other studies in Nigeria³¹ and India,³³ the eating of other nonfood items like cigarette butts, baby powder, needles, coins was not common in this study. Similar to what was found by Garg and Sharma³⁴ and Lopez and others,³⁵ most participants consumed these nonfood items daily. None of the women in this study reported amylophagia. This is similar to what has been found by others elsewhere.^{13,30}

Unlike in some studies in Tanzania,³⁶ Kenya,^{13,37} South Africa,³⁸ Nigeria,²⁴ and in Iran,²² there was no association between anemia and pica in this study.

In agreement with researchers from Kenya,^{13,36,39} women in their third trimester in this study were more likely to have pica when compared with women in the first trimester. This differs from what was found in South Africa³⁸ and in Argentina³⁵ in which there was no association between gestational age and pica. The explanation for the

TABLE 2
Bivariate analysis of factors associated pica among pregnant women attending ANC in Kawempe National Referral Hospital

Variable	Pica present		cOR	95% CI	P value
	NO	YES			
Presence of anemia					
No	109 (82)	139 (79.4)	1		
Yes	24 (18)	36 (2.6)	1.23	0.69–2.19	0.489
Age					
17–24	52 (39.1)	73 (41.8)	1		
25–30	47 (35.342)	65 (37.1)	0.99	0.59–1.65	0.955
31 and above	34 (25.646.4)	37 (21.1)	0.82	0.46–1.49	0.521
Marital status					
Single/divorced	9 (6.8)	19 (10.9)	1		
Married	123 (93.2)	156 (89.1)	0.6	0.26–1.37	0.228
Education level					
None/primary level	24 (18.2)	41 (23.4)	1		
Secondary/tertiary	108 (81.8)	134 (76.6)	0.7	0.39–1.23	0.213
Occupation					
Housewife/unemployed	62 (47)	70 (40)	1		
Nonprofessional	53 (40.2)	77 (44)	1.28	0.79–2.10	0.312
Professional	17 (12.8)	28 (16)	1.46	0.73–2.92	0.285
Socioeconomic status					
Low SES	51 (38.6)	71 (40.6)	1		
Middle class	27 (20.5)	36 (20.6)	0.96	0.52–1.77	0.891
High SES	54 (40.9)	68 (38.8)	0.9	0.54–1.50	0.698
Gravidity					
Prime gravida	49 (37.1)	60 (34.3)	1		
Two to three	47 (35.6)	79 (45.1)	1.37	0.81–2.31	0.235
Four and above	36 (27.3)	36 (20.6)	0.82	0.45–1.48	0.506
Trimester					
First	13 (9.8)	9 (5.1)	1		
Second	48 (36.4)	47 (26.9)	1.41	0.55–3.62	0.47
Third	71 (53.8)	119 (68)	2.42	0.98–5.95	0.054
Nausea					
No	102 (77.3)	118 (67.4)	1		
Yes	30 (22.3)	57 (32.6)	1.64	0.98–2.75	0.059
Abdominal pain					
No	99 (75)	121 (69.1)	1		
Yes	33 (25.3)	54 (30.9)	1.29	0.77–2.15	0.33
Constipation					
No	123 (93.2)	143 (81.7)	1		
Yes	9 (6.8)	32 (18.3)	2.96	1.35–6.46	0.006
Loss of appetite					
No	102 (77.3)	134 (76.6)	1		
Yes	30 (22.7)	41 (23.4)	1.04	0.61–1.78	0.885
Diarrhea					
No	122 (92.4)	158 (90.3)	1		
Yes	10 (7.6)	17 (9.7)	1.31	0.58–2.97	0.513
Vomiting					
No	114 (86.4)	150 (85.7)	1		
Yes	18 (13.6)	25 (14.3)	0.97	0.50–1.88	0.931
Complications during pregnancy					
No	113 (85.6)	147 (84)	1		
Yes	19 (14.4)	28 (16)	1.27	0.66–2.43	0.477
Use of iron supplements					
No	12 (0.9)	13 (7.4)	1		
Yes	120 (90.9)	162 (92.6)	1.47	0.63–3.45	0.373

SES = socioeconomic status; ANC = antenatal clinic; PICA = is a behavior which has been described in the text. Pica was associated with women who had constipation. The bold values are significant values at bivariate analysis.

association of pica and third trimester may be that women in the third trimester have increased demand of micronutrients, which predisposes them to pica.² Alternatively, this may be due to differences in immune function throughout pregnancy.⁴⁰

Similar to what was found by Aminu et al.,³¹ Mensah et al.,⁴¹ Miller et al.,¹³ and Young,¹ in our study there was a strong association between pica and nausea. It has been noted by some workers that women develop the pica habit to reduce the gastrointestinal distresses like nausea and

vomiting.^{1,13,17,19,23,30,34,42} Others have found that the women enjoy the taste and the clay and soil smells good.³⁴

In this study there was no association between pica and SES. It shows that regardless of their SES, pregnant women commonly consumed soil or nonfood items in Uganda. This is similar to what has been found elsewhere.^{30,43,44} However, in other studies,^{22,34} there was an association between SES and pica.

Strengths and limitations. The limitations are the cross-sectional nature of the study and lack of a qualitative

TABLE 3

Multivariate analysis for factors independently associated with pica among pregnant women attending the antenatal clinic at Kawempe National Referral Hospital ($N = 307$)

Variable	cOR (95% CI)	aOR (95% CI)	P value
Presence of anemia			
No	1	1	
Yes	1.23 (0.69–2.19)	1.14 (0.63–2.07)	0.66
Trimester			
First	1	1	
Second	1.41 (0.55–3.62)	1.95 (0.73–5.25)	0.18
Third	2.42 (0.98–5.95)	3.60 (1.36–9.48)	0.01
Nausea			
No	1	1	
Yes	1.64 (0.98–2.75)	2.11 (1.20–3.70)	0.01

cOR = crude OR.

component to explain the motives of the behavior of the women. However, to our knowledge this is the first study of pica in Kawempe hospital. It has demonstrated the magnitude of the problem and its covariates in Ugandan women.

CONCLUSION

There was a high prevalence of pica among pregnant women attending antenatal clinic at Kawempe national referral hospital. Pica was associated with nausea and was most prevalent in women who were the third trimester of pregnancy. The risks of pica seem to overshadow its benefits in pregnancy. There is need to counsel women in the antenatal clinic about the dangers of pica. This will reduce the helminth infections and micronutrient deficiency associated with pica. Future studies should investigate the association pica practice with the third trimester and explore the changes of pica practice throughout pregnancy and in the puerperium.

Received January 9, 2021. Accepted for publication May 17, 2021.

Published online July 12, 2021.

Acknowledgments: We acknowledge the input of the research assistants, the women, and the staff of the Department of Obstetrics and Gynaecology for their cooperation. The American Society of Tropical Medicine and Hygiene (ASTMH) assisted with publication expenses.

Authors' addresses: Olivia Nakiyemba and Paul Kiondo, Department of Obstetrics and Gynaecology, Makerere University College of Health Sciences, Kampala, Uganda, E-mails: olivianakiyemba@gmail.com and kiondop@yahoo.com. Susan Obore, Department of Obstetrics and Gynaecology, Mulago Hospital, Kampala, Uganda, E-mail: arsuob@yahoo.co.uk. Milton Musaba and Julius Wandabwa, Faculty of Health Sciences, Department of Obstetrics and Gynaecology, Busitema University, Mbale, Uganda, E-mails: miltonmusaba@gmail.com and gjwandabwa@yahoo.com.

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