



Original article

The influence of pica practice on nutritional status, stress and anxiety of pregnant women

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ABSTRACT

Pica is a minor disorder in pregnancy associated with strong craving for food or non-food substances of little or no nutritional value.

Objective: The study assesses the characteristics of pica practice among pregnant women and evaluates its influence on the nutritional status, anxiety and stress of pregnant women.

Methods: A cross-sectional study was conducted among pregnant women attending the antenatal unit of a tertiary care hospital in Chennai, India. Pregnant women took a survey for presence of pica practice. Women with pica practice were assessed for dietary information, haemoglobin, pre-pregnant body mass index and stool analysis. Women's anxiety and stress were assessed using Beck anxiety inventory scale and Lipp Stress Inventory Scale. **Results:** Out of 739 pregnant women screened, 220 (29.7%) women were found to practice pica. Of the 220 women, 42.2% ingested food substances, 41% ingested non-food substance and 16.8% consumed both. The most common substances craved for were: unripe mango (42.2%), pagophagia (23.8%), ash (41%) and geophagia (19%). Amongst the women with pica, 67.3% women had anaemia, 36% were underweight and 9.5% were overweight. About 40% women had low anxiety, 43% had moderate anxiety and 17% had severe anxiety. Distribution of women based on phases of stress found 15.4% in alert phase, 65% in resistance phase, 1.4% in near exhaustion phase, and 18.2% in exhaustions phase.

Conclusion: The study identified that pica practice is not limited to ingestion of edible substances alone. Women practicing pica during pregnancy had anaemia, increased levels of stress and anxiety.

1. Introduction

Pica is a desire to consume unusual non-food substances that lack nutritional value or take food substances in an odd manner, which is not a part of regular food habit. Pregnant women with pica crave for substances such as dirt, soap, cigarette ashes, chalk, ice, freezer frost, hair, starch, paint chips, burnt match heads, plaster, wax, clay, baking soda, tooth paste, coffee grounds, paper, sand or gravel, rust, charcoal, antacids, mothballs, raw rice and unripe mango.^{1–3} Based on substance consumed, pica is classified as Pagophagia (ice), Amylophagia (raw rice), Metallophagia (paint/metal) Geophagia (dirt, soil, clay), Trichophagia (hair) and lithophagia (stone).

Prevalence rates of pica considerably vary in geographic areas. About 27.1% of pregnant women reported pica in Kenya.⁴ The

prevalence rate was 5% among pregnant women in Udupi district in Karnataka, India.⁵ Another study among women in Tamil Nadu, India found 15% pregnant women to have pica of which 46% crave for raw rice.⁶ Studies indicate no significant association between gestational age and pica.³ Various causes has been attributed for pica practice that includes genetic factors, traditional customs, cultural and religious reasons, nutritional deficiencies, pregnancy complications, unwanted pregnancies, stress and emotional factors, poor socio-economic status, learned behaviour or biochemical disorders.^{4,6–9}

Consumption of non food substances which are toxic or contaminated is considered harmful. Moreover, non food substances hamper nutrient absorption resulting in deficiencies. Amylophagia, pagophagia and geophagia impede iron absorption resulting in iron deficiency anaemia.^{10,11} Pica practice had significant association with higher

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transferrin receptor rates that signifies low iron stores among Spanish pregnant women.¹² A study found significant reduction in the total body iron among women with pica compared to the non pica group ($p = .005$).¹¹ Another study shows that geophagia is linked with hookworm and roundworm infestation during pregnancy.¹³

Pica practice among pregnant women is associated with presence of co-morbidities. A study found that 69.2% of pregnant women with pica had co-morbidity that included pre-existing anaemia, diabetes, gestational diabetes mellitus, urinary tract infection, gestational hypertension, gastrointestinal disorders, hypothyroidism, hypocalcaemia and other electrolyte changes.^{14–16} Stress and anxiety assessed among pregnant women who participated in the maternal–fetal risk screening program show minimal level of anxiety in a majority of women and less than one-third women without stress related symptoms. Half of the women with stress symptoms were in the resistance phase of stress.¹⁷ A previous study found that pica practice among women vary with nutritional demand, psychological distress, nutrient deficiencies, lack of adequate family and social support.⁶ Another study hypothesized that pregnant women adopt pica as a protective mechanism to combat stress.¹⁹

1.1. Study objectives

Based on this background, the following were set as the objectives of this study: (a) to assess the characteristics of pica practice among pregnant women and (b) to evaluate the influence of pica practice on nutritional status, anxiety and stress of pregnant women.

2. Materials and methods

A cross-sectional study design was used to assess the set objectives. The study was conducted in the antenatal outpatient and inpatient units of Obstetrics department of a tertiary care, University teaching hospital in Chennai, India. The estimated sample size was 220 pregnant women with pica practice based on the previous literature.²⁰ In order to identify 220 women with pica practice during the current pregnancy, 739 pregnant women who visited the antenatal outpatient department were screened using a pica practice assessment questionnaire through an interview. Each pregnant woman was first asked for presence of craving for any food substances or non-food substances during the current pregnancy. A response of 'Yes' was considered to be a positive response for pica, following which, ten questions that identified the type and frequency of the edible or non-edible substance consumed during the current pregnancy and the past history of pica practice were put forth. Thus, pregnant women of 6–40 weeks of gestation with pica practice, carrying single foetus and willing to participate in the study were selected through purposive sampling. Data was collected from the participants with the following study instruments: (a) Background variables assessed were: age, education, occupation, area of residence, type of food consumed – vegetarian, non-vegetarian or mixed, marital status, family income, gestational age, gravida, parity, live children and presence of co-morbid conditions. (b) Nutritional factors included: (i) haemoglobin obtained from clinical records of the participant to detect anaemia and grade it as per WHO guidelines as mild (9–10.9 g/dl), moderate (7–8.9 g/dl) or severe anaemia (<7 g/dl) (ii) Pre - pregnant Body Mass Index (BMI) was calculated based on the data in the clinical record just before the pregnancy or in the first trimester. Women were classified according to WHO classification (2000) as underweight (16–18.5 kg/m²), normal (18.5–25 kg/m²) or overweight and obese (25–35 kg/m²)²¹ (iii) Stool analysis was done to detect ova, cyst or any other pathogen to confirm the presence of infection or parasite infestation. (iv) Dietary information on number of the meals consumed per day and history of missing food was obtained. (c) Beck Anxiety Inventory (BAI) Scale, 21 item, three point rating scale was used to assess anxiety.²² Each item was scored 0–3 from Not at all to being severely bothered. Anxiety was categorized as low (1–21), moderate (22–35),

and persistent or high anxiety (36 and more) (e) Lipps stress symptoms inventory for adults (LSSI) with 56 items evaluated the stress symptoms among women with pica, whether the symptom was physical or psychological and the phase of stress: alert, resistance, near exhaustion and exhaustion phase.²³

BAI scale and LSSI stress symptoms inventory were translated in local language using back translation technique. The internal consistency (coefficient alpha) for the original BAI²² scale was 0.92, and the test–retest reliability was 0.75. The internal consistency (coefficient alpha) for the original LSSI inventory was 0.91.²³ The reliability correlation coefficient of the translated tool for BAI and LSSI was 0.76 and 0.80 respectively.

Institutional Ethics Committee approval was obtained for this study (CSP/16/JAN/45/73). Subject information sheet was distributed. Informed consent was sought from willing participants. Data required from clinical record was noted. The investigator collected the data through interview from each participant using the tools for about 35–40 min. Stool sample was collected from each participant on the same or the next day or on the day of follow-up visit to antenatal outpatient department as per the participant's convenience. Based on the objectives, the data were analysed with SPSS package version 19 using descriptive statistics (frequency, percentage, mean and standard deviation) and inferential statistics (chi-square) to associate anaemia with anxiety and stress of pregnant women with pica practice.

3. Results

3.1. Demographic and obstetrical characteristics of women with pica practice

The prevalence of pica among the pregnant women in the study was 29.7%. Among these women with pica practice, the age ranged between 20 and 34 years with the mean age and SD being 24.8 ± 4.2 . About 89% women were educated and 82.3% were working (Professionals 12.7% Clerical work/shop-keepers/farmers 42.2%, unskilled workers 27.4%). Around 94% women were married and living with husband and 6% were married but divorced/separated. About 68% subjects had mixed diet. About 55.5% women were nulliparous of which 46.3% were first time mothers. The gestational age of women at the time of inclusion in the study was 22 weeks or less in 31.4% women. A large number of women with pica practice (65.5%) had co-morbidities that included anaemia (66.8%), gestational diabetes mellitus (14.0%), hypothyroidism (13.8%), urinary tract infection (11.1%) and gestational hypertension (4.5%).

3.2. Characteristics of pica practice

The frequency of the edible and non-edible substances consumed by pregnant women is shown in Table 1. The most common food substance craved for were unripe mango, ice, pickles and ash. About 35.3% of the women consumed the edible pica substance at least once a day. Pica initiation was high among women in the second trimester and least in third trimester. Majority of women had previous history of pica practice during pregnancy or in childhood.

Anaemia was present in (Table 2) 67.3% of women with pica practice, with mild anaemia being most prevalent. Body Mass Index showed that 36% women were underweight and 9.5% were overweight. Stool analysis detected pathogen in 21.8% women with pica practice, of which 6.8% had E.coli and 15% had Entamoeba histolytica. Majority of women had missed their regular food due to pica practice.

Majority of pregnant women with pica experienced moderate level of anxiety. Distribution of women based on phases of stress showed 15.4% were in alert phase, 65% in resistance phase, 1.4% in near exhaustion phase, and 18.2% in exhaustion phase. Women experienced more physical symptoms of stress and less psychological symptoms in all the phases of stress as evidenced by mean scores (Table 3).

Table 1
Pica practice characteristics of pregnant women (N = 220).

S. No.	Pica Practice Characteristics	Frequency	Percentage
1.	Type of substance craved for		
	Food substance	93	42.2
	Non-food substance	90	41.0
2.	Both-food & non-food substance	37	16.8
	Food substances craved for (f = 130)		
	Unripe mango	55	42.2
	Ice	31	23.8
	Raw rice	15	15.0
3.	Pickles	29	19.0
	Frequency of craving for food Substances (f = 130)		
	4 to 6 times daily	21	6.2
	2 to 3 times daily	33	25.3
	Once daily	46	35.3
4.	At least once weekly	30	23.2
	Non-food substances craved for (f = 127)		
	Ash	52	41.0
	Clay	24	19.0
	Paint	2	1.5
	Chalk	21	16.5
	Toothpaste/tooth powder	5	3.9
	Charcoal	16	12.6
5.	Sand	7	5.5
	Frequency of craving for non- food substances (f = 127)		
	4 to 6 times daily	15	12.0
	2 to 3 times daily	13	10.2
	Once daily	48	37.7
6.	At least once weekly	51	40.1
	History of pica in previous delivery		
7.	Yes	52	23.6
	No	168	76.4
7.	History of pica during childhood		
	Yes	121	55
8.	No	99	45
	Pica practice initiation during antenatal period		
	1-3 month	80	36.3
	4-6 month	123	56.0
	7-9 month	17	7.7

Table 2
Nutritional status and presence of pathogens in stool of pregnant women with pica practice (N = 220).

S. No.	Nutritional variables	Frequency	Percentage
1.	Habit of Missing Food		
	Yes	105	47.7
2.	No	115	52.3
	Number of Meals Consumed per day		
	Two times	22	10.0
	Three times	78	35.4
	Four times	89	40.4
	Five times	24	11.0
	Six times	4	2.0
3.	More than 6 times	3	1.2
	BMI (based on pre-pregnant weight)		
	Under weight (<16-18 kg/m ²)	79	36.0
4.	Normal (18.5-25 kg/m ²)	120	54.5
	Overweight and obese (25-30 kg/m ²)	21	9.5
4.	Haemoglobin status (g/dl)		
	<11 (Normal)	72	32.7
	9 to10.9(Mild Anaemia)	119	54.1
	7 to 8.9 (Moderate Anaemia)	29	13.2
5.	Stool analysis		
	E.coli	15	6.8
	Entamoeba histolytica	33	15.0
	No microorganism	172	78.2

Higher levels of anxiety occur among anaemic pregnant women practicing pica. Similarly, pregnant women practicing pica diagnosed with anaemia were more likely to experience higher phase of stress than those women without anaemia (Table 4). Pregnant women of gravida 1 and 2 experienced more stress than women of higher gravida ($\chi^2 =$

Table 3
Anxiety and stress among pregnant women with pica practice (N = 220).

S. No.	Frequency (%)	Range	M(SD)
1.	Anxiety	9-33	23.3 (8.2)
	Low	88(40)	
	Moderate	95 (43)	
2.	Severe	37(17)	
	Phases of stress	7-28	14.5 (3.1)
3.	Alert phase (Q1)	34(15.4)	1-9 3.73 (1.4)
	Resistance phase (Q2)	143(65)	1-11 4.34 (2.2)
	Near exhaustion phase(Q2)	3(1.4)	
	Exhaustion phase (Q3)	40(18.2)	1-15 6.5(2.2)
	Symptoms of Stress		
3a.	Physical symptoms		9.4(3.5)
	Psychological symptoms		6.1(3.3)
3b.	Alert phase (Q1) (n = 34)		
	Physical symptoms	25(73.5)	
3c.	Psychological symptoms	9(26.5)	
	Resistance phase(Q2) (n = 143)		
3d.	Physical symptoms	124(86.7)	
	Psychological symptoms	19(13.3)	
	Near Exhaustion phase (Q2) (n = 3)		
3d.	Physical symptoms	2(66.7)	
	Psychological symptoms	1(33.3)	
3d.	Exhaustion phase(Q3) (n = 44)		
	Physical symptoms	41(93.2)	
	Psychological symptoms	3(6.8)	

Table 4
Association of anaemia with anxiety and stress of pregnant women with pica practice.

Anaemia status	Frequency	Level of Anxiety			χ^2 & p-value
		Low	Moderate	Severe	
Normal	72	63	4	5	$\chi^2 = 103.46$ $P < .00001$
Mild	119	23	72	24	
Moderate	29	2	19	8	
		88	95	37	
Phases of Stress					
		Alert phase (Q1)	Resistance and Near exhaustion phase (Q2)	Exhaustion phase (Q3)	
Normal	72	22	30	20	$\chi^2 = 31.96$ $P < .00001$
Mild	119	11	93	15	
Moderate	29	1	20	8	
		34	143	43	

15.290, $p = .004$). Significant association was found among women with pica craving for food substance ($\chi^2 = 8.70$, $p = .003$) and craving for non food substance ($\chi^2 = 10.23$, $p = .001$). Women who started to practice pica in second trimester had higher level of stress than women who started in first or third trimester ($\chi^2 = 9.07$, $p = .028$).

4. Discussion

Among the surveyed population, the study showed one-fourth of the pregnant women to practice pica. This study finding reciprocates the results of previous study in India that reported 27% of women practice pica in Chhattisgarh.²⁴ The results of the present study showed that pregnant women craving for food and non-food substances were almost equal. Unripe mango was the commonest food substance craved and the other food substances consumed were ice (pagophagia), pickles and raw

rice (amylophagia). The most common non-food substances consumed were holy ash (Vibuthi) followed by clay (geophagia), chalk and charcoal. Vibuthi or holy ash refers to the sacred ash obtained from burnt dried wood, usually distributed in temples and is applied on the forehead. Similarly, another study in Tamil Nadu that excluded unripe mango as a substance of pica found 46% pregnant women consumed raw rice, 12% ash (vibuthi), 12% toothpaste, 3% mud and 2% each ingested charcoal and chalk.⁶ A study revealed that pagophagia (ice consumption) was the main type of pica practice, followed by geophagia (earth intake) and the ingestion of soap, toothpaste and chalk among Argentine women.²⁵ The prevalence of amylophagy was 37% and geophagy was 3.6% among pregnant Tanzanian women.¹⁰ The results of the current study showed that the consumption of unripe mango was most favoured by women of this population compared to raw rice. Half of the pregnant women among the surveyed population in this study started the pica practice in second trimester, followed by 36.3% in first trimester of pregnancy. These findings concur with other studies that points pica did not appear to commence more frequently in the first trimester compared to the second trimester.^{6,20,26} Contrary to this study results, a recent study in Uganda showed pica practice to be independently associated with third trimester of pregnancy.²⁷ Results of the current study showed that it is likely that women with history of pica during childhood or previous pregnancy develop tendency for pica practice during the current pregnancy. Childhood pica practice has shown to resurface during pregnancy too in more than half of the current study samples. Consistent results were found in studies that reported 40–45% women to have practiced pica during childhood and 20–50% of women with history of pica in previous pregnancies.^{28,29}

The current study findings revealed that most of the women (67.3%) had anaemia, with majority in the mild anaemia category based on WHO standards. None of the subjects had severe anaemia. A study reported that 40.8% women with pica practice had anaemia, of which 2.7% had severe anaemia.³⁰ Similarly, another study found 34.5% pregnant women with pica had anaemia, of which most of them had mild anaemia (55.2%) compared to 40.8% with moderate anaemia and 4.0% with severe anaemia.¹² A study showed statistically significant variations between mean haemoglobin level and pica behaviour of pregnant women from Tanzania. Findings suggested that women who were combined amylophagists and geophagist had lower haemoglobin concentrations by 1.05 g/dL than geophagists or amylophagists alone ($p < .001$).⁹

In the current study, the estimation of pre-gestational BMI of pregnant women with pica practice showed 36% women were underweight and 9.5% were overweight. A study in Brazil found 23.1% women with pica practice as overweight and 23.1% as obese.¹⁸ Though the women with normal BMI status were similar in both the population, the women with overweight and obese were found to be more among the Brazilian population than among the Indian women.

In the current study, the stool analysis showed that 21.8% had presence of pathogen in their stool, of which 6.8% had E.coli, and 15% had presence of Entamoeba histolytica. Contrary to this, a study found that the overall prevalence of Ascaris, Trichuris and hookworm infestation was 5.6%, 33.2% and 32.9% respectively. Geophagia was not a significant predictor of either Ascaris or Trichuris infection.³¹

About 47.7% of women in the current study verbalized that their pica practice resulted in missing their regular food consumption. A previous study indicated that neither geophagy nor amylophagy was associated with most of the indicators of poor socioeconomic status or reduced food availability, dietary diversity or number of meals consumed.⁹

The tendency to become anxious during pregnancy is a known fact. Very few studies have established the effect of pica among pregnant women and their stress and anxiety levels. The current study showed that 43% pregnant women with pica had experienced moderate anxiety and 17% had severe anxiety. Again, majority of women were in resistance phase of stress. Women exhibited more of physical symptoms than psychological symptoms in their respective phase of stress. A study

among a sample size of thirteen women in Brazil found that majority (71.4%) of pregnant women with pica had moderate level of stress, remaining had mild anxiety and none experienced severe anxiety. Regarding stress levels, 71.4% were in the resistance phase, and 28.6% were in the extreme phase of exhaustion. None were shown in phases of alert and almost exhausted, unlike the results in the current study.¹⁸

Pregnant women with pica practice experienced higher levels of anxiety and stress. The physical and psychological symptoms of stress were found to be significant among the women who participated in this study. Increased stress and anxiety and poor adaptation may lead to increased presence of co-morbid conditions during pregnancy. The current study found that 65.5% pregnant women with pica practice had some type co-morbidity such as anaemia, gestational diabetes mellitus, hypothyroidism, urinary tract infection and gestational hypertension. Also the nutritional status revealed one third of pregnant women with pica to be underweight. A recent study finding in Uganda reported a minor disorder experienced by women during pregnancy, nausea to be associated with pica practice.²⁷

This study had few limitations. Pica practice was not directly observed. There may be underreporting of consumption of some edible and non-edible substance among pregnant women due to guilt and shame. Nurses are the first accessible health care providers for pregnant women. Detection of harmful pica practice and guidance to withdraw from such harmful practice is an important component of antenatal education. Hence, screening for pica practice and factors influencing pica should be part of routine care for the pregnant women. Few recommendations for future research include a comparative study to determine the stress and anxiety and its effect on pregnant women with pica and without pica. Follow up studies on effects of pica on mother and their children can be conducted.

5. Conclusion

The study results reveal that one-fourth of pregnant women practice pica. Pica practice is not limited to ingestion of edible substances only. This study shows that many pregnant women also consume non-edible harmful substances. High prevalence of anaemia is found among pregnant women practising pica. Pica practice hampers the nutritional wellbeing of women and increases their stress and anxiety levels. Nurses and midwives play a pivotal role in detecting harmful pica practice among pregnant women. There is a need for nurses to create awareness among pregnant women on the adverse effects of pica.

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Ethical approval statement

Institution Ethics Committee of Sri Ramachandra Institute of Higher Education and Research approved this study. Informed consent was obtained from the study participants.

Authors' contribution

NSJ conceived the idea, designed the methodology, interpreted the analysed data and prepared the manuscript. FS conducted the study and collected the data. SR peer reviewed the manuscript, validated the translated tool, planned the execution of research activity and AS analysed the data. All the authors critically reviewed and approved the final draft and are responsible for the content and the similarity index of the manuscript.

Declaration of competing interest

The authors have no conflict of interest to declare.

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