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The Prevalence Rate of Pica Disorder and its Nutritional and Non-nutritional Risk Factors among Pregnant Woman in Sana'a – Yemen

Mohammed, Alsebaeai [1,2]; Shehab Al-Qubati [2]; Sarah Isskandar [2]; Haifa Juman [2]; Shaima Alhalhali [2]; Mesk ALosheeb [2]; Sumia AL_Badani[2]; Ala'a Al-duais[2]; Shaimaa Aklaan[2]

[1]Department of Food Science and Technology, College of Food and Agricultural Sciences, Ibb University, Yemen.
[2]Department of Therapeutic Nutrition, Faculty of Medical Sciences, Alyemenia University, Yemen.

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Abstract: This study aimed to estimate the prevalence and identify nutritional and non-nutritional risk factors associated with pica during pregnancy in Sana'a, Yemen. A cross-sectional study was conducted among 195 pregnant women using a self-administered questionnaire, developed based on a literature review and study objectives. Data were analyzed using SPSS software, and statistical tests were performed to assess associations between pica disorder and various risk factors. The results indicated that 28.7% of pregnant women exhibited pica behavior, with the most commonly consumed substances being ice (12.8%), clay (4.6%), petroleum oil (1.5%), charcoal (0.5%), water of haka (1.5%), cigarettes (1.5%), and other non-food items (3.6%). Statistical analysis revealed a significant association ($p<0.05$) between pica disorder and household members, as well as anxiety, while no significant relationships were found with other demographic, nutritional, or pregnancy-related factors. The findings emphasize the need for further research to explore the underlying causes of pica consumption and its relationship with dietary intake through quantitative analysis.

Keywords: *Woman, Pica, Questionnaire, Disease, Yemen.*

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I. 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%), 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. (5). Thus, many scientists have hypothesized that pica is a response to micronutrient deficiency to supplement a deficient diet. Indeed, some soils have high concentration of certain nutrients like iron, calcium, and zinc although its bioavailability has not been fully elucidated. Alternatively, pica is a maladaptive behavior, as an epiphenomenon to micronutrient deficiency (zinc, iron, calcium, etc.). It may lead to increase in helminthic infections lead poisoning, and hyperkalemia (6; 7).

It may reduce absorption of essential medicines and nutrients, 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. (8). Consumption of

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pica may be protective by enhancing the integrity of the intestinal mucosa against harmful chemicals and pathogens. (1; 9). 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. Pica substances especially geophagic earths contain alkaline substances that make them useful antiacids and some contain minerals that are effective in reducing nausea and vomiting (10).

In Sana'a, Yemen, where nutritional deficiencies and socio-cultural factors influence maternal health, the prevalence of pica during pregnancy remains largely undocumented. The condition may pose serious health risks to both mother and fetus, including anemia, parasitic infections, and heavy metal toxicity. Despite its potential consequences, limited research exists on the prevalence rate of pica among pregnant women in Sana'a and the associated nutritional (e.g., anemia, micronutrient deficiencies) and non-nutritional (e.g., cultural beliefs, psychological stress) risk factors. Identifying these determinants is crucial for developing targeted interventions to improve maternal and fetal health outcomes. This study amid to assess the prevalence of pica among pregnant women in Sana'a and examine the contributing factors, both nutritional and non-nutritional, to provide evidence-based recommendations for maternal healthcare policies and interventions in Yemen.

II. RESEARCH METHODOLOGY

A. Study Design

The study was used a cross-sectional study. The study was conducted between December 2023 and February 2024 in two health care centres, that is, Artil an Atane health centres in Sana'a. The two clinics are the most common health centres in Sana'a.

B. Study Population

According to the 2004 population census Sana'a district had population of 1065014 which female was 518691 holds almost 48% of the total district population. This comprised of pregnant women residing in and attending Artil an Atane centers clinics within Sana'a.

C. Data Collection Form

A structured questionnaire was used to collect demographic data which included, age, and other factors such as nutritional factors, food intake and dietary supplement and nutritional factors of the pregnant woman in Sana'a Yemen.

D. Data Analysis and Statistics

The data was collected using SPSS (26,2021), a data analysis software system.

E. Ethical Consideration

An ethical clearance was granted by pregnant woman and authorities of health care centers and Alyemnia University, Sana'a.

III. RESULT AND DISCUSSION

A. Demographic Characteristics Distribution of Selected Sample

Table 1 shows the demographic characteristics distribution of selected sample. The highest proportion of pregnancies occurred in the 20–25 age group (37.4%), followed by the 26–30 age group (24.6%). This indicates that the majority of pregnancies happen in early adulthood, which aligns with reproductive trends in Yemen, where early marriage is common. Teenage pregnancies (13.8%) remain a concern, as they are often associated with higher risks of maternal and neonatal complications due to physical and nutritional immaturity. Pregnancies among women aged 36 and older were the least common (6.7%), likely due to declining fertility, increased health risks, or societal norms favoring earlier childbearing.

Education plays a critical role in maternal health and decision-making. The highest percentage of participants (33.3%) had completed high school, while 22.1% had secondary education and 19.5% had only primary education. Notably, 19.5% had pursued higher education (university or diploma), whereas 5.6% of the women had no formal education. Lower education levels may contribute to a lack of awareness regarding prenatal care, nutrition, and maternal health risks, potentially increasing vulnerability to conditions such as anemia and pica.

The vast majority of participants (92.3%) were unemployed, while only 7.7% were employed. This reflects a common trend in many developing regions, where women, especially pregnant women, are less likely to participate in formal employment due to cultural expectations, caregiving responsibilities, or lack of job opportunities. Unemployment may also be linked to economic challenges, affecting access to healthcare, quality nutrition, and overall maternal well-being.

Household size can influence dietary intake, healthcare access, and overall maternal health. In this study, 51.3% of the women lived in small households with 1–3 members, while 46.2% had 4–7 household members. A smaller percentage (2.6%) lived in households with 8 or more members. Larger households may indicate extended family living arrangements, which could provide additional support but may also contribute to financial strain, limiting resources available for maternal and child healthcare.

The majority of the women (75.4%) lived in urban areas, while 24.6% resided in rural areas. Urban residency is often associated with better access to healthcare facilities, education, and nutritional resources, while rural areas may face challenges such as limited healthcare infrastructure, lower awareness of prenatal care, and food insecurity.

B. Pica Practice and Pica Types Distribution of Selected Sample

The study revealed that 28.7% of the participants suffered from pica, while the majority (71.3%) did not exhibit any pica-related behaviors. This prevalence rate highlights a significant portion of pregnant women engaging in non-

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nutritive substance consumption, which could have potential health implications for both the mother and the fetus.

Among the women experiencing pica, the most commonly consumed non-food substance was ice (12.8%), followed by clay (4.6%), water of haka (3.1%), petroleum oil (1.5%), residual cigarette ash (1.5%), charcoal (0.5%), and other substances (3.6%). The remaining 72.3% of women did not report any pica behavior as showed in table 2.

The predominance of pagophagia (ice consumption) over geophagia (clay consumption) in this study differs from the findings of Ahmed et al. (2023), where geophagia (eating clay and sand) was the most frequent form of pica (86.4%), followed by pagophagia (11.8%) and starch consumption (1.6%). This discrepancy suggests potential geographical, cultural, and nutritional differences influencing pica behaviors in different populations.

C. The Relationship between Risk Factors and Pica Disorder among Pregnant Woman

- *The Relation between Demographic Factors and Pica Disorder among Woman*

The study analyzed the relationship between pica disorder and various demographic factors, including age, education, and employment status. The results showed that age had no significant effect on pica ($P > 0.05$). Although the highest prevalence of pica was observed among women aged 20–25 years (37.5%), followed by those under 20 years (21.4%), and both the 26–30 and 31–35 age groups (17.9%), the statistical analysis did not indicate a strong association between age and pica behavior.

Similarly, education level was not significantly associated with pica ($P > 0.05$), as pica prevalence was 25.0% among women with primary education, 21.4% among those with secondary education, and 25.0% among high school graduates as showed in table 3. This suggests that educational background may not be a major determinant of pica disorder. Additionally, employment status was also found to have no significant effect on pica ($P > 0.05$).

Table 1: Socio-Demographic Characteristics of the Study Population (n=195)

Variable		**Number of Participate**	**Percentage of Participate**
Age of participant	less than 20	27	13.8
	20-25	73	37.4
	26-30	48	24.6
	31-35	34	17.4
	36 or more	13	6.7
Residence area	Urban	147	75.4
	Rural	48	24.6
Education	Primary	38	19.5
	Secondary	43	22.1
	High school	65	33.3
	University diploma	38	19.5
	Non	11	5.6
Occupation	Employed	15	7.7
	Non employed	180	92.3
Household members	1 to 3	100	51.3
	4 to 7	90	46.2
	8 or more	5	2.6

Table 2: Pica Practice and Pica Types Distribution of Selected Sample

Variable		**Number of Participate**	**Percentage of Participate**
Pica practice	Yes	56	28.7
	No	139	71.3
Types of Pica	Ice	25	12.8
	Clay	9	4.6
	Petroleum oil	3	1.5
	Charcoal	1	0.5
	Waterof haka	6	3.1
	Residual of cigarette	3	1.5
	Others	7	3.6
	Non	141	72.3

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Among the women with pica, 7.1% were employed, while 92.9% were unemployed, indicating that occupational status did not play a substantial role in pica development. These findings suggest that pica disorder among pregnant women may be influenced more by physiological, nutritional, or psychological factors rather than demographic variables such as age, education, or employment status. Future research should focus on exploring potential biological and cultural determinants of pica to develop more effective maternal health interventions.

The findings indicated that household size had a significant effect on pica ($P \leq 0.05$), with 53.6% of women with pica belonging to households with 1–3 members, 39.3% in households with 4–7 members, and a lower percentage in households with 8 or more members. This suggests that smaller household sizes may be associated with a higher prevalence of pica, possibly due to differences in economic or social support. However, residence area ($P > 0.05$) showed no significant effect on pica, despite a higher prevalence among urban residents (73.2%) compared to rural residents (26.8%). Similarly, stress ($P = 0.810$) was not significantly associated with pica, even though a larger proportion of women with pica reported experiencing stress (78.6%).

Regarding nutritional status, malnutrition ($P > 0.05$) was not a significant factor in pica prevalence, with the majority of women with pica being of normal weight (76.8%), while 17.9% were underweight and 5.4% were overweight. Dietary habits also showed no significant association with pica. Meat consumption did not influence pica prevalence ($P > 0.05$), with 46.4% of women with pica consuming meat once a week, 19.6% consuming it twice a week, 25.0% three times a week, and 8.9% not consuming meat at all. Similarly, milk and dairy product consumption ($P > 0.05$) had no significant effect, though most women with pica consumed milk once daily (58.9%), followed by twice daily (25.0%), and no consumption (16.1%).

Table 3: The Relation between Demographic Factors and Pica Disorder among Woman

Variable		**Pica practice**		**P value**
		Yes	**No**	
Age of participant	less than 20	12 (21.42%)	15(10.79%)	0.294
	20-25	21(37.5%)	52(37.41%)	
	26-30	10(17.85%)	38(27.33%)	
	31-35	10(17.85%)	24(17.26%)	
	36 or more	3(5.35%)	10(7.19%)	
Residence area	Urban	41(73.21%)	106(76.25%)	0.655
	Rural	15(26.78%)	33(23.74%)	
Education	Primary	14(25%)	24(17.26%)	0.356
	Secondary	12(21.42)	31(22.30%)	
	High school	14(25%)	51(36.69%)	
	University \diploma	11(19.64%)	27(19.42%)	
	Non	5(8.92)	6(4.31%)	
Occupation	Employed	4(7.14%)	52(92.85%)	0.854
	Non employed	11(7.91%)	128(92.08%)	
Household members	1 to 3	16(28.57%)	40(28.77%)	0.95
	4 to 7	26(46.42%)	67(48.20%)	
	8 or more	14(25%)	32(23.02%)	

Table 4: Pica Practice and Pica Types Distribution of Selected Sample

Variable		**Number of participate**	**Percentage of participate**
Pica practice	Yes	56	28.7
	No	139	71.3
Types of Pica	Ice	25	12.8
	Clay	9	4.6
	Petroleum oil	3	1.5
	Charcoal	1	0.5
	Waterof haka	6	3.1
	Residual of cigarette	3	1.5
	Others	7	3.6
	Non	141	72.3

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➢ *The Relation between Symptoms and Pica Disorder among Woman*

The table 4 showed the relation between symptoms and pica disorder among woman. The findings indicate a significant relationship between anxiety levels and pica, as evidenced by the P-value of 0.027 ($P \leq 0.05$). Specifically, individuals with moderate anxiety exhibited the highest prevalence of pica (44.6%), followed by those with severe anxiety (28.6%) and low anxiety (26.8%). This suggests that as anxiety levels increase, the likelihood of engaging in pica behavior also rises, highlighting the potential role of anxiety as a contributing factor. In contrast, stress does not appear to have a significant impact on pica, as shown by the P-value of 0.810 ($P > 0.05$). While a majority (78.6%) of individuals with pica reported experiencing stress, the lack of statistical significance implies that stress alone may not be a determining factor in the development of pica. This distinction between anxiety and stress in relation to pica underscores the importance of further research to understand the specific psychological mechanisms involved in the condition.

➢ *The relation between Malnutrition and Pica Disorder among Woman*

The analysis reveals that malnutrition does not have a significant effect on pica, as indicated by the P-value of 0.197($P > 0.05$). Although the majority of individuals with pica fall within the normal nutritional range (76.8%), a smaller percentage are underweight (17.9%) or overweight (5.4%) as showed in table 5. These variations suggest that pica is not strongly associated with nutritional status, contradicting the common assumption that pica primarily occurs in individuals with malnutrition. The lack of statistical significance further supports the idea that other factors, such as psychological or behavioral influences, may play a more substantial role in the development of pica rather than nutritional status alone.

➢ *The Relation between Dietary Pattern and Pica Disorder among Woman*

Table 6 presented the relation between dietary pattern and pica disorder among woman. Vegetable and fruit consumption also did not show a significant effect on pica. Vegetable consumption ($P > 0.05$) was not a determining factor, with 21.4% of women with pica consuming vegetables three times per week, 12.5% once a week, 8.9% twice a week, and 3.6% four times a week. Similarly, fruit consumption ($P = 0.389$) had no significant association with pica, despite variations in consumption frequency, where 19.6% of women with pica consumed fruits two or three times per week, 16.1% once a week, and 8.9% four times a week.

➢ *The Relation between Dietary Supplementals and Pica Disorder among Woman*

The findings indicated that vitamin supplementation before pregnancy had no significant effect on pica ($P > 0.05$), with 17.9% of women with pica having taken vitamins before pregnancy, while 82.1% had not. Similarly, vitamin supplementation during pregnancy ($P = 0.947$) showed no significant effect, although a higher percentage of women with pica (67.9%) reported taking vitamins during pregnancy compared to those who did not (32.1%) as show in table 7.

Table 5: The Relation between Symptoms and Pica Disorder among Woman

Variable		Pica practice		P value
		Yes	No	
Stress	Yes	44(78.57%)	12(21.42%)	0.809
	No	107(76.97%)	32(23.02%)	
Anxiety	Low	15(26.78%)	25(44.64%)	0.03
	Moderate	53(38.12%)	68(48.92%)	
	Severe	16(28.57%)	16(12.94%)	

Table 6: The Relation between Malnutrition Status and Pica Disorder among Woman

Variable		Pica practice		P value
		Yes	No	
Malnutrition	Underweight	10(17.85%)	43(76.78%)	0.196
	Normal	13(9.35%)	121(87.05%)	
	Overweight	3(5.35%)	5(3.59%)	

Table 7: The Relation between Dietary Pattern and Pica Disorder among Woman

Variable		Pica practice		P value
		Yes	No	
Consumption of meat (week)	1	25(46.42%)	56(40.28%)	0.811
	2	11(19.64%)	27(19.42%)	
	3	14(25%)	44(31.65%)	
	NON	5(8.92%)	12(8.63%)	
Consumption of milk and milk products	Twice daily	14(25%)	33(23.74%)	0.907
	Once daily	33(58.92%)	80(57.55%)	

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	No	9(16.07%)	26(18.70%)	
Consumption of vegetable (week)	1	7(12.5%)	19(13.66%)	0.242
	2	5(8.92%)	19(13.66%)	
	3	12(21.42%)	28(20.14%)	
	4	2(3.57%)	11(7.91%)	
	5	24(42.85%)	58(41.72%)	
	Non	6(10.71%)	4(2.87%)	
Consumption of fruit (week)	1	9(16.07%)	21(15.107%)	0.388
	2	11(19.64%)	36(25.89%)	
	3	11(19.64%)	29(20.86%)	
	4	5(8.92%)	14(10.07%)	
	5	15(26.78%)	36(25.89%)	
	Non	5(8.92%)	3(2.158%)	

Table 8: The Relation between Dietary Supplements and Pica Disorder among Woman

Variable		**Pica practice**		**P value**
		Yes	**No**	
Vitamins supplements before pregnancy	Yes	10(17.85%)	23(16.54%)	0.825
	No	46(82.14%)	116(83.45%)	
Vitamins supplements during pregnancy	Yes	38(67.85%)	95(68.34%)	0.94
	No	18(32.14%)	44(31.65%)	
Iron supplementation before pregnancy	Yes	5(8.92%)	7(5.03%)	0.306
	No	51(91.07)	132(94.96%)	
Iron supplementation during pregnancy	Yes	26(46.42%)	58(41.72%)	0.54
	No	30(53.57%)	81(58.27%)	
Zinc supplementation before pregnancy	Yes	4(7.14%)	3(2.15%)	0.09
	No	52(92.85%)	135(97.84%)	
Zinc supplementation during pregnancy	Yes	16(28.57)	39(28.057%)	0.94
	No	40(71.42%)	100(71.94%)	

Iron supplementation also did not significantly influence pica. Iron supplementation before pregnancy ($P > 0.05$) was not a determining factor, with only 8.9% of women with pica reporting iron intake before pregnancy, while the majority (91.1%) had not taken iron supplements. Likewise, iron supplementation during pregnancy ($P = 0.549$) had no significant effect on pica, with 46.4% of women with pica having taken iron supplements during pregnancy, while 53.6% had not.

Regarding zinc supplementation, the results also indicated no significant relationship with pica. Zinc supplementation before pregnancy ($P > 0.05$) did not show a significant effect, as 7.1% of women with pica had taken zinc before pregnancy, while 92.9% had not. Similarly, zinc supplementation during pregnancy ($P > 0.05$) had no significant impact on pica prevalence, with 28.6% of women with pica reporting zinc intake during pregnancy, while 71.4% had not taken zinc supplements.

Overall, these findings suggest that vitamin, iron, and zinc supplementation, whether taken before or during pregnancy, did not play a significant role in the occurrence of pica among pregnant women. While nutrient deficiencies have been traditionally associated with pica, the lack of a significant relationship in this study highlights the complexity of the disorder, suggesting that other biological, psychological, or cultural factors may be more influential in its development. Further research is needed to explore additional determinants of pica, such as micronutrient absorption, dietary habits, and socio-environmental influences, to better understand its underlying causes.

IV. CONCLUSION

The preferred spelling of the word “acknowledgment” in America is without an “e” after the “g.” Avoid the stilted expression “one of us (R. B. G.) thanks ...”. Instead, try “R. B. G. thanks...”. Put sponsor acknowledgments in the unnumbered footnote on the first page. The cross-sectional study, conducted between December 2023 and February 2024 at Artil and Atane health centers in Sana’a, examined the prevalence and associated factors of pica disorder among 195 females. The findings revealed varying prevalence rates for different non-food substance consumption, with eating ice being the most common (12.8%), followed by clay (4.6%) and other substances such as petroleum oil, charcoal, and cigarette consumption at lower rates. Statistical analysis indicated no significant association between pica disorder and demographic factors such as age, education, occupation, residence area, pregnancy-related factors, nutritional intake, or supplement consumption. However, the study identified a

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significant relationship between pica disorder and household members, suggesting that family dynamics may influence the condition. These findings emphasize the need for further research to explore the role of mental health and social environment in the development and persistence of pica during pregnancy.

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