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Update on the Global Prevalence of Pica in Pregnant Women: A Meta-analysis

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Abstract

Objectives: Pregnancy pica is harmful to the mother and her baby. This study aimed to update the global prevalence of pica in pregnant women.

Methods: Scopus, Science Direct, Wiley online, Google Scholar, and PubMed databases were searched for observational studies until July 2021. This search was done with the keywords "pregnancy pica", "prevalence of pica", "pica frequency". After evaluating the extracted studies based on inclusion and exclusion criteria, 45 final articles were selected. Calculations were performed based on STATA software. Publication bias was also assessed.

Results: The global prevalence of pica in pregnancy in the final forty-five articles (Sample size: 21 267) was 34%. However, the prevalence has decreased since 2015. In the subgroup analysis, rural women, women with lower education, younger women, unemployed women, and women living in the African geographical area had the highest prevalence of pica. Our results also showed that this rate was higher in women in the first trimester of pregnancy and multiparous women.

Conclusions: The global prevalence of pica was 34%. Therefore, it is recommended to implement educational programs, empower women and distribute nutritional supplements during pregnancy.

Keywords: Prevalence, Pica, Pregnant Woman, Meta-analysis

Introduction

Pica is an eating disorder in which a person intentionally and frequently eats non-food items (1). Pica usually exists in three forms: geophagy (eating soil and all soil-derived materials such as white clay-red clay-brick-pottery), amylophagy (eating rice and raw starch), and pagophagy (eating ice and frozen materials) (2,3).

Due to the presence of bacteria, parasites, and heavy metals in non-nutrient(1), Pica causes consequences such as intestinal obstruction, interference with the absorption of nutrients from the intestine, and electrolyte disturbances (4). Some cultures, however, use these items to treat gastrointestinal problems (5).

Pica is found in all races or cultures (1). but is more common in poor areas, among children, lactating women, and pregnant women (6).

In pregnancy, the mother's need for nutrients increases due to metabolic changes (7). Although adequate intake of these substances is necessary to maintain the health of mother and child (8,9), pica harms the mother and child by substituting non-food items instead of food and preventing the absorption of nutrients from the intestine (10). These injuries include dental injuries, internal obstruction, constipation, lead poisoning, parasitic infections, anemia, hyperkalemia, malnutrition (10-12), preterm labor, low birth weight, and increased mortality (11,13).

The prevalence of pica in pregnancy is between 0.7-67%. For example: 74% in Kenya (14), 27% in India (15), 23% in Argentine, 46% in America (16), and 60.5% in Iran (17).

Cultural traditions (increased breast milk), biological factors (anemia, nutrient deficiency, cravings, reduced nausea, and vomiting), demographic status, and midwifery factors influence Pica practice (6,18).

Demographic factors such as celibacy (16), living in the rural (10,17), low level of education (19-21), young age (22), and unemployment (17) can increase the prevalence of pica in women.

However, some studies have shown conflicting results in terms of pica prevalence based on education level (23), age (24), and employment (10,25). There is also no relationship between maternal weight, body mass index (BMI) before pregnancy, and gestational weight gain with pica (16). In Santos and colleagues' study, no correlation was observed between weight and pica (13). In López and colleagues' study, BMI before pregnancy was not associated with pica (23).

For obstetric factors, the prevalence of pica is higher in the first trimester of pregnancy (26) and in nulliparous women (8). However, some studies have shown different findings (21,22).

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Key Messages

- Pica is the intentional eating of non-nutrients. This disorder is common in children, lactating women, and pregnant women.
- There have been many studies on the prevalence of pica worldwide. Therefore, performing a meta-analysis helps to understand the general situation.
- The prevalence of pica in pregnancy is affected by location, level of education, age, employment, geographical area, trimester of pregnancy, and parity.

According to the millennium development goal to eradicate poverty and malnutrition (27), the study of pica in pregnancy can be a way to achieve this goal. Due to the gap in studies on the prevalence of pica, a meta-analysis is necessary.

In Fawcett's meta-analysis, the global prevalence of pica in pregnancy was 27.8% (28). According to numerous studies conducted in recent years, performing a meta-analysis helps to resolve inconsistencies and improve therapeutic interventions. Therefore, this meta-analysis was performed to determine the global prevalence of pica.

Methods

This meta-analysis was performed based on the PRISMA checklist (29) by reviewing English language articles and dissertations on the world until July 2021. The required data were searched in Scopus, Science Direct, Google Scholar, Wiley online, and PubMed databases using the keywords "pregnancy pica", "prevalence of pica", and "pica frequency".

Selection of Studies

Inclusion criteria include observational studies in English that report the prevalence of pica during pregnancy, high-quality studies based on the Joanna Briggs Institute (JBI) checklist. Exclusion criteria include non-observational studies, articles without full text, and articles without data to calculate the prevalence.

After searching for studies, duplicate, irrelevant, and low-quality articles were removed. Finally, the information needed to calculate the prevalence was extracted from quality articles.

Quality Assessment

Studies that met the inclusion criteria of this meta-analysis were evaluated using the JBI checklist (30). The JBI checklist in cross-sectional studies comprises nine questions with four answers: yes, no, uncertain and unenforceable. We gave 1 point for each positive response. Only studies with a minimum score of 5 entered the final analysis. Search, extraction, and evaluation of the quality of studies were performed by two researchers separately. In case of disagreement, the view of the other researcher was acceptable.

Statistical Analysis

Prevalence was assessed using meta-analysis in STATA software (version 21). Cochrane Q test and I^2 index were used to evaluate the homogeneity between studies. After confirming the heterogeneity of the studies (I^2 index > 75%), the prevalence of pica was calculated by the effect random model (31). The publication bias of the studies was determined by the Begg test and sensitivity analysis (30).

The review also assessed the prevalence of pica based on the following subgroups: 1- Pica type (pagophagy, geophagy, and amylophagy), 2- Year of publication (until 2015, after 2015), 3- Marital status (married, single), 4- Residence (urban, rural), 5- Level of education (primary or lower, upper primary), 6- Age (under 30, over 30 years), 7- Employment status (employed, unemployed), 8- Geographical region (Africa, America, and Asia), 9- Pregnancy trimester (first, second and third trimesters) and 10- Parity (nulliparous women, multiparous women). The significance level of the Begg test was less than 0.05 (30).

Results

Initially, we found 452 articles. Finally, after deleting 406 studies (based on Figure 1), we included 45 final articles with a sample size of 21267 in the meta-analysis. Pica prevalence varied from 1.6% (32) to 76% (33) among selected studies. A checklist containing articles information is brought in Table 1.

Publication Bias

The Begg test value ($P=0.68$) shows there is no publication bias.

Meta-analysis

The prevalence of pica in pregnancy was 34% (95% CI: 28%-41%) and the I^2 index was 99.4% ($P=0.001$) (Figure 2).

Sensitivity Analysis

Excluding studies with a prevalence of less than 0.06 and above 0.7, no significant change was observed. The range of change was between 32% (95% CI: 30–38%), with Rainville (33) and Ngozi (14) excluded (Table 2), and 36% (95% CI: 31–43%), with Posner et al (32), Garg and Sharma (52) and Jonathan et al (55) excluded (Table 3).

Subgroup Analysis – Pica Type

In this analysis, the overall prevalence of pagophagy, geophagy, and amylophagy was assessed. The values were 38% (heterogeneity: $I^2=99.5\%$, $P=0.001$), 36% (heterogeneity: $I^2=98.7\%$, $P=0.001$) and 27% (heterogeneity: $I^2=99.9\%$, $P=0.001$), respectively. Finally, 32% of women in our study had polypica (Figure 3).

Subgroup Analysis – Year of Study

In this analysis, 21 studies were related to before 2015, and

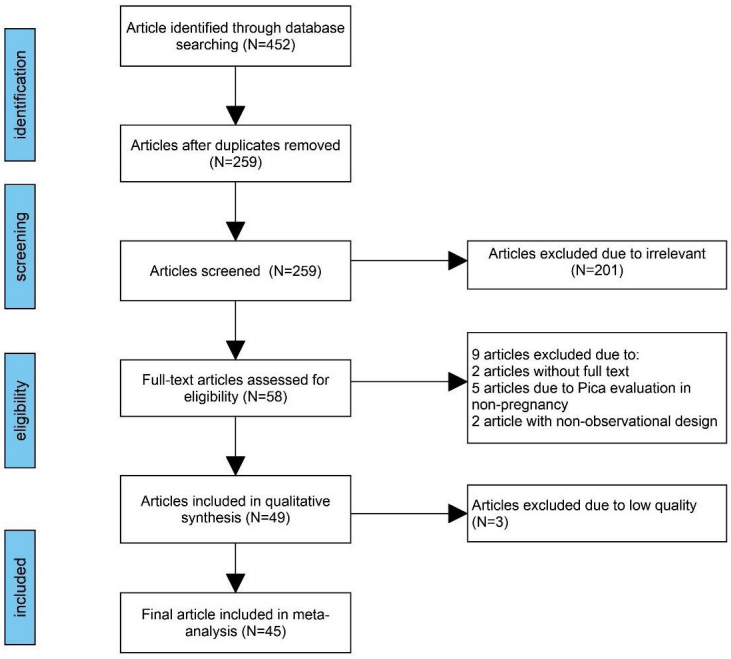

Figure 1. The Flowchart of the Study.

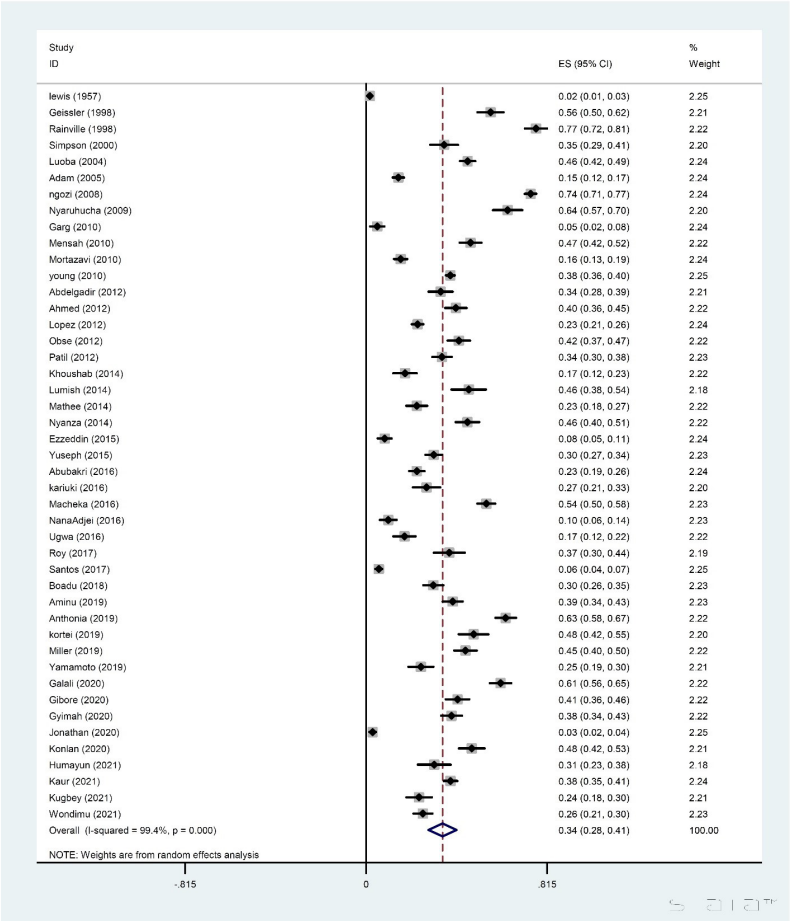

Figure 2. The Global Prevalence of Pica in Pregnancy.

Table 1. Checklist of Articles Related to Pica Prevalence in Pregnancy

Author (year)	Country	Study Design		Sample Size	Prevalence	Score of Quality	References
		Cross-sectional	Cohort				
Lumish (2014)	United States		*	158	46%	6	(16)
Khoushabi (2014)	Iran		*	200	17.5%	6	(26)
Rainville (1998)	United States		*	281	76.5%	5	(33)
Mortazavi (2010)	Iran	*		560	15.5%	8	(24)
Konlan (2020)	Ghana	*		286	47.5%	6	(10)
Nana Adj (2016)	Ghana	*		265	10%	6	(34)
Young (2010)	Tanzania	*		2368	37.9%	8	(3)
Miller (2019)	Africa		*	371	45%	6	(1)
Mensah (2010)	Africa	*		400	47%	9	(35)
Roy (2017)	United States	*		187	37.6%	5	(20)
Santos (2017)	Brazil	*		913	5.7%	6	(13)
Ahmed (2012)	Sudan	*		396	40.5%	5	(36)
Geissler (1998)	Africa	*		275	56%	5	(37)
Patil (2012)	Tanzania	*		457	34%	6	(38)
Luoba (2004)	Kenya		*	827	45.7%	5	(39)
López (2012)	Argentine	*		1014	23.2%	7	(23)
Ezzeddin (2016)	Iran	*		300	8.33%	9	(25)
Ngozi (2008)	Kenya	*		1071	24.8%	6	(14)
Aminu (2019)	Nigeria		*	452	38.9%	6	(40)
Kariuki (2016)	Kenya	*		202	27.4%	6	(22)
Nyaruhucha (2009)	Tanzania	*		204	63.7%	5	(41)
Yamamoto (2019)	Tanzania	*		227	24.7%	5	(21)
Ugwa (2016)	Nigeria	*		220	17%	6	(42)
Kugbey (2021)	Ghana	*		214	23.8%	7	(43)
Macheka (2016)	Africa	*		597	54%	6	(44)
Mathee (2014)	Africa	*		307	22.8%	7	(45)
Adam(2005)	Africa		*	744	14.5%	6	(46)
Abdelgadir (2012)	Sudan	*		292	33.5%	5	(47)
Abubakri (2016)	Africa	*		578	22.8%	8	(48)
Kortei (2019)		*		217	48.4%	7	(5)
Anthonia (2019)	Africa	*		420	62.8%	8	(19)
Gyimah (2020)	Africa		*	416	38.5%	6	(49)
Obse (2012)	Africa	*		374	41.7%	6	(50)
Nyanza (2014)	Tanzania	*		340	45.6%	5	(51)
Garg (2010)		*		180	5%	5	(52)
Humayun (2021)	Pakistan	*		150	30.6%	6	(53)
Gibore (2020)	Africa	*		338	41.1%	8	(54)
Jonathan (2020)	America		*	547	2.9%	5	(55)
Kaur (2021)	India	*		1000	38%	5	(56)
Simpson (2000)	America	*		225	35%	6	(57)
Posner (1957)	America		*	600	1.6%	5	(32)
Wondimu (2021)	Africa	*		407	25.5%	8	(58)
Yoseph (2015)	Africa	*		605	30.5%	8	(59)
Galali (2020)	Iran	*		400	60.5%	7	(17)
Boadu (2018)	Africa	*		400	30.2%	6	(60)

Table 2. Sensitivity Analysis for Prevalence Over 0.70

Study	Effect Size	95% CI		% Weight	References
Posner (1957)	0.017	0.006	0.027	2.36	(32)
Geissler (1998)	0.56	0.501	0.619	2.31	(37)
Simpson (2000)	0.351	0.289	0.413	2.3	(57)
Luoba (2004)	0.457	0.423	0.491	2.35	(39)
Adam (2005)	0.145	0.12	0.17	2.35	(46)
Nyaruhucha (2009)	0.637	0.571	0.703	2.29	(41)
Garg (2010)	0.05	0.018	0.082	2.35	(52)
Mensah (2010)	0.47	0.421	0.519	2.32	(35)
Mortazavi (2010)	0.155	0.125	0.185	2.35	(24)
Young (2010)	0.379	0.359	0.399	2.36	(3)
Abdelgadir (2012)	0.336	0.281	0.39	2.31	(47)
Ahmed (2012)	0.404	0.356	0.452	2.32	(36)
López (2012)	0.232	0.206	0.258	2.35	(23)
Obse (2012)	0.417	0.367	0.467	2.32	(50)
Patil (2012)	0.341	0.298	0.385	2.33	(38)
Khoushab (2014)	0.175	0.122	0.228	2.32	(26)
Lumish (2014)	0.462	0.384	0.54	2.26	(16)
Mathee (2014)	0.228	0.181	0.275	2.33	(45)
Nyanza (2014)	0.456	0.403	0.509	2.32	(51)
Ezzeddin (2015)	0.083	0.052	0.115	2.35	(25)
Yuseph (2015)	0.304	0.267	0.341	2.34	(59)
Abubakri (2016)	0.228	0.194	0.263	2.34	(48)
kariuki (2016)	0.272	0.211	0.334	2.3	(22)
Macheka (2016)	0.541	0.501	0.581	2.34	(44)
NanaAdjei (2016)	0.1	0.062	0.137	2.34	(34)
Ugwa (2016)	0.173	0.123	0.223	2.32	(42)
Roy (2017)	0.374	0.305	0.444	2.28	(20)
Santos (2017)	0.057	0.042	0.072	2.36	(20)
Boadu (2018)	0.303	0.257	0.348	2.33	(13)
Aminu (2019)	0.389	0.344	0.434	2.33	(60)
Anthonia (2019)	0.629	0.582	0.675	2.33	(40)
kortei (2019)	0.484	0.417	0.55	2.29	(19)
Miller (2019)	0.447	0.397	0.498	2.32	(5)
Yamamoto (2019)	0.247	0.191	0.303	2.31	(1)
Galali (2020)	0.605	0.557	0.653	2.33	(21)
Gibore (2020)	0.411	0.359	0.464	2.32	(17)
Gyimah (2020)	0.385	0.338	0.431	2.33	(54)
Jonathan (2020)	0.029	0.015	0.043	2.36	(49)
Konlan (2020)	0.476	0.418	0.533	2.31	(55)
Humayun (2021)	0.307	0.233	0.38	2.27	(10)
Kaur (2021)	0.38	0.35	0.41	2.35	(53)
Kugbey (2021)	0.238	0.181	0.295	2.31	(56)
Wondimu (2021)	0.256	0.213	0.298	2.33	(43)
D+L pooled effect sizes[a]	0.324	0.269	0.38	100	

[a] DerSimonian-Laird (D+L) is the simplest and most commonly used method for fitting the random effects model for meta-analysis (61).

Table 3. Sensitivity Analysis for Prevalence Less Than 0.06

Study	Effect Size	95% CI		% Weight	References
Geissler (1998)	0.56	0.501	0.619	2.36	(37)
Rainville (1998)	0.765	0.716	0.815	2.38	(33)
Simpson (2000)	0.351	0.289	0.413	2.36	(57)
Luoba (2004)	0.457	0.423	0.491	2.4	(39)
Adam (2005)	0.145	0.12	0.17	2.41	(46)
ngozi (2008)	0.74	0.714	0.767	2.41	(14)
Nyaruhucha (2009)	0.637	0.571	0.703	2.35	(41)
Mensah (2010)	0.47	0.421	0.519	2.38	(35)
Mortazavi (2010)	0.155	0.125	0.185	2.4	(24)
Young (2010)	0.379	0.359	0.399	2.41	(3)
Abdelgadir (2012)	0.336	0.281	0.39	2.37	(47)
Ahmed (2012)	0.404	0.356	0.452	2.38	(36)
López (2012)	0.232	0.206	0.258	2.41	(23)
Obse (2012)	0.417	0.367	0.467	2.38	(50)
Patil (2012)	0.341	0.298	0.385	2.39	(38)
Khoushab (2014)	0.175	0.122	0.228	2.37	(26)
Lumish (2014)	0.462	0.384	0.54	2.33	(16)
Mathee (2014)	0.228	0.181	0.275	2.38	(45)
Nyanza (2014)	0.456	0.403	0.509	2.37	(51)
Ezzeddin (2015)	0.083	0.052	0.115	2.4	(25)
Yuseph (2015)	0.304	0.267	0.341	2.4	(59)
Abubakri (2016)	0.228	0.194	0.263	2.4	(48)
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Ugwa (2016)	0.173	0.123	0.223	2.38	(42)
Roy (2017)	0.374	0.305	0.444	2.34	(20)
Santos (2017)	0.057	0.042	0.072	2.42	(13)
Boadu (2018)	0.303	0.257	0.348	2.39	(60)
Aminu (2019)	0.389	0.344	0.434	2.39	(40)
Anthonia (2019)	0.629	0.582	0.675	2.38	(19)
kortei (2019)	0.484	0.417	0.55	2.35	(5)
Miller (2019)	0.447	0.397	0.498	2.38	(1)
Yamamoto (2019)	0.247	0.191	0.303	2.37	(21)
Galali (2020)	0.605	0.557	0.653	2.38	(17)
Gibore (2020)	0.411	0.359	0.464	2.38	(54)
Gyimah (2020)	0.385	0.338	0.431	2.38	(49)
Konlan (2020)	0.476	0.418	0.533	2.37	(10)
Humayun (2021)	0.307	0.233	0.38	2.33	(53)
Kaur (2021)	0.38	0.35	0.41	2.4	(56)
Kugbey (2021)	0.238	0.181	0.295	2.37	(43)
Wondimu (2021)	0.256	0.213	0.298	2.39	(43)
D+L pooled effect size	0.366	0.306	0.427	100	

24 studies were related to 2015 and beyond. The pooled prevalence before 2015 was 37% (heterogeneity: $I^2 = 99.6\%$, $P = 0.001$) and after 2015 was 32% (heterogeneity: $I^2 = 99.2\%$, $P = 0.001$) (Figure 4).

Subgroup Analysis – Marital Status

Five studies examined the prevalence of pica in pregnancy based on marital status. In this study, the pooled prevalence of both married and single was 41%. The heterogeneity of studies related to married women was $I^2 = 97.2\%$, $P = 0.001$ and the heterogeneity of studies related to single women was $I^2 = 98.1\%$, $P = 0.001$ (Figure 5).

Subgroup Analysis – the Place of Residence

Five studies examined the prevalence in urban areas, and four studies examined the prevalence in rural areas. Random effect results showed a pooled prevalence of 47% and 54%, respectively. I2 test values show high heterogeneity ($I^2 = 87.6\%$, $P = 0.001$ and $I^2 = 88\%$, $P = 0.001$) (Figure 6).

Subgroup Analysis – Education Level

In this analysis, the level of education includes two categories up to primary school and higher than primary school. The overall prevalence in the first category was 40% (heterogeneity: $I^2 = 93.3\%$, $P = 0.001$) and in the second category was 39% (heterogeneity: $I^2 = 96.9\%$, $P = 0.001$). Three studies were discarded because of non-compliance (25,33,34) (Figure 7).

Subgroup Analysis – Age

In this study, the age of women includes two classes under 30 years and over 30 years. The pooled prevalence was 37% (95% CI: 20%-54%) In women under 30 years and 31% (95% CI: 11%-51%) In women over 30 years. The heterogeneity index of the studies was $I^2 = 97.3\%$, $P = 0.001$ and $I^2 = 97.9\%$, $P = 0.0011$ respectively (Figure 8).

Subgroup Analysi s– Employment Status

In this analysis, employment status includes two categories of employed and non-employed. The pooled prevalence in four studies with employed women was 29% (95% CI: 3%-55%) and in three studies with unemployed women was 39% (95% CI: -6-84%). The heterogeneity index of the studies was $I^2 = 98.4\%$, $P = 0.001$ and $I^2 = 99.4\%$, $P = 0.001$, respectively (Figure 9).

Subgroup Analysis – a Geographical Region

This study covers regions such as Africa, the Americas, and Asia. The overall prevalence in African countries

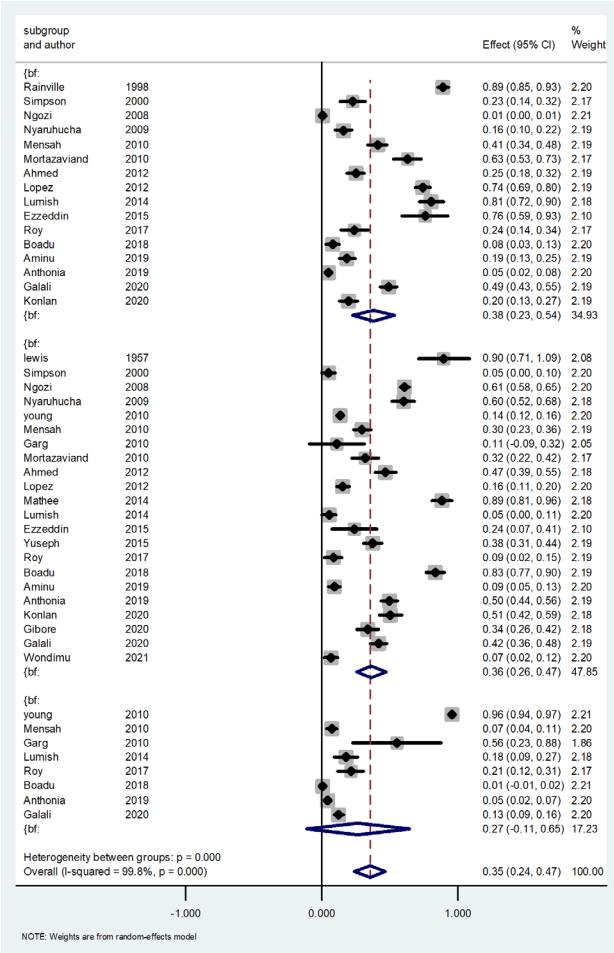

Figure 3. The Pooled Prevalence of Pica in Pregnancy (Pica Type).

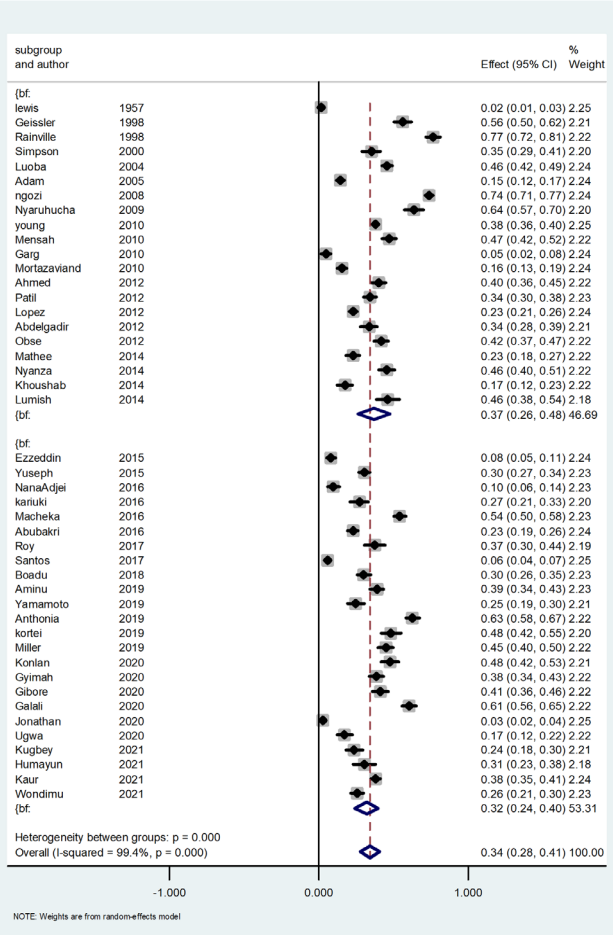

Figure 4. The Pooled Prevalence of Pica in Pregnancy (Year of Study).

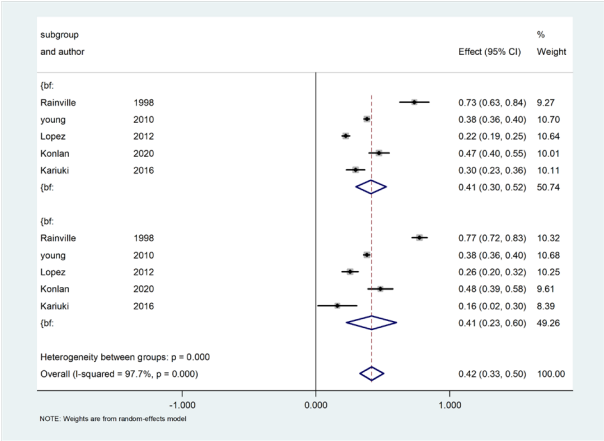

Figure 5. The Pooled Prevalence of Pica in Pregnancy (Marital Status).

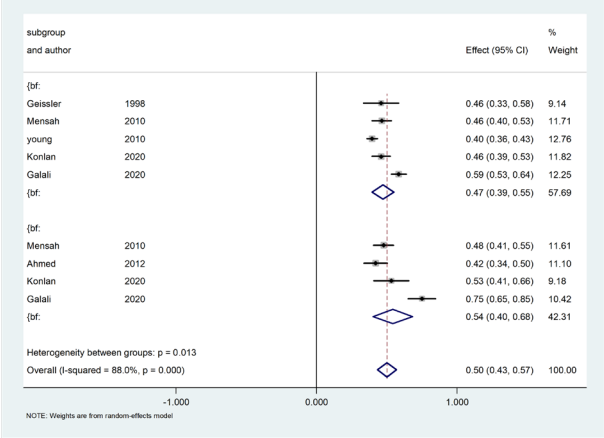

Figure 6. The Pooled Prevalence of Pica in Pregnancy (Place of Residence).

is 38% ($I^2=98.5$, $P=0.001$), American 32% ($I^2=99.5$, $P=0.001$), and Asian 28% ($I^2=98.9$, $P=0.001$) (Figure 10).

Subgroup analysis – Trimester of Pregnancy

The total prevalence of pica in the first trimester of pregnancy (0-14 weekly) is 41% ($I^2=99.2\%$, $P=0.001$), in the second trimester of pregnancy (14-28 weekly) 19% ($I^2=98.6\%$, $P=0.001$), and the third trimester of pregnancy (Over 28 weeks) 17% ($I^2=98.8\%$, $P=0.001$) (Figure 11).

Subgroup Analysis – Parity

The pooled prevalence in the seven studies related to nulliparous women (women without a history of childbirth) was 32% (95% CI: 17%-47%). The pooled prevalence in the four studies related to multiparous women (women with a history of childbirth) was 34% (95% CI: 5%-63%). The heterogeneity of each category was significant ($I^2=97.5\%$, $P=0.001$ and $I^2=98.7\%$, $P=0.001$) (Figure 12).

Discussion

Pica during pregnancy is a health problem worldwide.

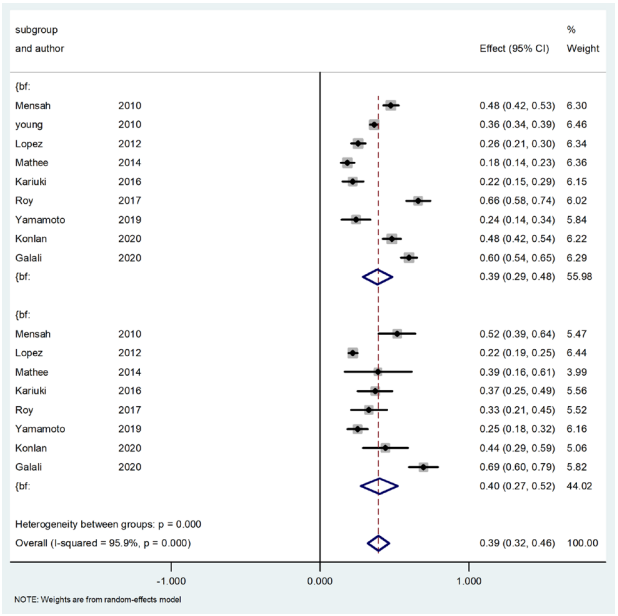

Figure 7. The Pooled Prevalence of Pica in Pregnancy (Educational Status).

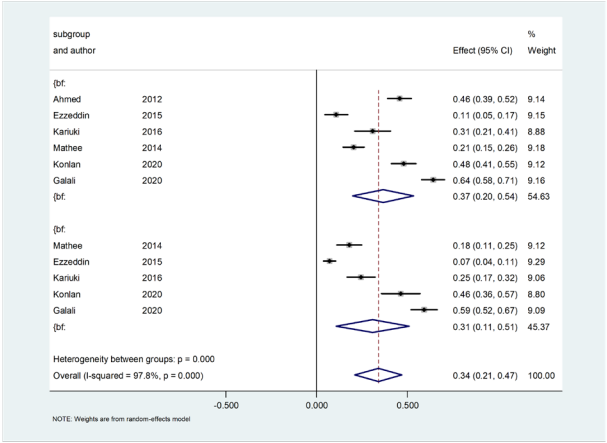

Figure 8. The Pooled Prevalence of Pica in Pregnancy (Women's Age).

Because on the one hand, Pica prevents the delivery of micronutrients to the mother by disturbing the nutritional balance, and on the other hand, it causes problems for the mother and child because of the consumption of harmful substances (62).

In this review, the global prevalence of pica in pregnancy was 34%. This amount is higher than the overall prevalence of the Fawcett study (27.8%) (28). Also, the total prevalence of pica and geophagy is higher than amylophagy. These results were similar to the results of the other eight studies (17,22,33,35,36,63,64) and different from the results of the other three studies ((32,65,66). The pleasant appearance and smell of soil-derived materials are the reason for the greater prevalence of geophagy. Yang's study hypothesizes that higher consumption of geophagy is because of its palliative effect on gastrointestinal disorders such as gastric reflux, which is more common in pregnancy (65). There is also a close relationship between pagophagia and

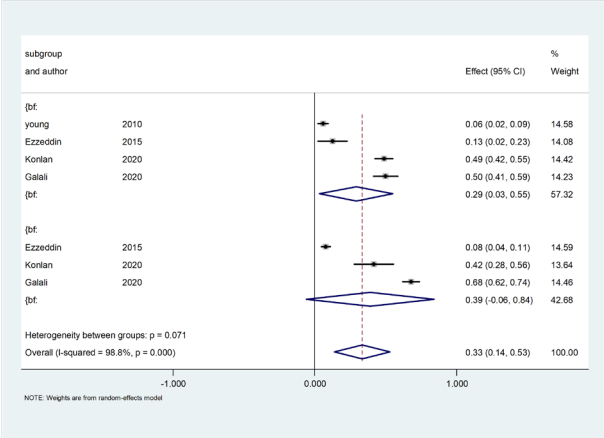

Figure 9. The Pooled Prevalence of Pica in Pregnancy (Employment Status).

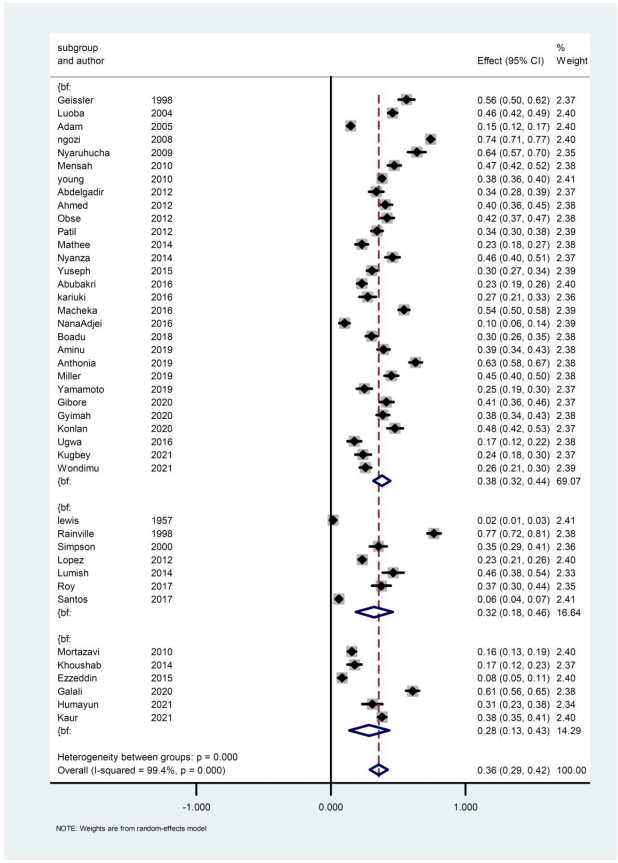

Figure 10. The Pooled Prevalence of Pica in Pregnancy (Geographical Region).

anemia, which is a risk factor for Pica behavior (25).

However, the pooled prevalence of pica in pregnancy has decreased since 2015. Mathee and colleagues' study showed similar findings (45). One possible reason is that most post-2015 studies are in African countries where non-nutritious consumption is traditionally and culturally acceptable, so the pica report in these countries is less-than reality. Pica, on the other hand, is a protected social behavior that women refuse to express to avoid criticism from others (28,45). These reasons justify the

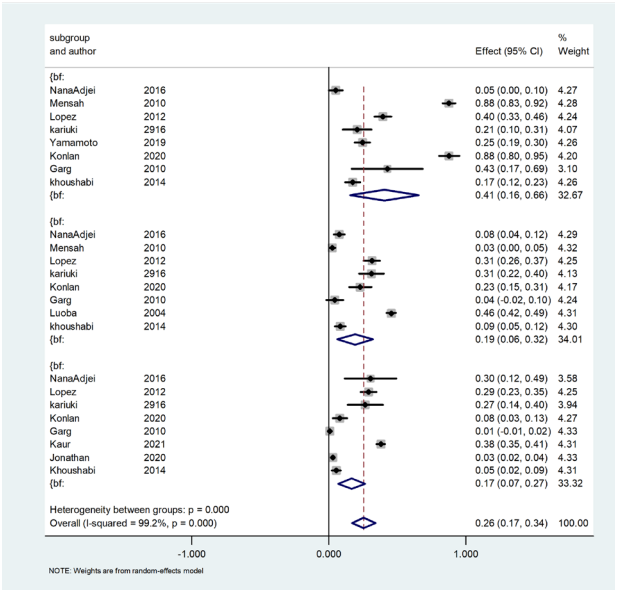

Figure 11. The Pooled Prevalence of Pica in Pregnancy (Trimester of Pregnancy).

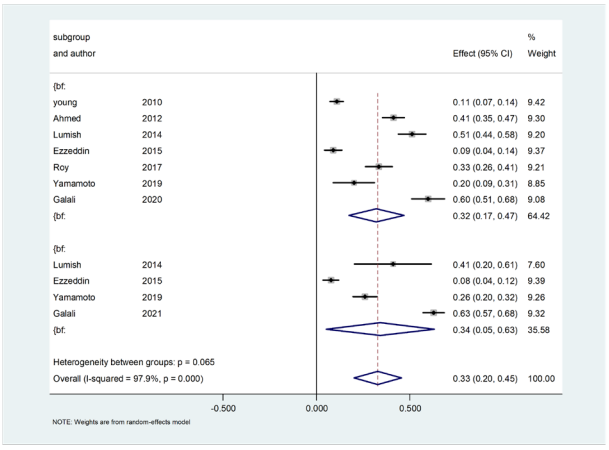

Figure 12. The Pooled Prevalence of Pica in Pregnancy (Parity).

lower prevalence of pica after 2015.

Education, empowerment (financial, educational, social, etc), and distribution of dietary supplements reduce pica in women (10,25,67). Therefore, it is recommended to implement educational programs, empower women and distribute nutritional supplements during pregnancy.

The pooled prevalence was the same in married and single women. This finding was similar to the results of Yang's study (65) and different from the findings of the previous four studies (10,22,23,33).

According to this study, the overall prevalence of pica was higher in rural than in urban women. Three studies have shown the same results (10,17,35). Rural communities are likely to be in a lower position in terms of social statuses, such as education level and poverty, which, according to studies, these factors have a positive effect on Pica practice (68).

The results showed that the prevalence of pica was

higher in women with primary education. Our results were similar to the findings of five studies (17,21,22,35,45) and different from the findings of three studies (10,20,23). In educated women, due to high health literacy, consumption of non-nutrient is less (10).

According to the findings, the prevalence of pica is higher in women under 30 years of age. Five studies showed the same results (10,17,22,25,45). Because young women are probably still growing, their bodies need more iron. Studies show that there is a positive association between iron deficiency and pica (16).

Also, the overall prevalence of pica is higher in unemployed women than in employed women. These findings were matched to the results of the Galali study (17) and contradict the findings of the previous two studies (24,25). Unemployed people are at a lower level in terms of social status, and according to Khosravizadegan and colleagues' study, pica is more common in people with low social classes (69).

The prevalence of pica in Asian countries was lower than the global average. Because more than half of the articles in this meta-analysis are related to African countries with high poverty and malnutrition, Asian studies in this meta-analysis are related to developing countries that have provided good supplements and diet plans for pregnant women (70). Another reason is the high level of education of Asian women. For example, in one Asian study, 76% of women had an academic education (25). Higher education is associated with increased awareness of the negative consequences of pica. These women also report less pica behavior due to shame (28).

According to this meta-analysis, the highest prevalence of pica was in the first trimester of pregnancy. These findings are similar to the results of the other six studies (10,17,23-25,71) and contradictory to the findings of the Geissler et al study (37). Higher levels of human chorionic gonadotropin in the first trimester of pregnancy lead to an increase in the prevalence of pica. An increase in this hormone causes pregnancy nausea and vomiting and changes in the sense of smell and taste (41,72). Therefore, women are more inclined to eat non-nutritious foods to relieve nausea during pregnancy and because of the pleasant and excellent smell of non-nutrient (10).

According to this meta-analysis, the highest prevalence of pica was in multiparous women. These findings are similar to the results of the previous two studies (17,21) and contradictory to the findings of the three studies (16,22,25).

Although pica is present in all communities, its prevalence has decreased since 2015. A possible reason is the lack of reporting and cultural and ethnic traditions. It is suggested that the effects of these factors be investigated in future studies.

Strengths and Limitations

Use of studies published in recent years, assessment of the prevalence of pica in subgroups (based on marital status, place of residence, level of education, age, geographical area, trimester of pregnancy, and parity), use high-quality studies in the meta-analysis, and evaluation of publication bias of studies (Begg test and sensitivity analysis) were the strengths of this study.

The most important limitation was the lack of a valid scale for Pica evaluation. It is suggested that a scale be developed in future studies to evaluate pica. Another limitation of this study is the plurality of studies in African countries whose high poverty and specific culture affect the prevalence of pica in pregnancy. Another limitation is the lack of quality studies in European countries. Therefore, the results should be generalized with caution.

Conclusions

According to the current meta-analysis, the prevalence of pica in pregnancy was 34%. Given the scattering of studies worldwide, the results of this study are acceptable. Also, the meta-analysis findings support a decrease in the prevalence of pica after 2015. These rates were higher for married women, rural women, less educated women, younger women, unemployed women, African women, women in the first trimester, and multiparous women. Therefore, the development of screening programs and training for these high-risk groups can reduce the prevalence of pica.

Authors' Contribution

SHSA and AAF were responsible for all stages of literature search and extraction. MRMS did the analysis. SHSA prepared the initial draft of the article. The comments of the other two authors were applied in the final draft. The final version was read and confirmed by all 3 people.

Conflict of Interests

Authors declare that they have no conflict of interests.

Ethical Issues

This study was approved by the ethical committee of Shahroud University of Medical Sciences (No. IR.SHMU.REC.1400.184).

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