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REVIEW

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Food taboo practices and associated factors among pregnant women in Sub-Sahara Africa: a systematic review and meta-analysis

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Abstract

Background Even though maternal nutrition has improved, food taboos and poor dietary practices during pregnancy can still lead to nutrient deficiencies, increasing the risk of complications for both mothers and children. Therefore, this study aimed to generate pooled evidence from across different countries in Sub-Saharan Africa to inform effective prevention actions. This meta-analysis aims to determine the pooled prevalence of food taboo practices and identify associated factors among pregnant women in Sub-Saharan Africa.

Methods This study systematically reviewed relevant articles and reports from databases including Embase, MEDLINE, Science Direct, PubMed, Google, and Google Scholar. The Newcastle–Ottawa Scale assessed article quality. Data extraction and analysis were done using Excel and STATA 17, respectively. Heterogeneity was assessed using Cochran's Q test and the I^2 statistic, with a random effects model employed for meta-analysis. Publication bias was evaluated and addressed using Duval and Tweedie's Trim and Fill analysis.

Results A total of fifty-eight studies with 20,262 pregnant women were included in this meta-analysis. The pooled proportion of food taboo practices reported by the 58 studies was 41% (95% CI: 34, 48%). In the subgroup analysis, the pooled proportion of food taboo practices for studies conducted in urban areas was 40% (95% CI: 32, 48%), while it was 43% (95% CI: 32, 56%) among rural residents. Factors associated with food taboo practices among pregnant women included being unable to read and write (AOR = 2.64%; 95% CI: 1.79–3.90; $I^2 = 56.9\%$), not receiving antenatal care follow-up (AOR = 3.73%; 95% CI: 2.83–3.90; $I^2 = 55.1\%$), and poor maternal nutrition knowledge (AOR = 3.33%; 95% CI: 1.56–7.09; $I^2 = 84.3\%$).

Conclusion According to this review, over two out of every five pregnant mothers practiced food taboos in the region. The educational status of the mother, antenatal care follow-up, and maternal nutrition knowledge were factors affecting food taboo practices among pregnant women. Therefore, emphasis should be given to the uptake of antenatal care follow-up to improve maternal nutrition knowledge and nutritional status.

Keywords Food taboo, Pregnant women, Sub Saharan Africa

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Introduction

Ensuring access to affordable, safe, nutritious, and sustainable food systems alongside essential healthcare services is a fundamental cornerstone for improving the survival, health, and well-being of pregnant women and their offspring [1–4]. Pregnancy demands increased nutrient requirements to support the physiological changes occurring in the mother, including tissue

growth, metabolic adaptations, and fetal development [5, 6]. However, maternal undernutrition remains a significant challenge, particularly in low- and middle-income countries [7].

Globally, malnutrition, including underweight, short stature, and anemia, affects millions of women, particularly during pregnancy. Globally, more than 1 billion adolescents and women suffer from at least one form of malnutrition, and two in three also suffer from essential vitamin and mineral deficiencies [8]. Close to 170 million women (9.1%) are underweight, 520 million (32.8%) are affected by anemia, and 7% have short stature [7, 9, 10]. While the impact of malnutrition has been reduced, there is still regional variation, especially in undernutrition. The highest prevalence is observed in South Asia, low-income women from other countries, and Sub-Saharan Africa [7].

Anemia, pre-eclampsia, hemorrhage, and death in mothers, as well as stillbirth, low birth weight, wasting, and developmental delays in neonates and infants, are the implications of maternal undernutrition [11–13]. Maternal malnutrition is a serious issue with devastating consequences. Every day, about 800 mothers die from preventable causes related to pregnancy and childbirth, and each year, this contributes to the deaths of 800,000 newborns [11, 14]. Furthermore, maternal malnutrition increases the risk of women dying from preeclampsia and postpartum hemorrhage. The burden of maternal mortality is particularly high in Sub-Saharan Africa, where it accounts for nearly 70% of global maternal deaths, a rate 136 times higher than in developed countries [15]. Deficiencies in folate early in pregnancy can also lead to neural tube defects in infants. As a result, globally, 20.5 million (14.6%) of neonates are born with low birthweight [10].

Several factors contribute to this problem. Many women lack access to nutrition services or cannot afford nutrient-rich foods due to their high cost [16, 17]. Furthermore, cultural beliefs, traditional practices, and food taboos often hinder optimal nutrition during pregnancy [18]. Gender bias, racial discrimination, and socioeconomic inequalities also contribute to food taboos and security among pregnant women [19]. These factors can lead to nutrient deficiencies, increasing the risk of complications for both mothers and children [20].

Malnutrition in pregnant women is highly influenced by cultural beliefs and practices, particularly regarding the relationship between food and fetal health. This is often a taboo topic, and it prevents many pregnant women, especially those living in low-resource regions like Sub-Saharan Africa, from accessing and consuming the available food [21]. As a result, the effect of high practice of food taboo resulted in a high prevalence of all forms of malnutrition for mothers and foetal. In Sub-Saharan Africa, there are unclear variations in reports and studies among different studies in the region, which range from 8 [22] to 97.3% [23]. In the study area, there is inconsistent evidence of food taboo prevalence, ranging from 8 [22] to 97.3% [23] among pregnant women. The findings from these studies revealed notable variation and inconsistency in the prevalence of food taboos in the areas. These uncertainties and inconsistency of findings across regions make it difficult for policymakers to make decisions based on such studies.

It is essential to assess the overall prevalence of food taboo practices and their associated factors among pregnant women in the region. Hence, this study aims to estimate the overall prevalence of food taboos and its associated factors among pregnant women in Sub-Saharan African countries. The results of the study will serve to generate summarized and pooled evidence on food taboo practices among pregnant women in the region. This review also contributes to reducing health disparities, informing policy, and promoting healthier diets for the most vulnerable populations, including pregnant women. The information obtained from this project will also be paramount in reviewing national and subnational food taboo practices related to food and nutrition indicators and utilizing this information for decision-making.

Methods

This systematic review and meta-analysis was conducted according to the reporting items for systematic reviews and meta-analyses (PRISMA-2020) statement [24]. We searched for studies on food taboo practices and the factors affecting the interest in the outcomes. We systematically reviewed the literature to appraise the epidemiological evidence and estimated the status of food taboo practices in Sub-Saharan Africa. The protocol was registered on PROSPERO international database with registration number of CRD42024620384. The Epistemonikos website (http://www.library.ucsf.edu), PubMed, PROSPERO, and the Cochrane Library were explored to confirm whether previous systematic reviews or meta-analyses exist on food taboo practices.

Data sources and search strategies

Countries in Sub-Saharan Africa were the source of the data for this review. A systematic and comprehensive search was used for both published and unpublished articles and studies written in English. Embase, MEDLINE, Science Direct, PubMed, Google, and Google Scholar, as well as other relevant databases, were used to search for relevant articles and reports from March 5, 2024, to July 16, 2024. Furthermore, snowballing and reference

retrieval methods were used to find more relevant studies.

The search strategy used in all databases was as follows: ((((Food taboos [Title/Abstract]) OR (food restriction [Title/Abstract])) OR (food superstition [Title/Abstract])) OR (food avoidance [Title/Abstract])) OR (food craving [Title/Abstract])) AND ((pregnant women [Title/Abstract]) OR (pregnant mother [Title/Abstract]))) AND ((((Sub Saharan Africa [Title/Abstract]) OR (Sub Saharan region [Title/Abstract])) OR (subsaharan Africa [Title/Abstract])). The review included only observational studies published between 1985 and 2024, focusing on human subjects and English-language publications.

Inclusion criteria and exclusion criteria: All types of observational study designs with appropriate methodology that assess the prevalence of food taboos and their risk factors among pregnant women were included in the study, whereas studies that did not have full-text access, did not report outcome measurements, reviews, commentaries, citations without abstract, editorials, and were not written in English were excluded. Additionally, qualitative studies were excluded.

Outcome of interest

The objective of this systematic review and meta-analysis was to estimate the prevalence of food taboo practices among pregnant women in Sub-Saharan Africa and identify factors associated with this prevalence. The first outcome, the pooled prevalence of food taboo practices, was estimated by dividing the number of pregnant women who practiced food taboos by the total number of study participants and multiplying by 100. In addition, odds ratios were calculated based on the binary outcome in the studies. The educational status of pregnant women, antenatal care (ANC) follow-up, and maternal nutrition knowledge were factors included in the review and analysis of this study.

Data extraction

A standardized data extraction Excel sheet tool was used to extract the data. The screening of titles, abstracts, and full texts, which is a three-stage process, was conducted independently by two review authors (AK & EA) based on these criteria, while BM and AM resolved any discrepancies that occurred between AK and EA, from published and unpublished articles identified through systematic searches of all databases, search engines, and additional reference sources. The primary author, year of publication, country, study settings, sample size, residence, food taboo, and factors affecting food taboo, along with a 2×2 table (a, b, c, and d), were considered during the data extraction process.

A total of eligible studies were imported into EndNote version 7.0.2, and duplicate studies were removed. Two independent reviewers participated in the review process, taking into account the title, abstract, and full text of the articles; primary author; year of publication; country; study settings; sample size; residence; food taboo; and factors affecting food taboo, along with their corresponding 95% confidence intervals.

Quality assessment

The selection of articles was based on a standardized critical appraisal instrument adapted from the risk of bias tool developed by Hoy et al. [25]. The risk bias tool has a total of 9 items, with a maximum score of 9 and a minimum score of 0. Then, the overall risk bias of each study was assessed using the following scoring algorithms: a score of 7 points or higher was considered good, 2 to 6 points were considered fair, and a score of 1 point or lower was considered poor quality. To ensure the validity of the systematic review results, only primary studies rated as fair to good quality were included. This approach aimed to enhance the reliability and accuracy of the findings. Additionally, the Meta-analysis of Observational Studies in Epidemiology (MOOSE) statement was used to report the review's findings [26].

Statistical analysis

The extracted data were entered into an Excel sheet and imported into STATA 17 for analysis. The prevalence of food taboo and estimates for risk factors obtained from each study were pooled to determine a single estimate. Prior to analysis, odds ratios were transformed. Publication bias was assessed using visual inspection of funnel plots and Egger's regression test. A Cochran's Q test and inverse variance (I^2) statistic were used to assess heterogeneity between the studies. An I^2 statistic of 25%, 50%, and 75% was considered mild, moderate, and severe heterogeneity, respectively, with a p-value less than 0.05 indicating statistically significant heterogeneity. To evaluate heterogeneity in meta-analyses, a random effects model was employed. Begg's and Egger's tests were used to evaluate publication bias, with a p-value of less than 0.05 serving as the threshold for identifying its presence. A nonparametric Duval and Tweedie's Trim and Fill analysis was performed to manage the publication bias due to the substantial publication bias.

Risk factors obtained from each study were thematically organized, and their effect sizes were pooled accordingly. Sensitivity analyses were conducted for the studies included in the meta-analysis. To clearly present the study inclusion, exclusion, and reasons for exclusion, a diagram following the preferred reporting items for systematic reviews and meta-analyses (PRISMA) statement

was utilized. This ensured transparency and clarity in reporting the systematic review and meta-analysis process.

Results

Study selection and characteristics

A total of 718 articles and unpublished papers were systematically retrieved from electronic databases such as Embase, MEDLINE, Science Direct, PubMed, Google, and Google Scholar, as well as other relevant databases. Of these, 324 were excluded due to duplication. After reading titles, abstracts, and full texts, 157 articles were removed as they were not relevant to our review. Among the 108 full-text articles accessed and evaluated, 50 were excluded due to not reporting the outcome variables or factors associated with food taboo, study area, or being qualitative studies. Finally, 58 articles were included in the final review [24] (Fig. 1).

Characteristics of included studies

After assessing all relevant information, including the title, abstract, and full information of the articles, 58 studies were included for final review. Among the included studies, the smallest size was among 60 pregnant mothers in Kenya [27] and 845 pregnant mothers in Ethiopia [28], respectively. A total of 20,262 pregnant women were included in the review, with a mean sample size of 349. The lowest prevalence of food taboo among pregnant women was 8% [22] reported in Ethiopia, and the highest food taboo was 97.3% in Nigeria [23].

A total of 10 countries' studies were eligible for final review. Half of the articles included were from Ethiopia, eleven [11] articles from Nigeria, and four [4] studies each from Kenya, Uganda, and Sudan. About 36 studies were conducted at the facility level, while 22 studies were conducted at the community level. Approximately one-third 18 (31%) of the studies were conducted in urban areas, 24 (41.4%) were in rural areas, and the remaining 12 (20.7%) were in both urban and rural settings (Table 1).

Common restricted food items among studies

Most common food items restricted by pregnant women include meat, honey, milk, salt, eggs, cabbage, cheese, linseed, coffee, tea, porridge, wheat bread, bananas, groundnuts, sugar cane, chili peppers, yogurt, legumes, and cereals. Restricting these foods might result in nutritional deficits that can affect the health of both the mother and fetus, increasing the risk of low birth weight, anemia,

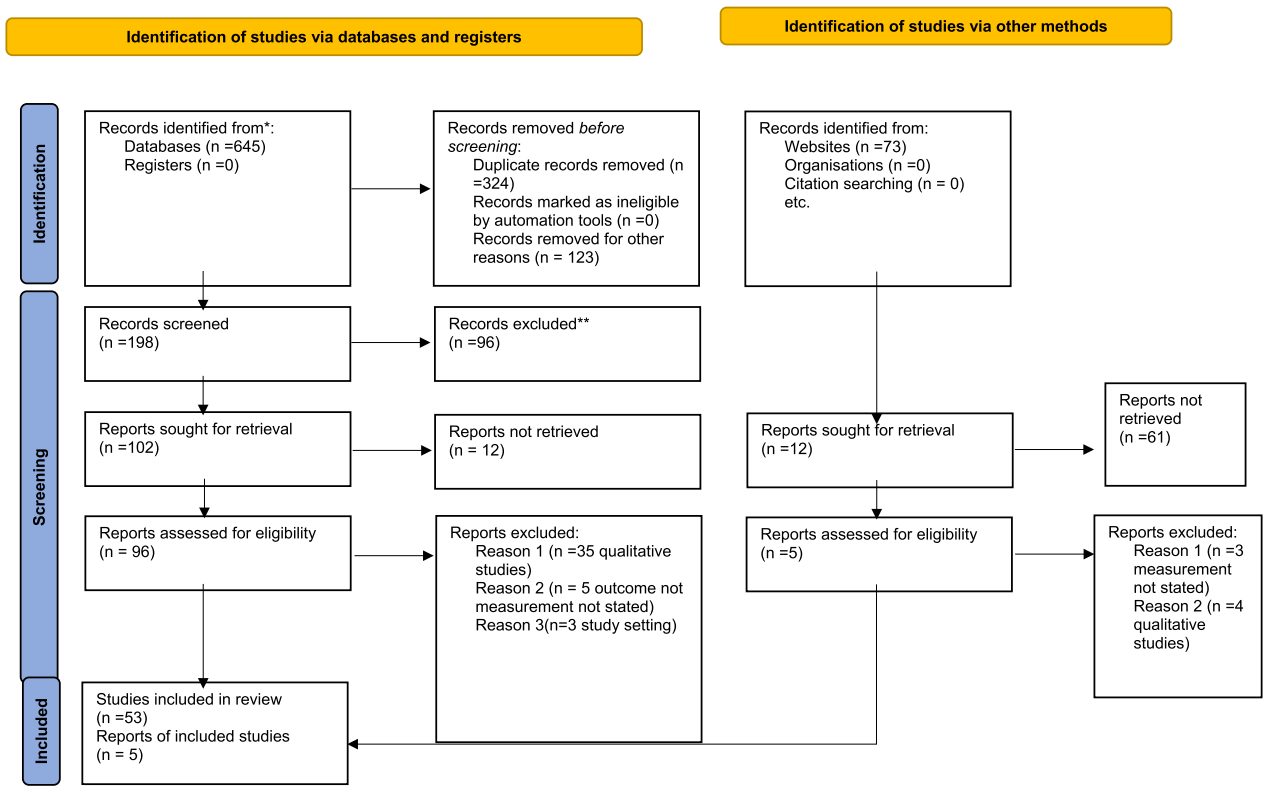

Fig. 1 Flow chart diagram studies included in the systematic review, and meta-analysis using the PRISMA check list

Table 1 Characteristics of included study in systematic review and meta-analysis of studies conducted on food taboo practices among pregnant women in Sub Sahara Africa countries (n = 58), 2024

S. no	Author, year	Country	Study design	Setting	Sample size	Residence	Response rate	Prevalence	NOS result
1	Amare et al.,2019	Ethiopia	Cross sectional	Community	422	rural	98.6	34	8
2	Mohammed et al.,2019	Ethiopia	Case control	Facility	592	Urban	100	18.2	9
3	Riang'a et al., 2017	Kenya	Cross sectional	Facility	154	rural	100	60	8
4	Namakau et al., 2015	Zambia	Cross sectional	Facility	294	rural	100	37.76	9
5	Kuzma et al.,2013	P.Guine	Cross sectional	Community	176	rural	100	28.97	5
6	Demissie et al., 1998	Ethiopia	Cross sectional	Facility	295	Urban/rural	100	27.1	6
7	Getnet et al.,2018	Ethiopia	Cross sectional	Facility	307	Urban/rural	100	27	7
8	Zinab et al.,2019	Ethiopia	Cross sectional	Facility	276	Urban/rural	96	34.7	6
9	Walters et al.,2019	Malawi	Cross sectional	facility	62	Urban	100	35	5
10	Tahir et al.,2019	Sudan	Cross sectional	Facility	331	Urban	100	43.8	6
11	Tesfaye et al.,2022	Ethiopia	Cross sectional	Community	680	rural	98	37	8
12	Hailu et al., 2023	Ethiopia	Cross sectional	Community	624	Rural	100	8	8
13	Tela et al., 2020	Ethiopia	Cross sectional	Facility	332	Urban	100	12	7
14	Abere et al., 2023	Ethiopia	Cross sectional	Facility	421	Urban	100	27.5	8
15	Wondimu et al.,2021	Ethiopia	Cross sectional	Community	422	rural	96.45	55.5	8
16	Diro et al.,2023	Ethiopia	Cross sectional	Community	513	rural	98	26.33	8
17	Agustino et al.,2014	Kenya	Cross sectional	Community	374	rural	98.66	71.5	7
18	Mengi et al.,2022	Ethiopia	Cross sectional	Community	636	rural	95.97	67.4	9
19	Kayma et al.,2016	Ethiopia	Cross sectional	Facility	283	Urban/rural	95.8	39.9	6
20	Muchima et al., 2023	Malawi	Cross sectional	Facility	90	Urban	100	32.7	8
21	Zepro et al., 2021	Ethiopia	Cross sectional	Facility	295	Urban/rural	100	49.8	7
22	Tugume et al.,2023	Uganda	Cross sectional	Community	489	Urban/rural	100	40	7
23	Zenebe et al.,2016	Ethiopia	Cross sectional	Facility	355	Urban	100	25.6	6
24	Ekwochi et al., 2016	Nigeria	Cross sectional	Facility	149	Urban	100	37	6
25	Gedamu et al., 2016	Ethiopia	Cross sectional	Community	318	rural	100	50.9	7
26	Ebabu et al., 2021	Ethiopia	Cross sectional	Facility	308	Urban	100	32.8	6
27	Melesse et al., 2021	Ethiopia	Cross sectional	Community	845	rural	100	19.2	9
28	Akiso et al., 2024	Ethiopia	Cross sectional	Facility	422	Urban	100	54.5	8
29	Tugume et al., 2024	Uganda	Cross sectional	Community	462	rural	100	27.5	9
30	Chakona et al.,2019	South Africa	Cross sectional	Community	280	rural	100	37	7
31	Sholeye et al., 2014	Nigeria	Cross sectional	Community	720	Urban/rural	100	17.5	7
32	Diko et al., 2020	Ethiopia	Cross sectional	Facility	420	Urban/rural	100	55.2	7
33	Oni et al., 2012	Nigeria	Cross sectional	Community	421	rural	96.2	13.3	6
34	Oluleke et al., 2016	Nigeria	Cross sectional	Facility	530	Urban	100	46.6	7
35	Ekwere et al., 2015	Nigeria	Cross sectional	Facility	121	Urban	100	97.3	5
36	Ramulondi et al.,2021	South Africa	Cross sectional	Community	140	Rural	100	64	6
37	Teshome et al., 2020	Ethiopia	Cross sectional	Facility	276	Urban	100	34.7	6
38	Kayumba et al., 2023	Zambia	Cross sectional	Facility	76	Urban	100	50	6
39	Obiakor-Okeke et al., 2013	Nigeria	Cross sectional	Facility	530	Urban	100	29	8
40	Godwin et al.,2022	Nigeria	Cross sectional	Community	364	Rural	100	67.9	7
41	Maduforo et al.,2010	Nigeria	Cross sectional	Community	100	Rural	100	15	5
42	Teshome et al., 2020	Ethiopia	Case control	Facility	344	Urban	100	32.8	8
43	Florence et al., 2015	Uganda	Cross sectional	Facility	325	Urban/rural	100	9.8	7
44	kheiri et al., 2017	Sudan	Cross sectional	Facility	675	Urban	88.8	33	7
45	Ani et al., 2021	Kenya	Cross sectional	Facility	60	Urban/rural	100	63.3	5
46	Osman et al., 1985	Sudan	Cross sectional	Facility	108	Urban/rural	100	20	5
47	Olatona et al.,2021	Nigeria	Cross sectional	Facility	352	Urban	100	27.1	6
48	Fedha et al., 2013	Kenya	Cross sectional	Facility	109	Rural	81.7	70.8	5
49	Appiah et al., 2019	Ghana	Cross sectional	Facility	120	Urban	83.3	61	6

Table 1 (continued)

S. no	Author, year	Country	Study design	Setting	Sample size	Residence	Response rate	Prevalence	NOS result
50	Chea et al.,2023	Ethiopia	Cross sectional	Community	550	Rural	96	32.45	9
51	Abidoye et al., 1997	Nigeria	Cross sectional	Facility	184	Urban	100	75	6
52	Ogech et al., 2017	Nigeria	Cross sectional	Facility	210	Urban	90.9	82.4	6
53	Koeryaman et al., 2018	Sudan	Cross sectional	Facility	300	Urban/rural	100	93.9	7
54	Tola et al., 2015	Ethiopia	Cross sectional	Community	303	Rural	100	19.1	6
55	Wondmeneh et al., 2022	Ethiopia	Cross sectional	Facility	250	Rural	96.4	37.4	8
56	Yallew et al., 2019	Ethiopia	Cross sectional	Community	505	Rural	98.4	69.2	9
57	Habtamu et al., 2019	Ethiopia	Cross sectional	Community	645	Rural	96.28	13.2	7
58	Udho et al., 2023	Uganda	Cross sectional	Facility	349	Urban	91.7	55.63	8

developmental problems, and other long-term effects on maternal health and birth outcomes.

Meta-analysis

Pooled prevalence of food taboo in Sub-Sahara Africa

Based on a visual forest plot using a random effects model, the pooled prevalence of food taboo among pregnant women in Sub-Saharan Africa was 41% (95% CI: 34–48) (Fig. 2). Heterogeneity was observed across studies, with an I^2 statistic of 99.3% and $P < 0.001$. Therefore, a random effects model was used. As a result, a Der Simonian and Laird random effects model was used to estimate the pooled prevalence of food taboo practices due to the heterogeneity among the included studies (Fig. 2).

Publication Bias: Publication bias was assessed using visual inspection of the funnel plot, which indicated an asymmetrical funnel shape (Fig. 3), suggested publication bias. Egger's test is also used to assess publication bias. The estimated bias coefficient was 7.07 (Egger bias B = 7.07 (95% CI: −1.65–15.80; $p = 0.110$) with a standard error of 4.38. The test thus provides no evidence for the presence of small-study effects (Table 2). Nevertheless, a publication bias was found using Begg's test (p-value = 0.0071). Thus, the Trim and Fill analysis by Duval and Tweedie was carried out (Fig. 4).

Trim and fill analysis: Trim and fill analysis indicated that twenty-five studies were imputed for missing studies, resulting in a total of 83 articles. When publication bias was accounted for, the pooled prevalence of food taboo practices among pregnant women in Sub-Saharan Africa was 23.6% (95% CI 15.8 to 31.3%) (Fig. 4).

Meta regression: Meta-regression was conducted to identify the source of heterogeneity among studies using publication year, country of study, study settings, residence, and sample size. However, none of these categories were significantly associated with food taboo practices among pregnant women in Sub-Saharan Africa.

Subgroup analysis: Subgroup analysis was conducted to compute the prevalence of food taboo practices among pregnant women in the region using publication year, country of study, study settings, residence, and sample size (Table 3). The pooled prevalence of food taboo practices in studies published before 2020, which is 42% (with 95% CI 32, 56), was higher than that of studies published after 2020, with a prevalence of 40% (with 95% CI 32, 44). Studies conducted in countries other than Ethiopia showed a higher pooled prevalence of food taboo practices (47%, 95% CI 36, 56) compared to studies conducted in Ethiopia (41%, 95% CI 35, 48). Residence was another subgroup analysis conducted. Studies conducted in urban areas showed a lower pooled prevalence of food practices (40%, 95% CI 32, 48) compared to rural areas, where 43% (95% CI 32, 56) of pregnant women practiced food taboos.

In addition, the pooled prevalence of food taboo also varied across study settings. Studies conducted at the facility level showed a higher prevalence (44%, 95% CI 35, 58) compared to studies conducted at the community level, which reported a prevalence of 37% (95% CI 28, 43). Furthermore, studies with a sample size less than four hundred showed a higher prevalence of food taboo practices (45%, 95% CI 36, 53) compared to studies conducted with a sample size of four hundred or more, which showed a prevalence of 34% (95% CI 27, 42) of food taboo practices among pregnant mothers in Sub-Saharan Africa (Table 3).

Sensitivity analysis: Sensitivity analysis was conducted to check the effect of individual studies on the pooled prevalence. As shown in the supplementary figure, no single study removal had a significant effect on the overall prevalence of food taboo practice.

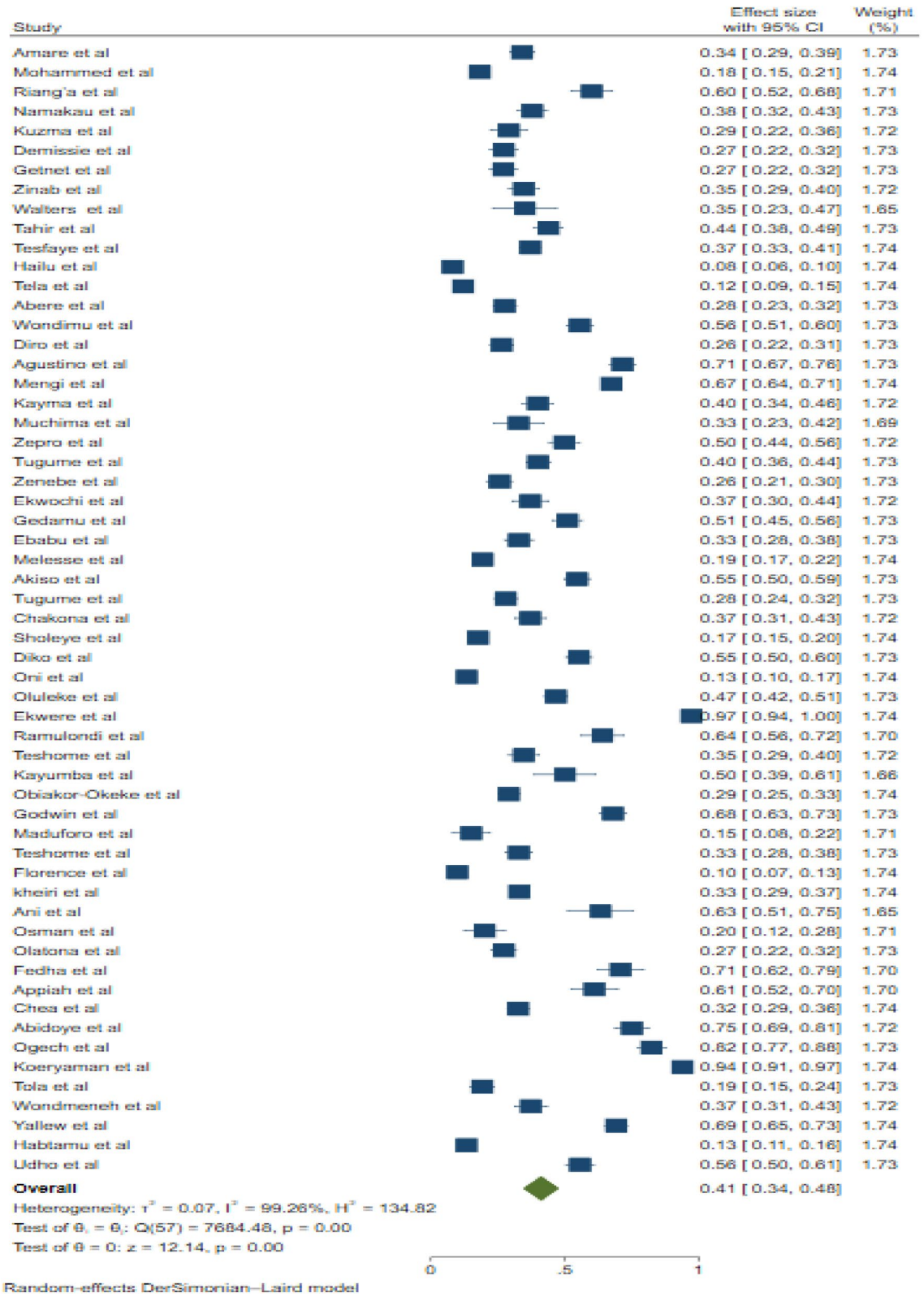

Fig. 2 Forest plot indicating the pooled prevalnce of food taboo practice among preganat women in Sub Sahara Africa, 2024

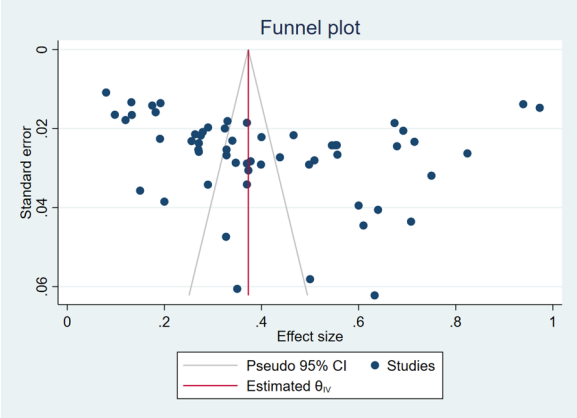

Fig. 3 Funnel plot presented the visual inspection of publication bias for systematic review and meta-analysis of food taboo among pregnant mother in Sub Sahara Africa, 2024

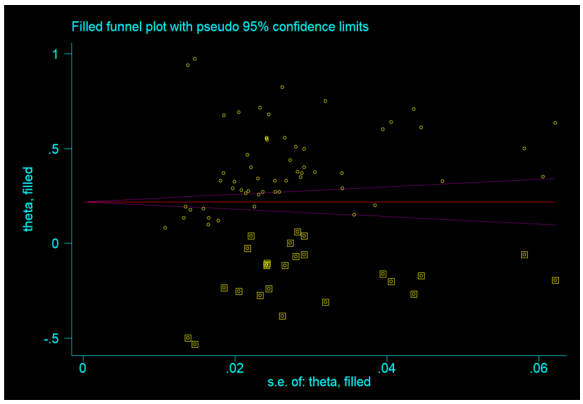

Fig. 4 Duval and Tweedie's Trim and Fill funnel plot

Factors associated with food taboo among pregnant women in Sub Saharan Africa

Educational status and food taboo: A total of eight articles were included to assess the association between educational status and food taboo [22, 28–34]. Pregnant women with an educational status of unable to read and write were 2.64 times more likely (with a 95% CI of 1.79, 3.90 and $I^2 = 56.9\%$) to practice food taboos compared to those with a diploma and above educational status (Fig. 5).

ANC follow-up and food taboo: A total of seven articles were included in the analysis to detect the association between ANC follow-up and food taboo [22, 28, 32, 33, 35–37]. Pregnant women who had not received ANC follow-up were 3.73 times more likely (with a 95% CI of 2.83, 4.93 and $I^2 = 55.1\%$) to practice food taboos compared to pregnant mothers who had received ANC follow-up (Fig. 6).

Nutrition knowledge and food taboo: There were a total of three articles included to show the relation between nutrition knowledge and food taboo [33, 36, 37]. Pregnant mothers who had poor nutrition knowledge were 3.33 times more likely (with a 95% CI of 1.56, 7.09 and $I^2 = 84.3\%$) to practice food taboos compared to mothers who had good nutrition knowledge (Fig. 7).

Discussion

Food taboos during pregnancy, driven by beliefs about fetal development, spirituality, and practical concerns, can significantly impact nutrient intake in pregnant women [38, 39]. This review aims to assess the prevalence of food taboo practices and associated factors among pregnant women in Sub-Saharan Africa. As a result, the prevalence of the pooled food taboo practices among pregnant women in Sub-Saharan Africa was 41% (95% CI: 34–48). In the reviewed studies, there are different food taboos among various countries. However, the most common food items restricted by pregnant women include meat, honey, milk, salt, eggs, cabbage, cheese, linseed, coffee, tea, porridge, wheat bread, bananas, groundnuts, sugar cane, chili peppers, yogurt, legumes, and cereals. Restricting these foods might result in nutritional deficits that can affect the health of both the mother and fetus, increasing the risk of low birth weight, anemia, developmental problems, and other long-term effects on maternal health and birth outcomes.

The subgroup analysis indicates that the pooled prevalence of food taboo practices in studies published before 2020 was higher than that of studies published after 2020. The possible reason for these variations might be due to time differences. In earlier years, there was inadequate health service utilization, as well as limited media exposure to improve knowledge and awareness of the negative effects of food taboos among pregnant women [40].

Table 2 Egger's test result to assess publication bias

Std_Eff	Coefficient	Std. error	t	*P*>|t|	[95% conf	Interval]
slope	.2265398	.0959943	2.36	0.022	.0342402	.4188394
bias	7.07303	4.357699	1.62	0.110	−1.656491	15.80255

Test of H0: no small-study effects $P = 0.110$

Table 3 Food taboo practices among pregnant women in Sub Sahara Africa, sub-group meta-analyses (N = 58, random effect model), 2024

Variables	Numbers of studies	Sample size	Pooled estimate, 95%CI	I^2	*P*-value	Overall with 95%CI
Year of publication						
< 2020	33	10, 498	42(32, 56)	99.4	*P* < 0.001	41%(34, 48) $I^2 = 99.2$ ^*P* < 0.001
> = 2020	25	9,764	40(32, 44)	98.7	*P* < 0.001	
By countries			36(24, 44)			
Ethiopia	27	11, 550	41(35, 48)	98.7	*P* < 0.001	41%(34,48) $I^2 = 99.2$ ^*P* < 0.001
Others countries	31	8,712	47(36,56)	99.3	*P* < 0.001	
Residence in which the study was conducted						
Urban	22	6,886	40(32, 48)	99.1	*P* < 0.001	41%(34,48) $I^2 = 99.2$ ^*P* < 0.001
Rural	36	13, 376	43(32,56)	99.3	*P* < 0.001	
Study setting level						
Community	22	9,898	37(28,43)	99.2	*P* < 0.001	41%(34,48) $I^2 = 99.2$ ^*P* < 0.001
Facility	36	10, 363	44(35,58)	99.2	*P* < 0.001	
Sample size						
< 400	37	8,827	45(36, 53)	99.2	*P* < 0.001	41%(34,48) $I^2 = 99.2$ ^*P* < 0.001
> = 400	21	11, 435	34(27, 42)	99	*P* < 0.001	

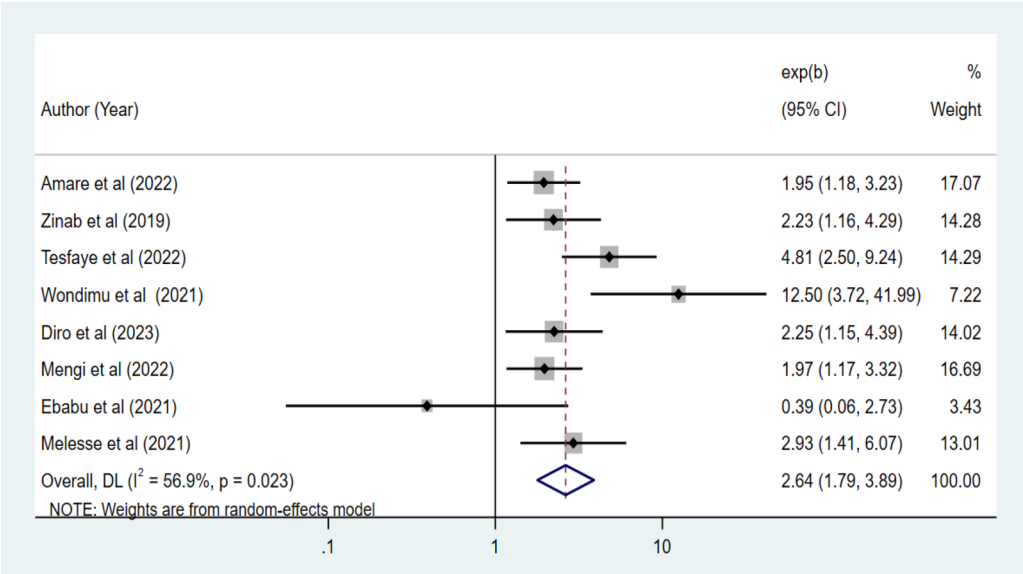

Fig. 5 Forest plot showing that pooled odd rations of unable to read and write associated with food taboo among pregnant women in Sub Sahara Africa, 2024

Studies conducted in countries other than Ethiopia showed a higher pooled prevalence of food taboo practices compared to studies conducted in Ethiopia. The variation might be due to specific cultural, religious, and social norms, as well as access to healthcare services and educational status [41]. The majority of Ethiopians are Christian Orthodox followers, which might negatively affect dietary patterns during pregnancy [42]. Availability, accessibility, and utilization of healthcare services remain limited, hindering the adoption of evidence-based practices related to pregnancy nutrition [43]. Moreover, lower education levels might be another possible reason for the higher prevalence of food taboo practices among pregnant women [43].

Studies conducted in urban areas showed a lower pooled prevalence of food taboo practices compared to rural areas. The possible reasons for this difference might be due to the fact that in rural areas, there is

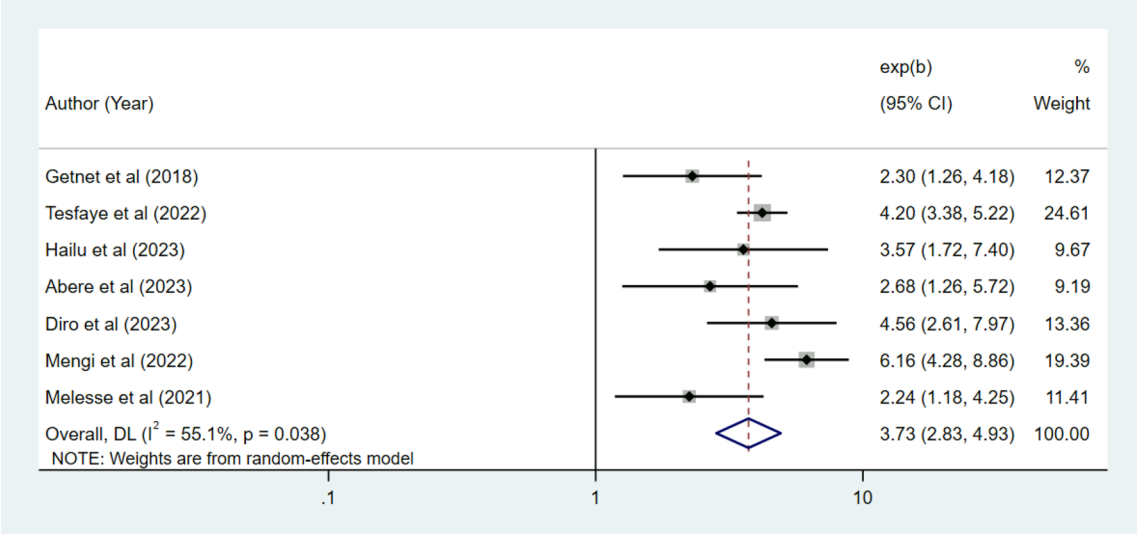

Fig. 6 Forest plot showing that pooled odd rations of no ANC follow up associated with food taboo among pregnant women in Sub Sahara Africa, 2024

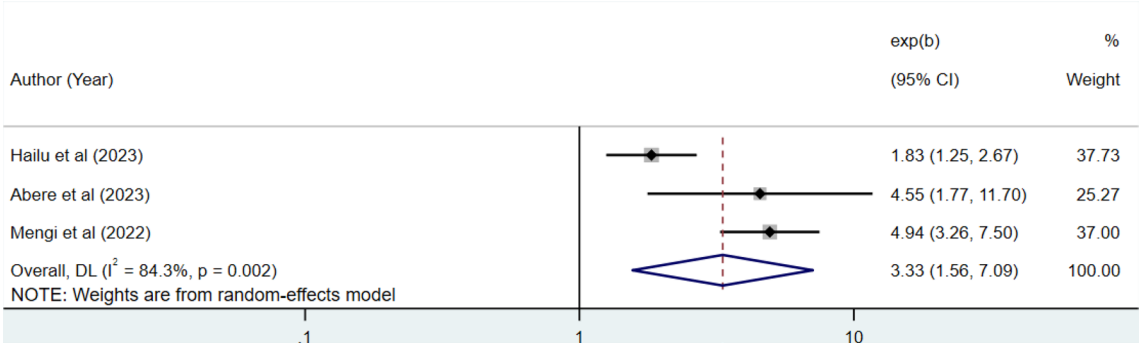

Fig. 7 Forest plot showing that pooled odd rations of poor maternal nutrition knowledge associated with food taboo among pregnant women in Sub Sahara Africa, 2024

limited utilization of health services to improve behavioral change regarding nutrition practices during pregnancy at critical contact points [44, 45]. Moreover, community studies are affected by access to healthcare services and information, which influences the implementation of current recommendations. This, in turn, leads to a lower reported prevalence of food taboos among pregnant women in urban areas compared to rural areas [14].

Food taboos also varied across study settings. Studies conducted at the facility level showed a higher prevalence compared to studies conducted at the community level. The possible reason for the variation might be due to selection bias [46]. Studies conducted at the facility level often include participants who are seeking healthcare, leading to selection bias. Additionally, social desirability bias can play a role, as pregnant women visiting healthcare services might feel pressured to adhere to healthy practices [47]. This social desirability bias can lead to an overestimation of the pooled prevalence of food taboo practices [48].

Furthermore, studies with a sample size of less than four hundred showed a higher prevalence of food taboo practices as compared to studies conducted with a sample size of four hundred and above among pregnant mothers in Sub-Saharan Africa. The possible explanation might be due to the fact that articles with smaller sample sizes might be affected by sampling bias, whereas studies with larger sample sizes will be more representative of the source population and less likely to be affected by random variations [49, 50]. Moreover, studies with smaller sample sizes might not have rigorous data collection techniques, which is liable to social desirability bias and recall bias. Studies with small sample sizes will affect the outcome by having

less statistical power to detect the difference in the outcome, leading to an overestimation of food taboo practices.

Pregnant women with an educational status of unable to read and write were 2.64 times more likely to practice food taboos compared to those with a diploma and above educational status. The possible reason might be that pregnant mothers with higher educational status have greater access to information about the importance of nutrition during pregnancy [51, 52]. This helps mothers make evidence-based decisions about their diet and reduce the practice of food taboos. Additionally, mothers with higher educational status may have a higher chance of increased economic status, leading to more options for accessing nutritious food.

Pregnant women who had not received ANC follow-up were 3.73 times more likely to practice food taboos compared to pregnant mothers who had received ANC follow-up. A possible explanation is that pregnant mothers who receive ANC follow-up have the opportunity to obtain nutrition counseling, which can help them improve their dietary behavior and enhance both their own nutritional status and that of the fetus [53]. Effective nutrition counseling during pregnancy can improve maternal awareness of recommended nutrition practices at home [1].

Pregnant mothers who had poor nutrition knowledge were 3.33 times more likely to practice food taboos compared to mothers who had good nutrition knowledge. The reason might be that mothers with poor nutrition-related knowledge may lack access to nutrition information about healthy eating practices during pregnancy, which could lead them to practice food taboos [54]. In addition, pregnant women with good nutrition knowledge are more likely to improve their eating habits, including maintaining a regular meal pattern and schedule and consuming a variety of food groups without unnecessary restrictions [55].

Strengths and limitations

This systematic review and meta-analysis have some strengths and limitations. Our review adds considerable knowledge regarding the updated prevalence of food taboos in Sub-Saharan Africa. Subgroup and sensitivity analyses were performed to minimize statistical heterogeneity. However, substantial statistically significant heterogeneity was observed across studies, which undermines the pooled estimate of food taboos and suggests that chance could be responsible for the between-study variability. Some studies were excluded due to their outcome ascertainment, which might affect the conclusions of your research. Moreover, qualitative studies exploring the psychological, cultural, social, and dietary factors affecting food taboos among the study participants were not included. Furthermore, no research was conducted in certain countries within the region.

Conclusion

According to this review, over two out of every five pregnant mothers practiced food taboos in the region. The educational status of the mother, antenatal care follow-up, and maternal nutrition knowledge were factors affecting food taboo practices among pregnant women. Therefore, emphasis should be given to increase the uptake of antenatal care follow-up to improve maternal nutrition knowledge and nutritional status.

Abbreviations

AK	Aysheshim Kassahun
AOR	Adjusted odd ratio
ANC	Antenatal care
BM	Berhanu Mengistu
AM	Ayenew Molla
EA	Esmael Ali
MOOSE	Meta-analysis of observational studies in epidemiology
NOS	Newcastle–Ottawa scale
PRISMA	Preferred reporting items for systematic reviews and meta-analyses

Supplementary Information

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Additional file 1.

Additional file 2.

Additional file 3.

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Author contributions

AK and EA developed the protocol and participated in study design, study selection, data extraction, statistical analysis and development of the initial manuscript drafts. BM and AM participated in the quality assessment. AK, BM, EA, and AM prepared and revised subsequent drafts. AK and EA, prepared the final draft of the manuscript. All authors have read and approved the final manuscript.

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Data availability

Data will be available upon request from the corresponding authors.

Declarations

Competing interests

The authors declare that they have no conflict of interest.

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