

Prevalence of khat chewing during pregnancy in Ethiopia: a systematic review and meta-analysis

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Research article

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Abstract

Background

Khat (*Catha edulis*) is a flowering green plant mainly chewed for recreational. Khat chewing is becoming on rising at alarming rate and adversely affects the socio-economic, psycho-social, and physical health including the health of the fetus. Thus, this study aimed to determine the pooled prevalence of khat chewing during pregnancy and its associated factors.

Methods

Databases: PubMed/Medline, CINAHL, SCOPUS and AJOL were searched. Weighted inverse variance random-effects model was used to calculate the pooled prevalence of depression. Heterogeneity across the studies was assessed by Cochrane chi-square and quantified by I^2 statistics test. Funnel plots and Egger's test were used to determine publication bias. Sensitivity test and subgroup analysis were also performed.

Results

In this study, a total of 9,915 study participants were included from 22 studies. The pooled prevalence of khat chewing was found to be 20% (95% CI; 14%-27%). Tests of heterogeneity demonstrated evidence of heterogeneity ($I^2 = 98.46\%$, $p < 0.001$). However, the analysis of sensitivity tests and publication bias showed absence of influential study and publication bias [Egger's test ($P = 0.02$)]. Factors such as: being Muslim, lower educational status, family history of mental illness, and partner previous history of khat chewing were associated with khat chewing.

Conclusion

One in five pregnant women has history of khat chewing. Thus, authors' suggest the need of screening for khat chewing as an integrated part of Antenatal care.

Background

Khat (*Catha edulis*) also known as qat, chat, African salad, Abyssinian tea, and African tea, is a flowering green plant containing a natural amphetamine like stimulant called amphetamine (1–3). Khat chewing practice is rapidly increasing worldwide and currently an estimated of 20 million people chew khat (4, 5). In East Africa, 18–90% of male and 10–60% females chew khat on a daily basis(6–9). In Ethiopia, chewing of khat is becoming habitual and increasing at an alarming rate with an estimated prevalence ranged from 30% to50% (10–13). According to 2016 Ethiopia Demographic and Health Survey (EDHS), around 27% of men and 12% of women had history of khat chewing (14) with up to 65% during pregnancy (15–31). Khat chewing has different socio-economic, psycho-social, physical and environmental impact (1, 5, 12, 13, 32).

In addition to these adverse effects, the practice of chewing khat goes beyond the life of the pregnant women and affects the neonate (15–18, 33, 34) by reduced daily food intake, anaemia, low birth weight and to the extent of maternal and infant death (15–18, 33, 34) (19, 20, 35–37). Factors such as: peer pressure, accessibility, acceptability, and cultural beliefs of relief for headache, weight loss and assistance during birth were associated with khat chewing during pregnancy (15, 17–20). However, Ethiopian government had an initiative to control the adverse effect of substance use for cigarette smoking, but there is no similar action for khat use. However, individual studies are important and showed the existence of khat use among pregnant mothers, the inconsistency of reported epidemiological findings need a comprehensive up-to-date information for all concerned bodies and the focus of most of the available studies were among the general population and college students. To the authors' knowledge, there is no systematic review and meta-analysis that address this gap. Thus, the main purpose of this systematic review and meta-analysis was to determine the pooled prevalence of khat chewing during pregnancy and synthesize its associated factors in Ethiopia.

Methods

Search strategy

Databases such as: PubMed/Medline, CINAHL, AJOL and SCOPUS were searched using the search terms: (khat OR *Catha edulis* OR khat use OR khat consumption OR khat chewing OR khat abuse OR khat dependence OR khat use disorder OR substance OR substance use OR psychoactive substance OR substance use disorder OR substance abuse) AND (prevalence OR incidence) OR magnitude) AND (factors OR risk factor OR risk OR determinant) AND (maternal OR mother OR primigravida OR wom*n OR pregnant OR prenatal) AND Ethiopia for PubMed/MEDLINE. A Google scholar search was also performed. We formulated a comprehensive search strategy by the combination of Medical Subject Headings (MeSH) thesaurus, text words, and appropriate Boolean Operators tailored to each database. No time and language restrictions were imposed on the search strategy. Reference lists of all articles were searched. Moreover, Google Scholar was searched for gray literature. All searches were performed until August-14-2019. Similarly, CINAHL, AJOL and SCOPUS were searched using similar search terms tailored to each database. We adhered to the Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) (38).

Selection of studies

All studies retrieved through search strategy were imported to EndNote X7 (Thomson Reuters, New York, USA) then, duplicated studies were removed from EndNote Library. The title and abstracts of the remaining articles were assessed independently by two reviewers (BBB and YDG). Disagreements were resolved by taking the mean score of the two reviewers.

Definition of concepts

In this study, khat use during pregnancy is defined as use of khat (any amount) at least once.

Eligibility Criteria

Setting: This review included studies carried out in Ethiopia.

Participants: This review included the results of khat use and its associated factors that assessed during pregnancy.

Outcome measure: This systematic review and meta-analysis have two main outcomes. The first outcome was to determine the pooled prevalence of khat use during pregnancy. The second outcome of the study was to identify factors associated with khat use. Prevalence was calculated by dividing the number of khat chewer during pregnancy to the total number of pregnant women included in the study (total sample size) multiplied by 100. For the associated factors, the reported odds ratio, 95% confidence interval and p-value were used to tabulate and described the results thematically.

Study design: Observational studies (cross-sectional and cohort/longitudinal) were included. Studies that focused on case reports, conference and abstracts were excluded if the required data are not accessed.

Data extraction

Data were extracted from the eligible studies using a pre-conceived and piloted data abstraction form. Data were simultaneously extracted by two independent reviewers (BBB and YDG). The extracted data include: name of the first author last name, year of publication, study area/region, study design, sample size, number of cases/prevalence and associated factors.

Quality assessment

The Newcastle-Ottawa quality assessment tool, adapted for cross-sectional studies (39) was used for quality assessment. This tool had three main parts (selection, comparability and outcome). The first part (selection) has five stars and assesses the methodological quality of the study. The second part of the tool evaluates the comparability of the study. The third part of the tool assesses the quality of the original article's outcome with respect to the statistical analysis. Individual paper was graded with score ranged from zero to ten stars. The overall quality of each article was determined using the sum of each star of the three parts and defined as high quality for score ≥ 6 out of 10, medium (fulfilling 50% of quality assessment criteria) and poor for < 4 .

Data synthesis and statistical analysis

The extracted data were entered into a Microsoft Excel Database and then imported into STATA version 14 (Stata Corp LLC, Texas, USA) software with packages of Meta-analysis for analysis. Meta-analysis was performed with STATA 14 using the "Metaprop" command with random-effects models to calculate the pooled effect size at 95% confidence intervals (40) with the Dersimonian and Laird method based transformed values and their variance (41). The Freeman–Tuckey variant of the arcsine square root transformation of proportions was fitted to avoid variance instability when handling proportions close to one (42). Heterogeneity between studies was measured by the index of heterogeneity (I^2 statistics) test (43). I^2 statistics values of 25%, 50% and 75% was used as low, medium and high heterogeneity respectively. Sub-group analysis was performed by years of publication, study setting, study design, sample size and quality

of included studies. Publication bias was examined by the visual inspection of funnel plot (44) and Egger test (45) with p-value of < 0.05 was considered as statistically significant. Sensitivity analyses were conducted to examine influential studies (46). However, we planned for meta-analysis of associated factors, because of the inconsistent and insufficient data; results were analyzed thematically and presented using texts and tables.

Results

The initial database literature search resulted in 954 published articles. Additionally, 13 studies were located through other sources. Finally, the overall literature search resulted in 967 articles. Of these articles, 678 were excluded during the initial assessments as their titles and abstracts were found to be irrelevant. Of the remaining 289 studies, 186 articles were excluded through abstract reading because of different outcomes and unclear results. Finally, 81 papers were excluded because of different eligibility. Then, the remaining 22 studies were included in the systematic review and meta-analysis (Fig. 1).

Study characteristics

In this study, a total of 9,915 study participants were included from 22 studies. These studies were carried out between 1997 to 2019 years in four different regions: Addis Ababa ($n = 6$), Amhara ($n = 3$), Oromia (10), and Southern Nation and Nationalities of People (SNNP) ($n = 3$). Majority (73%) of the included studies are institution-based cross-sectional study designs. All studies presented data on self-report. The sample size of study participants ranged from 112 to 1065. The qualities of included studies were between 5 and 8. Of these, majority 60% had an overall good quality and the remaining studies had fair quality (Table: 1).

Prevalence of khat chewing

The pooled prevalence of khat chewing was found to be 20% (95% CI; 14%-27%) (Fig. 2). Tests of heterogeneity demonstrated evidence of heterogeneity ($I^2 = 98.46\%$, $p < 0.001$). The analysis of sensitivity tests showed that none of the point estimates was outside of the overall 95% confidence interval confirming that: (i) there was no influential study and (ii) based on these 22 studies the pooled estimated prevalence of khat chewing was important. We did not find evidence of publication bias from the visual inspection of the funnel plot (Fig. 3) and Egger's test ($P < 0.02$).

Subgroup analysis

Overall, the highest and lowest pooled prevalence of khat chewing was reported from study with small sample size (< 300) 33% (95% CI: 15%-55%) and in Amhara region 12% (95% CI: 3–27) respectively. For the remaining subgroup analysis by sample size, study design, study quality, publication year between and study setting, we observed, higher pooled prevalence among studies with smaller sample size (pooled prevalence = 33% (95% CI: 15%-55%), community based study design (pooled prevalence = 22% (95% CI: 12%-32%), fair quality of study (pooled prevalence = 26% (95% CI: 16%-35%), 2016–2019 publication year (pooled prevalence = 23% (95% CI: 15%-32%) and in SNNP region (pooled prevalence = 23% (95% CI:

12%-41%), as compared to studies with higher sample size, institution based study, good quality of study, before 2016 publication year and Oromia/Addis Ababa/Amhara region (Table 2).

Table 1
Characteristics of the studies

Authors	Year	Setting	Design	Outcome	Sample size	No. of cases	prevalence	Quality
Fekadu	2017	Addis Ababa	Institution	Khat chewing	367	39	10.6	Good
S/Mariam	1997	Addis Ababa	Community	Khat chewing	202	85	42	Fair
Abdurashid	2013	Addis Ababa	Institution	Khat chewing	348	21	6	Fair
Hanlon	2009	Oromia	Community	Khat chewing	1056	135	12.8	Fair
Teso	2017	Oromia	Institution	Khat chewing	293	193	66	Fair
Smart	2016	SNNP	Community	Khat chewing	1009	305	30	Fair
Tesfaye	2013	Oromia	Institution	Khat chewing	336	120	36	Good
Eba	2014	Addis Ababa	Institution	Khat chewing	412	27	6.6	Good
Jebena	2015	Oromia	Institution	Khat chewing	642	369	57	Good
Demeke	2014	Amhara	Institution	Khat chewing	420	25	6	Fair
Demlash	2015	Oromia	Institution	Khat chewing	387	48	12	Good
Wachamo	2019	Amhara	Institution	Khat chewing	360	27	7.5	Good
Nakajima	2017	Oromia	Institution	Khat chewing	642	123	19	Good
Aderaw	2018	SNNP	Community	Khat chewing	341	122	36	Good
Tefera	2015	Oromia	Community	Khat chewing	340	20	9	Good
Tesfaye	2018	Oromia	Institution	Khat chewing	336	60	18	Good
Ahmed	2018	Amhara	Institution	Khat chewing	297	83	28	Fair

SNNP: Southern Nation and Nationalities of People

Authors	Year	Setting	Design	Outcome	Sample size	No. of cases	prevalence	Quality
Obse	2013	Oromia	Institution	Khat chewing	374	57	15	Good
Negewo	2019	Oromia	Institution	Khat chewing	228	20	8.8	Good
Dendir	2017	Addis Ababa	Institution	Khat chewing	112	32	28.6	Fair
W/amanuel	2018	Addis Ababa	Institution	Khat chewing	348	45	13	Good
Senturk	2012	SNNP	Community	Khat chewing	1065	137	13	Fair
SNNP: Southern Nation and Nationalities of People								

Table 2
Subgroup analysis by sample size, study quality and publication year

Subgroup	Number of Studies	Pooled prevalence	95% CI	I ²	P-value
Study design					
Institutional based	16	0.19	0.11–0.28	98.61	< 0.001
Community based	6	0.22	0.12–0.32	98.27	< 0.001
Sample size					
< 300	5	0.33	0.15–0.55	98.36	< 0.001
≥ 300	17	0.16	0.11–0.23	98.24	< 0.001
Study quality					
Good	13	0.19	0.12-26	98.42	< 0.001
Fair	9	0.26	0.16–0.35	98.79	< 0.001
Publication year					
1997–2015	11	0.17	0.9 – 0.27	97.80	< 0.001
2016–2019	11	0.23	0.15–0.32	98.89	< 0.001
Study setting					
Addis Ababa	6	0.16	0.8 – 0.26	96.67	< 0.001
Oromia	10	0.23	0.12–0.36	98.94	< 0.001
Amhara	3	0.12	0.3 – 0.27	-	-
SNNP	3	0.25	0.12-41	-	-
Note:-95% CI represents the 95% Confidence Interval for prevalence and I ² represents the prevalence of true heterogeneity.					

Factors associated with khat chewing

Narrative review

Based on this review, limited number of studies reported about the factors associated with khat chewing. So, results were synthesized thematically under: socio-demographic, psychological, and behavioral related factors.

Socio-demographic factors

Being Muslim (OR = 24, p < 0.001), illiterate (OR = 5.61, p < 0.001), and primary education (OR = 3.55, p < 0.001) were associated with khat chewing (17).

Psycho-social

Those pregnant women who had family history of mental illness were six times (OR = 6.33, $p < 0.001$) more likely engaged in khat chewing. Moreover, those pregnant women who had history of khat chewing were around two times (AOR, 1.65;95%CI, 1.10, 2.47) more likely experienced CMDs (17). Those pregnant women who had history of khat chewing were around two times (AOR, 1.65;95%CI, 1.10, 2.47) more likely experienced CMDs (47).

Behavioral factors: Those pregnant women who had partner history of khat chewing were twelve times (OR = 12.4, $p < 0.001$) and those with history of violence were around three times AOR 2.901(95%CI: 1.302–6.463, $P, 0.009$) more likely engaged in khat chewing (17, 48, 49).

Discussion

The main purpose of this systematic review and meta-analysis was to assess the pooled prevalence of khat chewing and its associated factors during pregnancy in Ethiopia. The present study indicated that one in five of pregnant women had history of khat use. This implies despite the international recommendation of pregnant women's abstinence to any substance (50), in Ethiopia, there is limitation in the implementations of internationally accepted measures for safe motherhood and infants. This may be attributed to the lack of knowledge toward the adverse effect of substance on the health mother and the fetus. In Ethiopia, there is a perception of khat use as medicine for headache, socialization, stress reduction and easy delivery that may be the reason for khat use (15–20). Even though similar studies are scarce, the results of this finding is within the reported prevalence of khat chewing in Yeme (40.7–47%) (51, 52). Previous meta-analysis showed that the association of khat chewing on birth weight (53), perinatal and young infant death, intrauterine growth retardation, low foetal birth weight (54), sleep disturbance and memory problems of pregnant women (20).

In the current systematic review and meta-analysis, however; the study level characteristics by subgroup analysis such: sample size, study design, study quality, publication year and study setting showed statistical significance; this implies the presence of other characteristics for the contribution of heterogeneity; the overall highest and lowest pooled prevalence of khat chewing was reported from study with small sample size [33% (95% CI: 15%-55%)].. This may be due to the research methodology, socio-cultural norms and the availability of khat in the study area. For example, "Jimma" is the name of place in Ethiopia, Oromia region, as the same time, it is the common name for khat (place where its name is originated). This is consistent with other studies (15–20) and supported by EDHS 2011 (10, 11).

Regarding the associated factors limited number of studies identified socio-demographic, pregnancy related psychological and behavioural related factors of associated factors (19, 20, 35). From this limited studies, we observed the scarcity of studies about factors associated with khat chewing that suggests the needs of future researchers to address this gap because identification of health determinant factors are important public health issues to design appropriate interventions.

Strengths and limitations of the study

To our knowledge, this is the first systematic review and meta-analysis about khat chewing among pregnant women in Ethiopia. To manage heterogeneity, bias and make the findings more meaningful, four different methods were performed. First; during analysis, we used appropriate model (a random effect model) to control the effects of the observed heterogeneity. Secondly; we conducted a leave one out sensitivity analysis to identify influential study. Third; we conducted subgroup analysis by sample size, study design, study quality, publication year and study setting. Finally, funnel and egger test was performed to identify small study effect. However, some limitations such as: use of reference lists and Google Scholar may have the possibility of having some overlooked articles and lack of similar study limited the discussion.

Conclusion

In Ethiopia, one in five pregnant women has experience of khat chewing. Factors such as: being Muslim, lower educational status, family history of mental illness, and pregnant women and partner previous history of khat chewing were associated with khat chewing. Thus, authors' suggest the need of pregnant women screening for khat chewing as an integrated part of ANC. Authors' also suggest the needs of strengthening awareness about the adverse effect of khat chewing.

Abbreviations

AJOL: African Journals Online; **ANC:** Antenatal Care; **CI:** Confidence Interval; **EDHS:** Ethiopia Demographic and Health Survey; **OR:** Odds Ratio; **PRISMA:** Preferred Reporting Items for Systematic Reviews and Meta-Analyses; **SNNP:** Southern Nation and Nationalities of People.

Declarations

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Availability of data and materials

All data in this study were included.

Authors' contributions

BBB designed the systematic review and meta-analysis in collaboration with YDG. BBB developed the search strategy and drafted the protocol. YDG improved the drafted systematic review and meta-analysis. BBB and YDG performed search strategy and conducted data selection and extraction. Both authors were

involved in data analysis and interpretation of the results and write up the manuscript. Authors read and approved the final manuscript for publication.

Ethics approval and consent to participants

Not applicable.

Consent for publication

Not applicable.

Competing interests

None declared.

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Figures

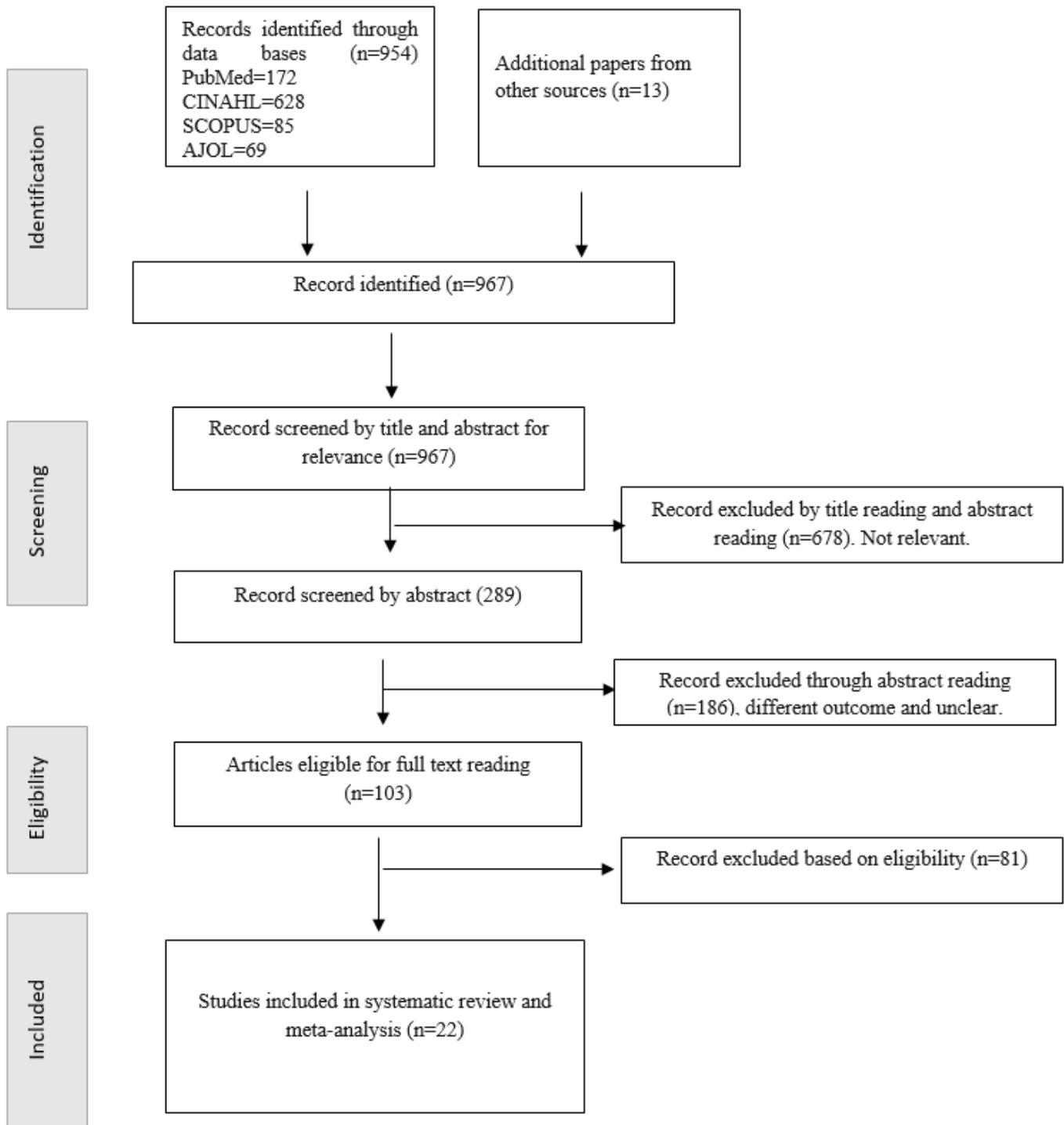


Figure 1

Flow diagram of included studies

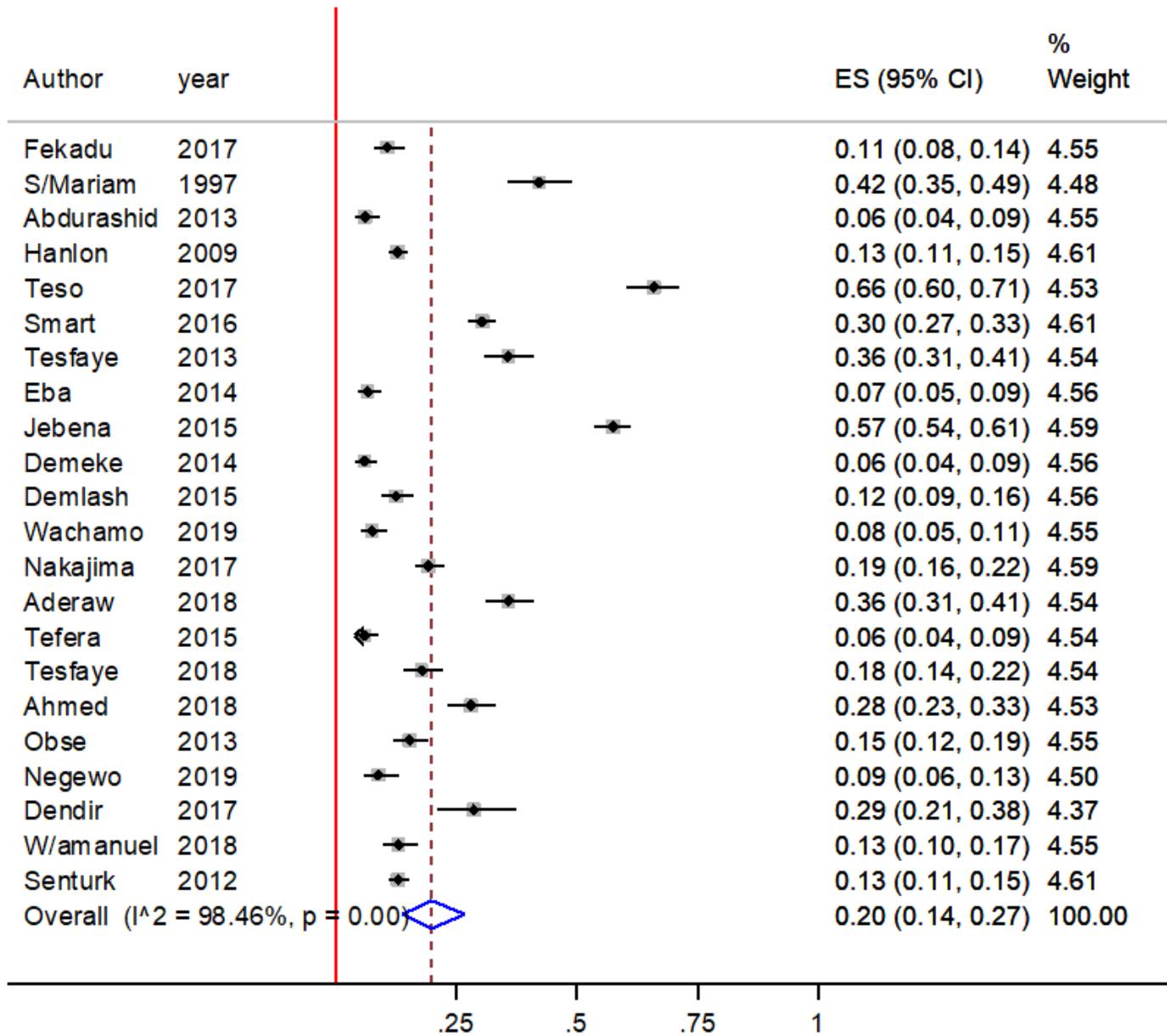


Figure 2

Forest plot presenting prevalence of khat chewing

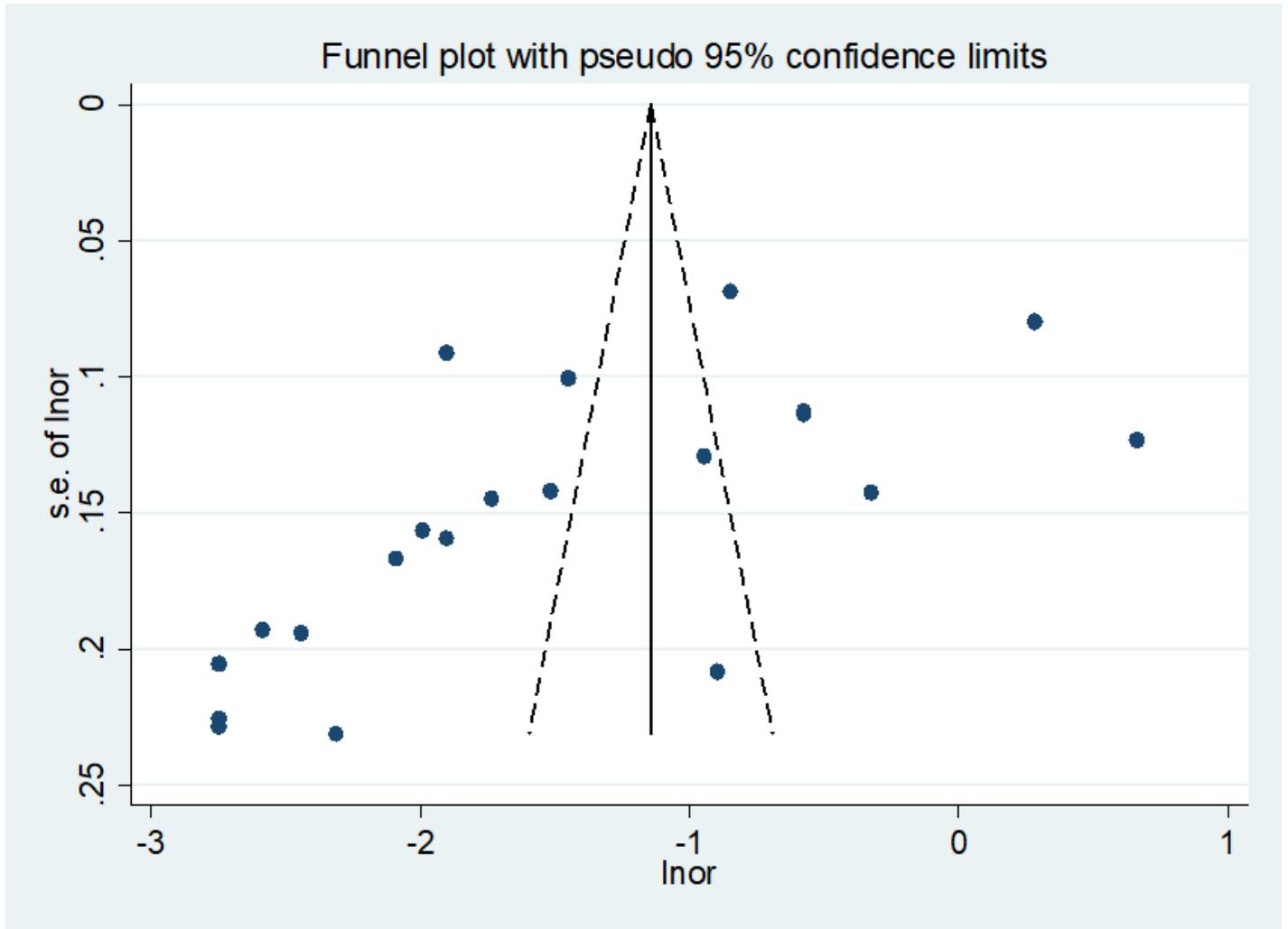


Figure 3

Funnel plot with pseudo 95 % confidence interval that investigated the publication bias of the pooled prevalence of khat chewing.

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- [Additionalfiles.docx](#)