

Food insecurity and its gender disparity among adult people living with Human Immunodeficiency Virus in Ethiopia: A systematic review and meta-analysis

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Abstract

Background People living with Human Immunodeficiency Virus may lack access to sufficient quantities of nutritious foods and are vulnerable to food insecurity. Studies suggest there is gender-based inequality in the experience of food insecurity. The few studies conducted on the prevalence of food insecurity among adults living with Human Immunodeficiency Virus in Ethiopia presented inconclusive findings. Therefore, the objective of the current systematic review and meta-analysis was to estimate the pooled prevalence of food insecurity and its gender disparity among adult patients living with HIV and receiving antiretroviral therapy in Ethiopia. **Method** We followed the Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA) guidelines. The research databases PubMed, Google Scholar, CINAHL, PopLine, MedNar, Embase, Cochrane library, the JBI Library and the WEB OF SCIENCE were searched using keywords. We included studies reporting prevalence of food insecurity among adults aged greater than 18 years who were living with HIV and receiving antiretroviral therapy. The meta-analysis was conducted using STATA 14 software. A random effects model was used to estimate the pooled prevalence at 95% CI. Funnel plots and Egger's and Begg's tests were used to check for publication bias. **Results** A total of 52 studies representing 4031 adults were identified; eleven studies were included in the meta-analysis. The overall pooled estimated prevalence of food insecurity was 63.44% (95% CI: 46.33-80.54%). A higher pooled prevalence of food insecurity was observed among females (68.85%, 95% CI (57.88%, 79.81%)) compared to males (31.15%, 95% CI (20.19%, 42.12%)). **Conclusion** The review demonstrates a high prevalence of food insecurity among people living with HIV in Ethiopia, with evidence of greater vulnerability among women. Interventions should be culture and context specific to address regional and gender disparities in the prevalence of food insecurity.

Background

An estimated 710, 000 people were living with Human Immunodeficiency Virus (HIV), with 30, 000 new HIV infections, in Ethiopia in 2017 [1]. The estimated HIV prevalence (Age 15–49) was 1.0% and estimated deaths due to AIDS were 15, 338 in the same year. Over 385,000 adults living with HIV were receiving antiretroviral treatment [1].

HIV and food insecurity are highly linked in both low- and high-income settings. Food insecurity is defined as having limited or uncertain availability of nutritionally adequate, safe foods or the inability to acquire personally acceptable foods in socially acceptable ways[2]. Food insecurity has been identified as a critical factor increasing the risk of transmission behaviors and susceptibility to HIV, among HIV-infected adults[2].

Evidence indicates a high prevalence of food insecurity among people living with HIV and found to have great role in HIV prevention, treatment, and care by striving household food needs[2]. In addition, the high prevalence of food insecurity negatively affects health behavior, functional health status, and health outcomes among individuals living with HIV[3].

In Ethiopia, the prevalence of food insecurity is higher among persons living with HIV, receiving antiretroviral therapy[4-10]. People living with HIV lack access to sufficient quantities of nutritious foods and develop feeling of hunger as results of food insecurity that creates challenges to the success of Anti-Retroviral Therapy. Maintaining adequate food consumption and nutrient intake and meeting the special nutritional needs to cope up with the disease and the antiretroviral therapy are critical for people living with HIV to achieve the full benefit of such a treatment[11].

The relationship between food insecurity and HIV are interwoven in the form of vicious cycle, in which they increase patient vulnerability and deteriorates the severity of each condition [11, 12]. Food insecurity increase the

progression of AIDS related illnesses, undermines adherence and decreases the response to antiretroviral therapy which in turn leads again to food insecurity[11-13].

Women in households experiencing violations related to food insecurity [2]. Study suggest that there is gender-based inequalities both in the experience of food insecurity and its potential impact on access to essential medical care[2].

The few studies that have been conducted on the magnitude of food insecurity among adults living with HIV on antiretroviral therapy in Ethiopia present controversial and inconclusive findings [4-11, 14-16]. Few studies reported significant inequity in the experience of food insecurity by gender in both resource rich and limited settings in which women were most at risk. This gender inequalities found as one of the contributing factors that shape the experience of food insecurity among women living with HIV[2, 17].

In Ethiopia, the very few studies present the gender disparity in the magnitude of food insecurity among adults living with HIV receiving antiretroviral therapy show inconsistent and inconclusive finding [7, 9, 11, 16].

Therefore, the main objective of the current systematic review and meta-analysis was to estimate the pooled prevalence of food insecurity and its gender disparity among adult patients living with HIV, receiving antiretroviral therapy in Ethiopia. The findings of this analysis would be helpful to policy makers and program planners to design appropriate interventions to improve the problem of food insecurity and its gender disparities among people living with Human Immunodeficiency Virus (PLHIV). The findings would also be helpful for clinicians and future researchers in related areas.

Methods

Search Strategy

We conducted systemic review and meta-analysis to estimate the pooled prevalence of food insecurity and its gender disparity among adult patients living with HIV, receiving antiretroviral therapy in Ethiopia. Before starting this review, different databases were retrieved to check for the presence of similar systematic reviews and meta-analysis to avoid duplications. The **DARE database (<http://www.library.UCSF.edu>) and Cochrane library** were explored in an effort to confirm whether systematic review or meta-analysis exists and to check the availability of ongoing projects related to the current systematic review and Meta-analysis. We also searched the two Trial Registries: **ICTRP and Clinical Trials.gov (searched 27 November 2017)**.

We searched all relevant published studies in the following major databases; *PubMed/ MEDLINE, Google Scholar, CINAHL, PopLine, MedNar, Embase, Cochrane library, the JBI Library, the web of science, and African Journals Online*. We also searched as well as grey literature using Google and Google Scholar searches. We also reviewed the reference lists of identified studies to retrieve additional articles. Unpublished studies were retrieved from different official website of local universities.

The search for published studies was restricted by the age of the study participants (adult living with HIV receiving antiretroviral therapy) whose age was greater than 18 years regardless of their treatment regimen) and the study country (studies conducted only in Ethiopia), but was not restricted by time. All published and unpublished articles up to December 30, 2017 were included in the systematic review. The following search terms were used: Prevalence of food insecurity, magnitude of food insecurity, level of food insecurity, gender disparities, gender difference, sex

disparities, sex difference adults living with HIV, patients living with HIV, individuals living with HIV, antiretroviral therapy and Ethiopia separately and/or in combination.

Search terms were also pre-defined to allow a comprehensive search strategy that included all the important studies. All fields within records and Medical Subject Headings (MeSH terms) were used to help expand the search in advanced PubMed search. The following search strategies were modified for the various databases using the two important Boolean operators and search engines with initial keywords/search terms 1) (*"Food insecurity" OR "Prevalence of food insecurity" AND "adult living with HIV" OR "Patients living with HIV" OR "individual living with HIV" OR antiretroviral therapy AND "Ethiopia"*). 2) (*"Food insecurity" OR "magnitude of food insecurity" AND "adult living with HIV" OR "Patients living with HIV" OR "individual living with HIV" OR "antiretroviral therapy" AND "Ethiopia"*). 3) (*"Food insecurity" OR "Level of food insecurity" AND "adult living with HIV" OR "Patients living with HIV" OR "individual living with HIV" OR "antiretroviral therapy" AND "Ethiopia"*). 4) (*"Food insecurity" OR "gender disparities" OR "sex disparities" OR "gender difference" OR "Sex difference" AND "adult living with HIV" OR "Patients living with HIV" OR "individual living with HIV" OR "antiretroviral therapy" AND "Ethiopia"*). The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guideline was followed during the systematic review [18].

Study Selection and Eligibility Criteria

The review included studies that were conducted on prevalence of food insecurity and its gender disparities among adults living with HIV, receiving antiretroviral therapy in Ethiopia. Both community and institutional based studies conducted in Ethiopia were considered. The prevalence of food insecurity and its gender disparities measured using the Household Food Insecurity Access Scale (HFAS)[19, 20] was considered as an outcome. All study types that were published in the form of journal articles, master's thesis and dissertations, that were written in English were included in the review. Studies conducted on the pediatric age group, studies with the methodological problems and review articles were excluded from the review. Retrieved studies were assessed for inclusion in the final review by reviewing using their title, abstract and full-text review of articles for quality.

Quality Assessment and Data Extraction

We used Joanna Briggs Institute Meta-Analysis of Statistics Assessment and Review Instrument (JBI-MASARI) for critical appraisal of studies [21]. Data were extracted by two independent reviewers using a standardized data extraction format. The extraction format/spreadsheet included primary author name, year of publication, region of study, study area, study design, sample size, number of outcome of interest, response rate, and number of outcome of interest by gender. Any discrepancies between the two reviewers in the review process were discussed with the team members until consensus was reached. Discrepancies between the two independent reviewers were resolved through thorough discussion, if no agreement it was resolved by taking the average of the two reviewers. When access to full-text articles were not available, authors were contacted once. If no reply was received within a month, the study was excluded.

Data Analysis and Synthesis

The extracted data were entered into computer through command window of STATA v.14 and the analysis was also performed using STATA v.14 statistical software. The standard error of prevalence for each original study were generated using "generate" command in STATA. Heterogeneity of the outcome of the study was checked by Cochrane's Q statistic (chi-square), I^2 and p-values. We declared the heterogeneity as low, moderate or high when I^2

test statistics results were 25%, 50%, and 75% respectively [22]. We also used Forest plots to visualize the presence of heterogeneity. Since we found high level of heterogeneity, we used a random effects model for analysis to estimate the Der Simonian and Laird's pooled effect. Furthermore, to identify source of heterogeneity, meta regression was conducted and statistically significant results were declared in the presence of heterogeneity. Funnel plots were used to check for publication bias. In addition, Egger and Begg tests at 5% significant level were used to check for publication bias [23-25]. A p-value less than 0.05 was used to declare the presence of publication bias. Sensitivity analysis was performed using a random effects model to assess the influence of a single study on the overall meta-analysis estimate.

Results

Selection and identification of studies

In the search process, we identified 52 published studies. Of those retrieved, 22 duplicate studies were removed and 8 studies were excluded after reviewing of their titles, abstracts and design based on the settled inclusion criteria. The remaining 22 studies were screened for full text for eligibility and whether they report outcome of interest, of which 7 studies were excluded due to lack of outcome of interest and 4 studies were excluded because they failed to meet eligibility criteria. After quality assessment with JBI eligibility criteria, 11 studies that scored seven and above were included in the final meta-analysis.

(Figure 1).

Characteristics of included studies

All included studies were cross sectional studies that directly or indirectly estimated the prevalence of food insecurity and gender disparity among adult people living with HIV in Ethiopia. A total of 11 studies were included in the review with a total of sample of 4031 individual living with HIV. It was found that the sample size of each study was almost similar. The range of sample size was between 305 and 452 participants in the studies conducted in Butajira of SNNPR Region[6] and Dembia of Amhara Region respectively [14]. The studies were conducted from 2012 to 2017 in different regions of the country.

Of the total 11 studies, two studies [10, 14] were conducted in Amhara Region, five studies [6-9, 16] in SNNPR Region, three studies [4, 5, 11] in Oromia Region, and one study [15] conducted in Tigray Region. Six studies[5, 7, 9-11, 16] were conducted directly to assess food insecurity among adults with HIV while the remaining five studies[4, 6, 8, 14, 15] were conducted to assess under nutrition, but indirectly assessed the prevalence of food insecurity as a variable (Table 1).

Prevalence of food insecurity among adult people living with HIV and receiving antiretroviral therapy

Our review of 11 included studies showed that the lowest prevalence of food insecurity among adult people living with HIV, receiving antiretroviral therapy was 18.36% in the study conducted at Dembia District health facilities [14] of Amhara Region, with the highest prevalence of 92.82% in the study conducted at Fitcha Hospital [4] of Oromia Region (Table1). The analysis indicated significant heterogeneity across studies ($I^2=99.5%$, $p < 0.001$) which suggest that the use of a fixed effect model might lead to unreliable estimates. Statistically, fixed-effects model is not usually recommended, since it assumes that all the heterogeneity can be explained by the covariates and such assumptions could further lead to excessive type I errors, when there is residual, or unexplained, heterogeneity.

Therefore, we used a random effects model to estimate the pooled prevalence of food insecurity among adult people living with HIV, receiving antiretroviral therapy reported by the 11 studies. The overall pooled prevalence of food insecurity among adult people living with HIV, receiving antiretroviral therapy in Ethiopia was 63.44 % (95% CI (46.33% - 80.54%)).

(Figure 2).

To identify the source of heterogeneity, we further assessed the heterogeneity using different statistical techniques. We performed meta-regression model using publication year and sample size as covariates by specifying the method for estimating the between-study variance. The analysis indicated that none of the two variables were statistically significant for explaining the presence of heterogeneity (Table 2).

We assessed the presence of Publication bias using funnel plot and Egger and Begg statistical tests at 5% significant level. There was no statistical evidence of publication bias. The funnel plots were symmetry, the Begg and Egger tests were not statistically significant with p-value = 0.213 and p-value = 0.599 respectively.

(Figure 3).

We also performed sensitivity analysis and the result of sensitivity analysis suggested that no strong evidence for the influence of single study the overall prevalence of food insecurity among adult people living with HIV receiving antiretroviral therapy.

(Figure 4).

Gender disparity pooled prevalence of food insecurity

From the 11 studies included in the overall meta-analysis, only 4 studies reported gender disparity as outcome variable of interest. Therefore, a total of 4 studies with 1436 participants were included to assess gender disparity in prevalence of food insecurity among adult people living with HIV[7, 9, 11, 16]. The finding of meta-analysis revealed significant gender disparities in the prevalence of food insecurity among adult people living with HIV. The findings showed a higher pooled prevalence of food insecurity among female (68.85%, 95% CI: 57.88%, 79.81%), $I^2=91.5%$, $p<0.001$) compared to males (32.24%, 95% CI: (20.19%, 42.12%), $I^2=91.5%$, $p<0.001$).

We further assessed the heterogeneity using different statistical techniques to identify the source of heterogeneity. We performed meta-regression using the same variable with general prevalence (publication year and sample size) as covariates by specifying the method for estimating the between-study variance. The analysis indicated that none of the two variables were statistically significant for explaining the presence of heterogeneity (Table 3).

We assessed the presence of Publication bias using funnel plot and Egger and Begg statistical tests at 5% significant level. There was no statistical evidence of publication bias. The Begg and Egger tests were not statistically significant with p-value = 0.734 and p-value = 0.480 respectively. We also performed sensitivity analysis and the result of sensitivity analysis suggested that no strong evidence for the influence of single study on the gender disparity prevalence of food insecurity among adult people living with HIV receiving antiretroviral therapy.

Discussion

This systematic review and meta-analysis was conducted to determine the pooled prevalence of food insecurity and its gender disparity among adult people living with HIV, receiving antiretroviral therapy in Ethiopia. Our review found out that the overall pooled prevalence of food insecurity among adult people living with HIV in Ethiopia was 63.44 % (95% CI (46.33% - 80.54%)). This finding is higher than findings of similar studies conducted in Kenya (33.5%) [2], Columbia (33%) [2], Democratic Republic of Congo (57%) [26], West Bengal of India (49.1%) [27], Uganda (38%) [28] and San Francisco(53.6%) [29]. This may be due the differences in socio-demographic and economic characteristics between the study population and the sample size difference in the studies.

This finding is lower than the finding of the study conducted in Senegal (84.6%) [30], Uganda (78.5%) [31], Nigeria (71.7%) [32] and one of global systematic review (71%) of food insecurity role on treatment Adherence [33]. As indicated above, the difference may be due to food insecurity measurement difference, difference in sample size, difference in the socio-demographic and economic status of the included population in the analysis. The finding of this review is consistent with the finding of the study conducted in Brazil (66.5%) [34].

The finding of our systematic review and meta-analysis showed gender disparities in the prevalence of food insecurity among adult people living with HIV, in which higher prevalence of food insecurity was found in females than males. This finding is consistent with the analysis of cohort data in India[35]. The disparity in our meta-analysis is consistent with the finding of a narrative review of the studies conducted among female living with HIV and other studies in Uganda, in which food insecurity remains a challenge for women across diverse settings including resource limited settings like Ethiopia[17, 28].

This review used comprehensive search strategies. The retrieval for both published and unpublished studies was through different database searches and used a random effects model to address the issues of potential variability across studies. More than one assessors were used in the quality assessment and another review process was utilized JBI-MAStARI and PRISMA guidelines. The restriction to only studies published in English language in this review limited the number of studies included in analysis. We planned to consider both community and institutional based studies in Ethiopia, unfortunately due to nature of the case under our review, all included studies were institutional based cross sectional studies.

Conclusions

The systematic review and meta-analysis showed that the overall pooled prevalence of food insecurity among adult people living with HIV and receiving antiretroviral therapy in Ethiopia was high. We also find significant gender disparities in the prevalence of food insecurity in which higher prevalence of food insecurity was observed among females than males. Therefore, policy makers, planners, program managers and health care providers should give attention to the food insecurity in HIV care and treatment. The intervention program should be culture and context specific to address the gender disparities in the prevalence of food insecurity. From our search and analysis, it was found that, further research should be conducted on the prevalence of the food insecurity.

Abbreviations

AIDS: Acquired Immunodeficiency Syndrome; HIV: Human immune virus; WHO: World Health Organization

Declarations

Declarations

Ethical Approval and Consent to Participate

Not applicable

Consent for Publication

Not applicable

Availability of Data and Materials

The datasets analyzed during the current study are available from the corresponding author upon reasonable request.

Conflict of Interests

The authors declare that they have no competing interests.

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Authors' Contribution

DJB involved in design, selection of articles, data extraction, statistical analysis and manuscript writing. AAA and AWY involved in developing the initial drafts of the manuscript, revising subsequent drafts and prepared the final draft of the manuscript. All authors read and approved the final draft of the manuscript

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Tables

Table 1: Characteristics of studies included in systematic review and meta-analysis of the prevalence of food insecurity among adult people living with HIV receiving antiretroviral therapy in Ethiopia from 2012-2017.

Study No	Author/s(reference)	Publication year	Region	Area of study	Study design	Sample size	Number subjects with the outcome	Response rate	Prevalence % (95% CI)
1	Chanie W, et al.[10]	2017	Amhara	Debre Markos	Cross-sectional	394	333	100%	84.52 (80.95, 88.09)
2	Mitiku et al. [14]	2016	Amhara	Demebia	Cross-sectional	452	83	100%	18.36 (14.79, 21.93)
3	M. Asnakew et al. [8]	2014	SNNPR	Hosanna	Cross-sectional	330	226	97.1%	68.48 (63.47, 73.50)
4	Tesfaye et al.[5]	2017	Oromia	Jimma	Cross-sectional	348	299	100%	85.92 (82.27, 89.57)
5	M. Asnakew[9]	2015	SNNPR	Hosanna	Cross-sectional	385	260	97.72%	67.53 (62.86, 72.21)
6	Yeneabat et al[4]	2017	Oromia	Fitche	Cross-sectional	390	362	100%	92.82 (90.26, 95.38)
7	Gedle et al.[7]	2015	SNNPR	Butajira	Cross-sectional	338	264	90%	78.11 (73.70, 82.52)
8	Belijo ZN, Mensa M[16]	2017	SNNPR	Arba Minch	Cross-sectional	394	77	100%	19.54 (15.63, 23.46)
9	Tiyou et al[11]	2012	Oromia	Jimma	Cross-sectional	319	201	100%	63.01 (57.71, 68.31)
10	Gedle et al[6]	2015	SNNPR	Butajira	Cross-sectional	305	241	100%	79.02 (74.45, 83.59)
11	Hadgu et al.[15]	2013	Tigray	Humera	Cross-sectional	376	152	100%	40.43 (35.47, 45.39)

Table 2 Related factors with heterogeneity of the prevalence of food insecurity among adult people living with HIV receiving antiretroviral therapy in Ethiopia, 2017.

Variables	Coefficients	p-value
Publication Year	0.136468	0.671
Sample size	-0.0109844	0.392

Table 3: Related factors with heterogeneity of the gender disparity in prevalence of food insecurity among adult people living with HIV receiving antiretroviral therapy in Ethiopia, 2017.

Variables	Coefficients	p-value
Publication Year	0.0704423	0.973
Sample size	0.0003928	0.997

Figures

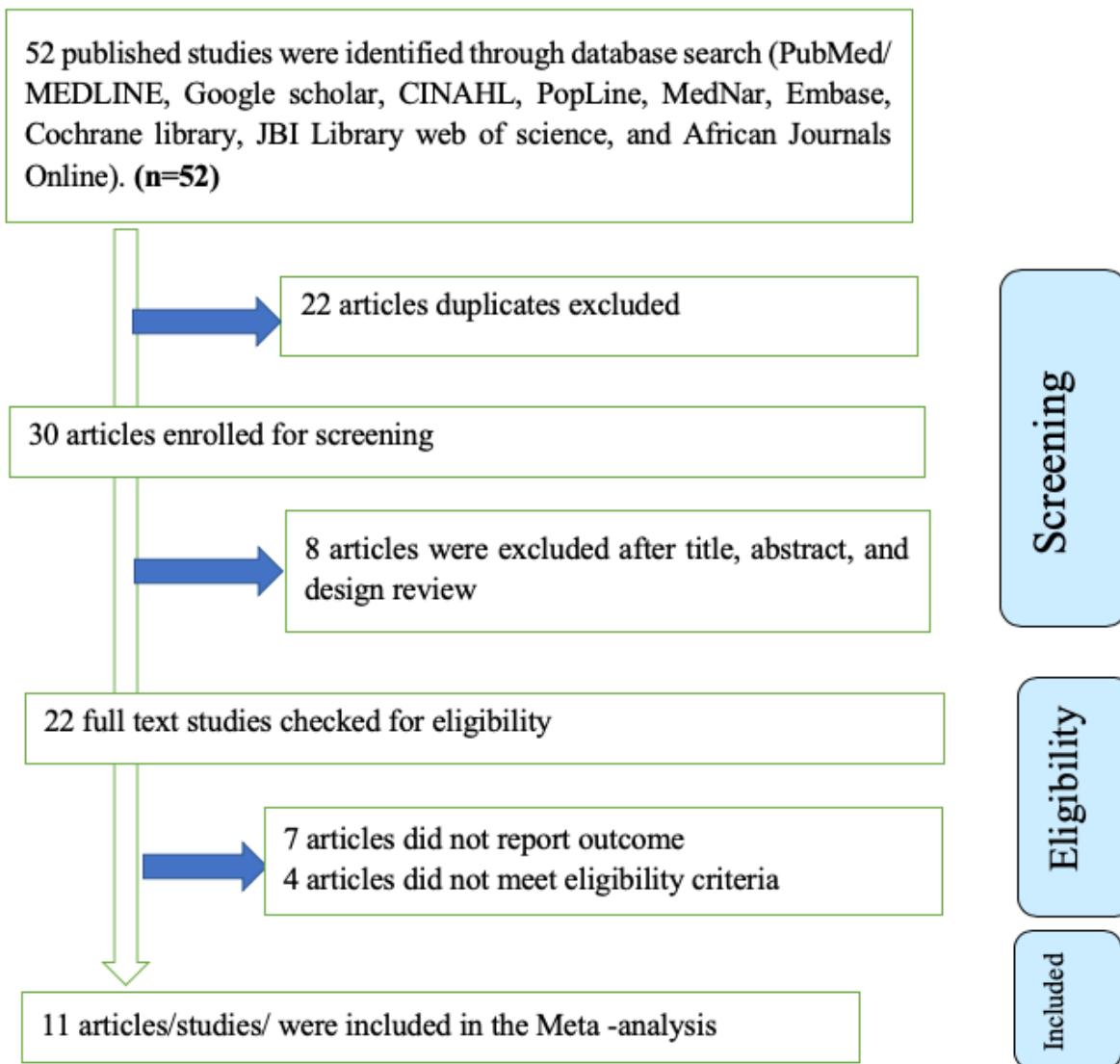


Figure 1

PRISMA flow diagram of included studies in systematic review and meta-analysis of the prevalence of food insecurity among adult people living with HIV receiving antiretroviral therapy in Ethiopia from 2012-2017 in Ethiopia.

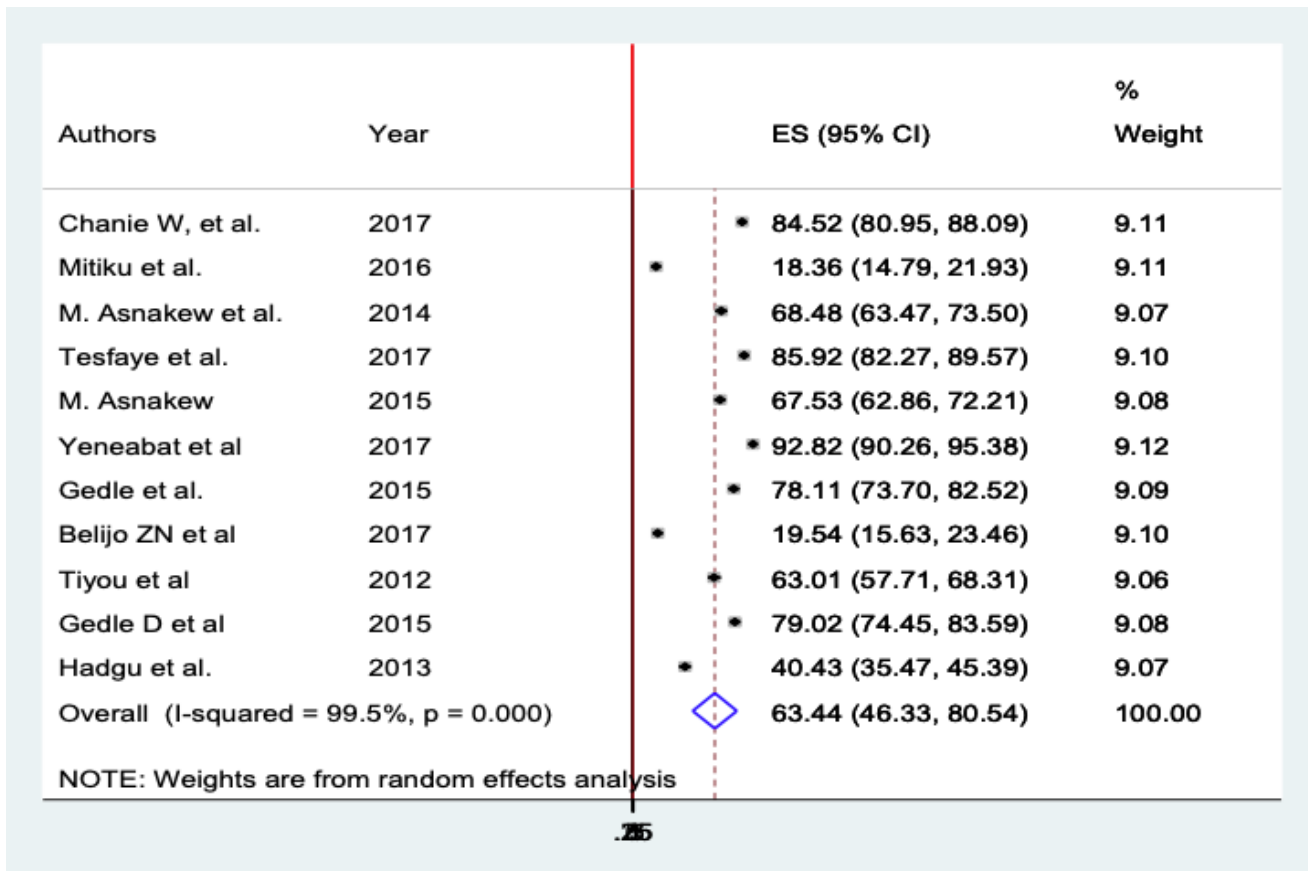


Figure 2

Forest plot of the pooled the prevalence of food insecurity among adult people living with HIV receiving antiretroviral therapy in Ethiopia from 2012-2017.

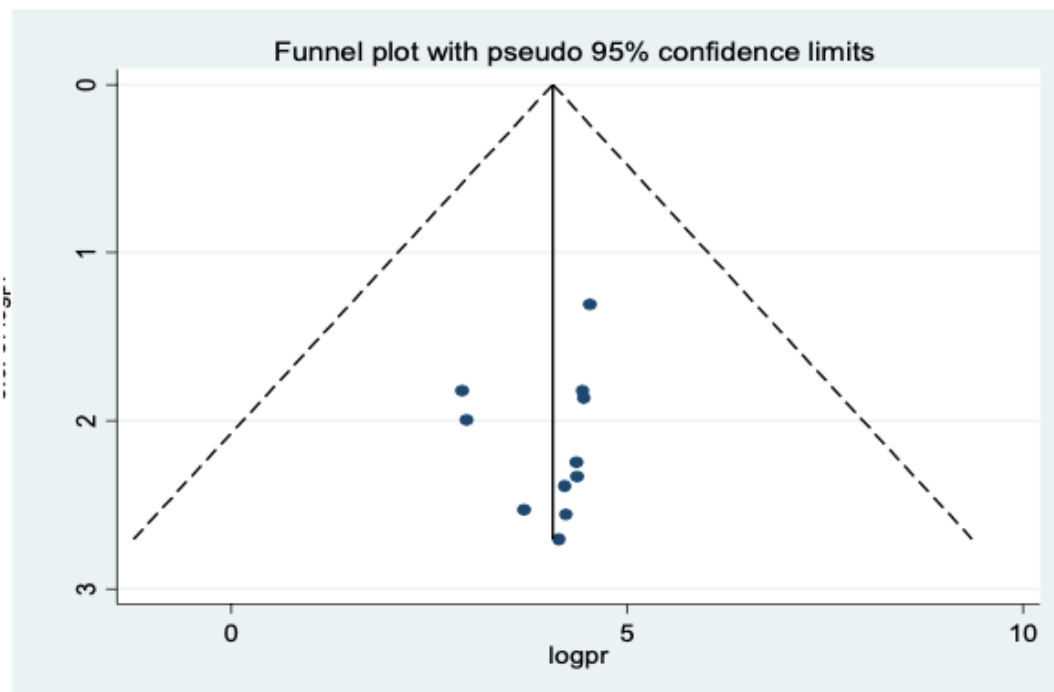


Figure 3

Funnel plots to test the publication bias of the 11 studies among adult people living with HIV receiving antiretroviral therapy in Ethiopia, 2017.

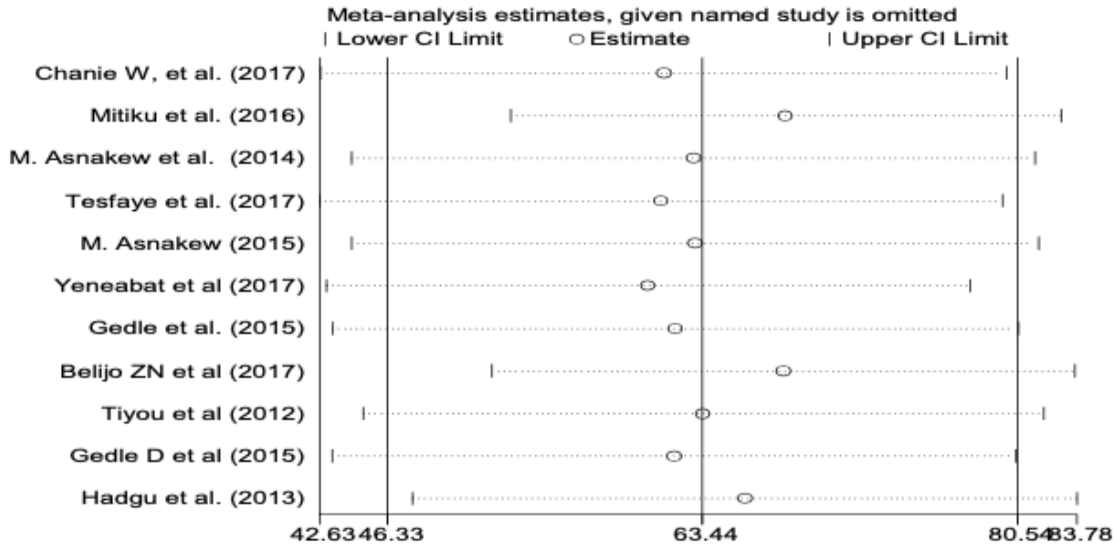


Figure 4

Influential or Sensitivity analysis of the 11 studies among adult people living with HIV receiving antiretroviral therapy in Ethiopia, 2017.

Supplementary Files

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

- [Appendix1.docx](#)
- [PRISMA2009checklist.doc](#)