

Institutional Delivery Service Utilization and Associated Factors in Ethiopia: A Systematic Review and Meta Analysis

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Abstract

Background: Different primary studies in Ethiopia showed the weight of institutional delivery service utilization and the factors associated with it. However, variation among those studies was seen. This study was aimed to estimate the pooled national prevalence and associated factors of Institutional delivery service utilization in Ethiopia.

Methods: PubMed, Cochrane library, Web of Science, and Google Scholar were searched. A funnel plot and Egger's regression test were used to see publication bias. I-squared statistic was applied to check heterogeneity of studies. A weighted Dersimonian laired random effect model was applied to estimate the pooled national prevalence and the effect size of associated factors.

Result: A total of twenty four studies were included in this review. The pooled prevalence of Institutional delivery service utilization was 31% (95% CI: 0.30, 0.31; $I^2 = 0.00\%$). Attitude towards institutional delivery of 3 studies(AOR=2.83; 95% CI 1.35,5.92), maternal age at first pregnancy of 4 studies((AOR= 3.59; 95% CI 2.27,5.69)), residence setting of 7 studies (AOR= 3.84; 95% CI 1.31, 11.25), educational status of 5 studies(AOR=2.91;95% 1.88,4.52), availability of information source of 6 studies(AOR= 1.80;95% CI 1.16,2.78), ANC follow-up of 13 studies((AOR= 2.57 95% CI 1.46,4.54)), frequency of ANC follow up of 4 studies(AOR= 4.04;95% CI 1.21,13.46), knowledge of institutional delivery & danger signs during pregnancy of 11 studies((AOR=3.04;95% CI 1.76 ,5.24)) and place of birth the most recent birth of 4 studies(AOR=8.44;95% CI 5.75,12.39) were identified factors of institutional delivery service utilization.

Conclusions: The findings of this review found several modifiable factors such as empowering women through education, promoting antenatal care to prevent home delivery, increasing awareness of women through mass media and making services more accessible would likely to increase utilization of institutional delivery.

Background

Globally, in the 25 years between 1990 and 2015 a total of 13.6 million women have died due to complications during and following pregnancy and child birth [1]. Majority of maternal health complications and deaths occurred in low and middle income countries. And 75% of the deaths are due to preventable direct obstetric complications [2-6]. Institutional delivery service utilization ensures safe birth, reduce both actual and potential complications and maternal death and increase the survival of most mothers and newborns. But most deliveries in developing countries occur at home without skilled birth attendants[1, 7]. Even though many developing countries tried their best to optimize key and effective maternal health interventions to improve maternal health[8] the progress made was low.

Behavioral intention (BI) is an indication of a person's readiness to perform a given behavior or action. Intention of pregnant women to utilize institutional delivery is affected by socio-demographic variables; household monthly income, health institution, mother occupation and husband occupation had significant effect on the odds of giving birth at health institutions and five variables (perceived susceptibility, perceived barriers, self-efficacy, being able to make decision on her own and being informed where to deliver were predictors of the probability of giving birth at health institution[9]. Worldwide in 2014, 71 % of women delivered with the support of a skilled birth attendant which is better as compared to 59 % in 1990.

On the other hand, there is little progress in closing the gap in antenatal care between urban and rural women[10]. The risk of maternal death is now increasingly concentrated in sub-Saharan Africa as a result of high fertility rates combined with inadequate access to quality antenatal care and skilled attendance at birth. To achieve the goal of ending preventable maternal, new born and child deaths in the Sustainable Development Goals (SDG) it will be essential to bring about significant improvements in levels of coverage, and quality of care provided before, during and after birth. The type of assistance a woman receives during childbirth has important health consequences for both the mother and child[11]. Since most maternal deaths and obstetric complications cluster around the time of delivery [7] and cannot be predicted a priori, skilled attendance at birth remains the most important intervention in reducing maternal mortality and complications.

Skilled attendance during labor, delivery and the early post-partum period could reduce an estimated 13-33% of maternal deaths [12]. Recent data, however, suggest that the skilled attendance at birth (SBA) rate is very low in many settings, especially in sub-Saharan African and South Asian countries. A finding from Uttarakh and India shows that only 33% of study participants delivered their index child in health facility[13]. On the other hand a finding from Ethiopia shows that only 11.3% women were delivered their index child in health facility[14].

In sub-Saharan Africa, a woman's risk of dying from treatable or preventable complications of pregnancy and childbirth over the course of her lifetime is 1 in 22, compared to 1 in 7,300 in the developed regions [15] Even though the maternal mortality of Ethiopia shows improvement from 2011 Ethiopian Demographic and Health Survey (EDHS), still it is one of the highest figure, accounting 412 deaths per 100,000 live births [16].

The health care seeking behavior of a woman regarding institutional delivery affects her chances of accessing and receiving institutional delivery care, particularly in developing countries where an equitable health care system is yet to be set up. Mothers with low health care seeking behavior regarding institutional delivery have a disproportionate burden of maternal deaths. Therefore, this systematic review and meta-analysis was aimed, firstly, to estimate the pooled prevalence of institutional delivery service utilization and secondly, to estimate the effect size of associated factors of Institutional delivery service utilization (IDSU) in Ethiopian context, thereby making the available evidence accessible for decision makers (Figure 1).

Methods

Review protocol were developed/prepared based on the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA-P), 2015 [17], submitted and published in PROSPERO with an ID= CRD42019124210. Database was searched for the same systematic review to avoid duplications. The website (<http://www.library.UCSF.edu>), PROSPERO and Cochrane/Wiley library explored to confirm whether previous systematic review or meta-analysis exists.

Inclusion and exclusion criteria

Cross-sectional, case-control, and cohort studies were included. Those studies had reported the prevalence and/or at least one associated factors of institutional delivery service utilization and published in English were considered. Studies conducted in all region of Ethiopia (Amhara, Oromiya, SNNPR, Tigray, Bie. Guz, Afar, Gambiela, Somalia, Harari, Dirie Dawa and Addis Abeba) since 2010 up to December 30/2018 were considered for the review. The main reason for the year 2010 was selected as the starting point as home delivery free (HDF) strategy (including free maternal services, availability of ambulance etc...) was not clearly available in all parts of Ethiopia prior to this. Citations without abstract and/ or full-text, anonymous reports, editorials, and qualitative studies were excluded from the analysis.

- **Population/Participants**..... reproductive aged women (15–49 years) who were bringing a child in the last two years and who live in Ethiopia.
- **Interventions/Exposure**..... Institutional delivery
- **Outcome**..... Institutional delivery service utilization
- **Study design**..... Cross-sectional, case-control, and cohort studies

Searching strategy and information sources

Pub Med, Web of Science, Cochrane library, Google, and Google Scholar were accessed. Articles with incomplete reported data were handled through contacting authors. The core search terms and phrases were "Institutional delivery", "health facility delivery", "service", "factors associated", "reproductive age women", "15-49 year's women" and "Ethiopia". The search strategies were developed using different Boolean operators.

Particularly, to fit advanced PubMed database, the following search strategy was applied:

[(Institutional delivery) [All Fields] OR Institutional delivery [MeSH Terms]] AND [service) [All Fields] OR service [MeSH Terms]] AND [factors) [All Fields] OR factors [MeSH Terms]] AND [reproductive age women) [All Fields] OR reproductive age women [MeSH Terms]) OR 15-49 years women) [All Fields] OR 15-49 years women [MeSH Terms]] AND [Ethiopia].

Data extraction

Two independent reviewers extracted data using a structured data extraction form. Whenever variations of extracted data observed, the phase was repeated. If discrepancies between data extractors continued, third reviewer was involved. The name of the first author and year, the study region, the study design, the target population, the sample size, prevalence of IDSU, and Adjusted Odd Ratio (AOR) with Confidence interval (CI) of associated factors were collected.

Study selection

Retrieved studies were exported to reference manager software, Endnote version 7 to remove duplicate studies; in which 203 articles were removed. Three independent reviewers screened the title and abstract. The disagreement between the reviewers was handled based on established article selection criteria. Fifty four (54) articles/studies title and abstracts' is not fit (is not relate) with our review i.e. studies title without abstract and or full text so that excluded from full text assessment. Forty three (43) articles were going for full text assessment of the eligibility and 19 of them were excluded from synthesis because the outcome variable and study subject are not the same with our review objectives. Twenty four (24) studies/articles were included in the prevalence and/or associated factor estimation (Figure-2). Three independent authors conducted the abstract and full-text review.

Quality assessment/critical appraisal

Three independent authors appraised the quality of individual studies. The Joanna Briggs Institute (JBI) quality appraisal checklist was used [18, 19]. The disagreement was resolved by the interference of third reviewer. The following items were used to appraise **cohort studies**:

[1] Similarity of groups, [2] Similarity of exposure measurement, [3] Validity and reliability of measurement, [4] Identification of confounder, [5] Strategies to deal with confounder, [6] Appropriateness of groups/participants at the start of the study, [7] Validity and reliability of outcome measured, [8] Sufficiency of follow-up time, [9] Completeness of follow-up or descriptions of reason to loss to follow-up, [10] Strategies to address incomplete follow-up, and

[11] Appropriateness of statistical analysis. Studies got 50% and above of the quality scale were considered low risk. We have only one cohort/follow up study and got a score of 81.2% of the quality scale, which is low risk and can be included in the study.

The items used to appraise **case-control** studies were:

[1] Comparable groups, [2] Appropriateness of cases and controls, [3] Criteria to identify cases and controls, [4] Standard measurement of exposure, [5] Similarity in measurement of exposure for cases and controls, [6] Handling of confounder, [7] Strategies to handle confounder, [8] Standard assessment of outcome, [9] Appropriateness of duration for exposure, and [10] Appropriateness of statistical analysis. Studies got 50% and above of the quality scale were considered low risk. We have only one case control study and got a score of 65% of the quality scale, which is low risk and can be included in the study.

The following items were used to appraise **cross-sectional studies**:

[1] Inclusion criteria,[2] Description of study subject and setting,[3] Valid and reliable measurement of exposure,[4] Objective and standard criteria used, [5] Identification of confounder,[6] Strategies to handle confounder,[7] Outcome measurement, and [8] Appropriate statistical analysis. Studies were considered low risk when it scored 50% and above of the quality assessment indicators. We have twenty two cross-sectional study and all have got a score of above 50% of the quality scale, which is low risk and can be included in the study.

Outcome measurement

Institutional Delivery Service utilization was considered, when women's reported that they gave their most recent birth (within the last two years) at health institution.

Data synthesis and analysis

Synthesis was begun by constructing a clear descriptive summary of the included studies. This was done by tabulating details about name of author, year of study or year of publication, study design, and number of participants.

The data entry and statistical analysis for the quantitative data was carried out using stata-11 software. Tables and figures were used to summarize the selected studies and results descriptively. We also implemented a meta-analysis of studies that provided a comparable classification of the determinants or exposures and the outcome variables.

For the meta-analysis, we considered estimates of adjusted odds ratio with the confidence interval (CI) as the measure of association. The overall effect (pooled estimates of the magnitude and the factors) of institutional delivery service utilization was estimated using a random effect model and measured by the prevalence rates and odds ratio with 95% CI. We selected the random effect model because of heterogeneity due to difference in the study design and study regions. To determine heterogeneity among studies, we calculated the I^2 statistic, which describes the percentage of total variation among studies due to heterogeneity rather than to chance. Statistical heterogeneity assessed using Forest plot, Cochran's Q statistic (P value < 0.1) and I square tests (>50%). Heterogeneity of studies was quantified using the I-squared statistic, in which 25, 50, and 75% represented low, moderate and high heterogeneity respectively [20]. Pooled analysis was conducted using a weighted DerSimonian and Laird random-effects model [21]. Publication bias was checked by funnel plot and more objectively through Egger's regression test [22]. Subgroup analysis was done by the study setting (region), design, and year of publication. Sensitivity analysis was employed to see the effect of single study on the overall estimation (Figure 4). Besides, the time-trend analysis was conducted to check whether variations through time are observed.

Results

Study characteristics and study participants

The search strategy retrieved 104 from PubMed, 23 from Cochrane library, 16 from Web of Science, 55 from Google, 69 from Google Scholar and 05 from other sources. After duplication removed, 97 remained. Finally, 43 studies were screened for full-text review and 24 were included to the prevalence and/ or associated factors analysis (Figure 2).Seven (7) Studies were found in Amhara region [23, 24] [25-29], Nine(9) in Oromia[30-38], two in Afar [39, 40], one in Bienishangul-Gumuz [41], three(3) in Southern Nation Nationalities and Peoples region (SNNPR) [42-44],one in Gambiela [45] and one in Tigray&Oromiya [46].

The design of 22 of the studies examined was cross-sectional, one prospective follow up, and one case control. The year of study publication ranged from 2010 to 2018, five (5) studies were published in 2018, eleven (11) studies were published between 2015 and 2017, and eight (8) studies were between 2011 and 2014. Table 1 summarizes the characteristics of the 19,969 women's who gave birth within the past two years preceding the survey encompassed by the twenty four included studies and among which 6,672 women gave birth in health institution. All twenty four studies had an enrollment period exclusively after 2010, when institutional delivery service utilization with at least one factor becomes available. All papers

stated the proportions of institutional delivery service utilization. A large proportion of the participants (69 %) in these studies were not use institutional delivery for their last birth (Table 1).

Quality of studies

The studies included in this systematic review and meta-analysis had no considerable risk (has low risk). Therefore, all the studies were considered [23-46] (Table 1).

Meta-analysis

Heterogeneity of studies

Heterogeneity test for the proportion of the review indicated $I^2=0.0\%$, no variability was observed among the included studies hence fixed effect model was assumed in the analysis.

Prevalence of Institutional delivery service utilization

The prevalence of institutional delivery service utilization of individual studies was range from 12.1% to 80.1% [28, 29]. The seven included studies from Amhara region, which was conducted at different period of time shows that the prevalence of institutional delivery service utilization was 74.7%,34.0%,62.3%,78.8%,15.7%,12.1%, and 80.1%[23-29]. The nine included studies from Oromiya region, which was conducted at different period of time shows that the prevalence of institutional delivery service utilization was 28.7%,13.9%,34.2%,39.7%,12.3%,47.0%,18.2%,16.4%, and 60.3%[30-38]. Three included studies from SNNPR region, which was conducted at different period of time shows that the prevalence of institutional delivery service utilization was 14.6%, 31.0% and 78.3% [42-44]. Two included studies from Afar region, which was conducted at different period of time shows that the prevalence of institutional delivery service utilization was 35.2% and 18.4% [39, 40]. Three different studies from Bie.Guz, Gambiela and Tigray&Oromiya (one from each) which was conducted at different period of time shows that the prevalence of institutional delivery service utilization was 51.1%, 63.2% and 25.0% respectively [41, 45 and 46].

The estimated overall prevalence of institutional delivery service utilization (IDSU) is presented in a forest plot (**Figure 3**). The overall pooled prevalence of IDSU was 31% (95% CI: 0.30, 0.31; $I^2 = 0.000\%$).

Publication bias

A funnel plot showed a symmetrical distribution (**Figure 4**). Egger's regression test p-value was 0.193, which indicated the absence of publication bias.

Subgroup analysis

The subgroup analysis based on the region and year of publication was done. Based on this, the prevalence of IDSU found to be 47%, 39% and 24% in Amhara, SNNPR and Oromiya studies respectively, on the other hand the prevalence of IDSU found to be 37% between the year of 2015-2016 and 2017-2018 and 24% between the years of 2011-2014 (**Table 2**).

Sensitivity analysis

There is no any study out of the confidence bound mean that all study has almost equal influence on the pooled proportion (**Figure 5**).

Time-trend analysis

The time-trend analysis showed that the prevalence of IDSU is increase from 24% (95%CI 23%, 25%) in 2011-2014 to 37 % (95%CI 36%, 38%) in 2017-2018. However, the pooled prevalence from year to year is increasing significantly (p-value = 0.000) (**Figure 6**).

Associated factors

Based on this review, IDSU in Ethiopian context is associated with the three dynamics factors of Andersen Healthcare Utilization conceptual model i.e. predisposing factors (The socio-cultural characteristics of individuals that exist prior to their illness.), enabling factors (the logistical aspects of obtaining care), and need (The most immediate cause of health service use, from functional and health problems that generate the need for health care services).

Predisposing factors

In a family where husbands had been a decision maker on a place where to give birth is 54 % (AOR=0.46; 95% CI 0.18, 1.19) less likely to give birth at health institution [32].

Attitude towards Institutional delivery

Women who had favorable attitude on institutional delivery service utilization were 2.83 times (AOR = 2.80; 95% CI 1.60, 4.91) more likely to use institutional delivery service as compared to those women having unfavorable attitude [36].

The pooled effects of three studies[28, 36, 39] showed that favorable attitude towards institutional delivery was a significant associated factors with IDSU. The pooled effect of this three studies revealed that those mothers who had favorable attitude towards institutional delivery service utilization were 2.83 times as likely to use the services.

Heterogeneity test indicated moderate variability, $I^2=48.4\%$ i.e. moderate heterogeneity, hence random effect model was assumed in the analysis. Sensitivity analysis was done, and no change was observed in the overall OR (**Figure7**).

Maternal Knowledge

Knowledge regarding danger signs during pregnancy and institutional delivery service increased the probability of utilizing health institution for delivery service. Women who had good knowledge on institutional delivery service utilization were 2 times (AOR = 2.10; 95% CI 1.08, 4.09) more likely to use institutional delivery service as compared to those women having poor knowledge [39].

The pooled effect of eleven studies[25, 27-30, 35, 36, 39, 41, 42, 44] showed that women who were knowledgeable were 3 times (AOR=3.04;95%CI 1.76,5.24) more likely to give birth in health institution than those women who were not knowledgeable. Heterogeneity test indicated high variability, $I^2=77.3\%$ i.e. high heterogeneity, hence random effect model was assumed in the analysis. Sensitivity analysis was done, and no change was observed in the overall OR (**Figure8**).

Maternal age at first pregnancy

Women whose age 15-24 (AOR=4.02; 95%CI 2.07-8.55) and 25-34 (AOR=2.21; 95% CI 1.32-3.69) at first pregnancy were more likely to use institutional delivery service[33].

The pooled effect of four studies[27, 28, 33, 41] showed that women who had their first pregnancy between the age of 15-24 years were 3.60 times as likely to give birth in health institution than those who became pregnant after 35 years of age (AOR= 3.59; 95% CI 2.27 5.69). Heterogeneity test indicated $I^2=0.0\%$, no variability was observed among the included studies hence fixed effect model was assumed in the analysis. Sensitivity analysis was done and illustrated stability of overall OR (**Figure 9**).where as women who had their first pregnancy between the ages of 25-34 years were not became significantly associated factors (**Figure 10**).

Maternal Education

This review indicated that significant association between women's' educational status and utilization of institutional delivery service. Women who can read & write (AOR=1.75; 95% CI 1.21-2.54), Primary level (AOR=2.23;95%CI 1.39,3.59) and secondary & above(AOR=2.40;95%CI 1.05,5.49) more likely to use institutional delivery service [24].

The pooled estimate findings of five [24, 26, 27, 32, 35] review also indicated significant association between mothers' educational status and utilization of institutional delivery service. Mothers who can read and write were 1.62 times as likely to give birth at health institution as compare to who can't read& write(AOR=1.62;95%CI 1.18-2.24). Heterogeneity test indicated $I^2=0.0\%$, hence fixed effect model was assumed in the analysis. Sensitivity analysis did not bring significant change in the overall ORs (Figure 11).

Similarly women's who attend Primary school were almost two times as likely to give birth at health institution than who can't read and write (AOR=1.95; 95% CI 1.42-2.69). Heterogeneity test indicated $I^2=0.0\%$, hence fixed effect model was assumed in the analysis. Sensitivity analysis did not bring significant change in the overall ORs (Figure 12).

Women's who attended secondary and above educational level were almost three times as likely to give birth at health institution as compare to women's who can't read and write (AOR=2.92;95% 1.88-4.52. Heterogeneity test indicated $I^2=0.0\%$, hence fixed effect model was assumed in the analysis. Sensitivity analysis did not bring significant change in the overall ORs (Figure 13).

Maternal occupation

Women's who is not house wife in occupation (AOR=2.50; 95 % CI 0.75,8.30) were more likely to use institutional delivery service [26].

The pooled estimate findings of five [24, 26, 27, 33, 35, 37, 42] review showed insignificant association of utilization of institutional delivery service with mothers' occupation (AOR=1.10; 95% CI 0.57,2.09). Heterogeneity test indicated $I^2=65.1\%$, moderate variability hence random effect model was assumed during analysis. Sensitivity analysis was done, and no change was noted on overall OR (Figure 14).

Parity

The combined estimate findings of five [27, 32, 33, 40, 43] review shows that the number of children the women delivered was not significantly associated with institutional delivery service utilization(AOR= 1.48; 95% CI 0.75,2.95) and (AOR=1.10;95%CI 0.87,1.39) for women who have one and 2-4children respectively. Heterogeneity test indicated for women who have one child is $I^2=81.2\%$, hence random effect model was assumed in analysis Sensitivity analysis was done, and no significant change was observed in overall OR (Figure 15), whereas for women who have 2-4 children $I^2=0.0\%$, hence fixed effect model was assumed in analysis.

Enabling factors

Availability of Information Source

The chance of delivering in health institution among those women have the access of information source were 1.8 times higher than those women who have not the access of information source (AOR = 1.80; 95%CI 1.16, 2.78). Heterogeneity test indicated $I^2=71.9\%$, hence random effect model was assumed in the analysis. Sensitivity analysis was done and revealed the stability of overall effect size (Figure 16).

Place of residence

The pooled estimated findings of seven [26, 28, 29, 34, 35, 41, 43] review showed that place of residence as defined rural and urban were the enabling factors that determined utilization of institutional delivery service. Women from urban area were 3.84 times as likely to deliver in health institution than women from rural area (AOR= 3.84; 95%CI 1.31, 11.25). Heterogeneity test indicated $I^2=91.3\%$, hence random effect model was assumed in the analysis. Sensitivity analysis was done, and no change was noted in the overall OR (Figure 17).

Distance to health facility

The findings of five [27, 32, 33, 40, 43] review shows that distance to health facility was not significantly associated with institutional delivery service utilization(AOR= 1.45;95% CI 0.97 2.18). Heterogeneity test indicated $I^2=77\%$, hence random effect model was assumed in analysis. Sensitivity analysis was done, and no significant change was observed in overall OR (Figure 18).

Need factors

ANC follow up

The combined finding of thirteen study[24, 25, 28-30, 32-36, 39, 40, 46] review showed that ANC follow up was significantly associated with institutional delivery service utilization. Women who had ANC follow-up 2.6 times as likely to utilize the service than those who did not visited ANC (AOR= 2.57; 95%CI 1.46, 4.54). Heterogeneity test indicated $I^2=93.3\%$, hence random effect model was assumed in the analysis. Sensitivity test was done, and no change was noted on overall OR (Figure 19).

Frequency of ANC follows up

The combined effect of four study [29, 35, 41, 42] shows that attending ANC follow up four or more was significantly associated with institutional delivery service utilization. Women who attended ANC four or more times were 4 times as likely to give birth in health institution than those women who attended ANC service below four or less than four times (AOR= 4.04 ;95%CI 1.21,13.46). Heterogeneity test indicated $I^2=90.6\%$, hence random effect model was assumed in the analysis. Sensitivity test demonstrated stability of the overall OR (Figure 20).

Place of birth the most recent birth

The pooled effects of four studies [27, 29, 31, 43] showed that women's who have an experience a birth of the most recent birth in health institution were 8.44 times as likely to utilize the service again than those who gave the most recent birth in home (AOR=8.44;95% CI 5.75 12.39).Heterogeneity test indicated $I^2=0.0\%$, no heterogeneity, hence fixed effect model was assumed in the analysis. Sensitivity analysis did not bring significant change in the overall ORs (Figure 21).

Presence of complication during birth preceding the most recent birth

Finding of review from four studies [25, 38-40] indicated that presence of complication during birth preceding the most recent birth was not significantly associated with institutional delivery service utilization (AOR= 1.00; 95%CI 0.39, 2.70). Heterogeneity test indicated $I^2=85.8\%$, high variability, hence random effect model was assumed in the analysis. Sensitivity analysis was done and illustrated stability of overall OR (Figure 22).

Discussion

In this review, twenty four studies comprising a total of 19,969 participants were analyzed to estimate the best available evidence for the prevalence and factors associated with IDSU in Ethiopia. The findings of the review have revealed valuable information which is comparable with all the factors related to the outcome variable across the nation. The factors were

related to the three dynamics factors of Andersen Health care Utilization conceptual model i.e. predisposing factors (The socio-cultural characteristics of individuals that exist prior to their illness), enabling factors (the logistical aspects of obtaining care), and need factors (The most immediate cause of health service use, from functional and health problems that generate the need for health care services).

This meta-analysis was estimated the national prevalence of IDSU in Ethiopia. Accordingly, the national pooled prevalence of IDSU was 31% (95% CI: 0.30-0.312). This result was in line with an analysis study from Four Demographic surveillance sites of South Asia[47]. But less than a study from Haiti 2012 Demographic Health Survey and 2013 service provision assessment survey (39%) [48] and an analysis of Nepal Demographic and Health survey 2011(36.9%) [49]. This difference is probably due to the fact that the way of awareness creation regarding institutional delivery service for the large community ,difference in community engagement and with poor access to health services in Ethiopia.

From the subgroup analysis, the prevalence of IDSU was high in Amhara as compared to other regions. Those studies included in this meta-analysis were conducted in community based.

Based on the pooled analysis of three or more AOR of studies, maternal age at first pregnancy (15-24 years), place of residence (Urban), maternal knowledge (good knowledge), maternal educational status(Can read & write, primary level, secondary & above) ,Attitude towards Institutional delivery (favorable attitude), availability of information system, ANC follow- up,frequency of ANC(4+) follow up and place of birth the most recent birth(health institution) were associated with IDSU.

The odds of women's age 15-24 years were more likely to use institutional delivery service. This finding is consistent with a primary studies conducted in Nepal and three district of Tanzania[49, 50]. The possible explanations might be that younger women are more likely to be literate and more likely to have knowledge on the benefits of health care facility delivery than older women. On the other hand, older women may consider that giving birth at home is not risky as they have previously experienced birth at home.

Women's knowledge on danger sign of pregnancy and IDSU was found to be one of the determinants in this review (AOR=3.04; 95%CI 1.76, 5.24). This finding was in agreement with primary study findings from Kenya [51] and Southern Tanzania that illustrated nearly threefold increase in skilled birth attendance when women has knowledge about risks during pregnancy (AOR=2.95 ; 95% CI 1.65,5.25) [52]. Knowledge is an important factor that affects attitude, intention and behavior. Women who have sufficient knowledge about delivery danger signs might have perceived service benefits of a health institution, like complication management by skilled health care workers in time of labor.

Educational status of women's was found to be one of the determinants in this review i.e. women's who can read & write, who attend Primary school, secondary & above were more likely to use institutional delivery service as compare to women's who can't read & write. This finding is consistent with study from countries; an analysis from the Four Demographic surveillance sites of South Asia women's who attend secondary in Bangladesh (AOR=2.46) [47] , from 2012 Haiti demographic Health Survey & 2013 Haiti service provision assessment survey who attend primary in rural Haiti(AOR=1.47),who attend secondary and above in rural Haiti(AOR=2.06) [48], who attend secondary & above in Guatemala,Mexco and panama(AOR=1.36) [53], an analysis from Bangladesh Demographic Health Survey 2011 who attend Primary school(AOR=1.26), Secondary & above(AOR=2.07)[54]and an analysis of 2013 Nigeria DHS data set who attend primary and secondary & above(AOR=1.48 & 2.54 respectively) [55]and a primary study in Guinea women's who can read & write(AOR=2.4)[56]. As education makes mothers to be more concerned for institutional delivery service utilization their health and have more autonomy, their ability and freedom to make decisions about their own health is more favorable, which eventually enhance their health-seeking behavior. Education also improves the ability of educated women to afford the cost of medical health care service.

Women's with adequate exposure to the media had more odds of institutional delivery than mothers with inadequate exposure. This finding was supported by a primary cross sectional study in a remote mountains district of Nepal [57]. Having adequate exposure to the media might increase the woman's concern and awareness of her pregnancy related issue and the need for professional help and having adequate exposure to the media increasing their familiarity with medical personal which expose the women to more health education and counseling which are more likely to increase the utilization of delivery service.

Place of women's residence was significantly associated with the utilization of institutional delivery service. This finding was consistent with an analysis of 2011 Demographic health survey of Nepal, which showed that urban/rural differences had significant associations with institutional delivery service utilization (AOR=2.42; 95%CI 1.83 3.19) [49] and with an analysis of 2011 Bangladeshi Demographic Health Survey(AOR=1.84)[54]. This might be explained in terms of the characteristics of the urban residents, namely more proportion of educated mothers, more proportion of knowledge on institutional delivery service, availability of health care services nearby, and better access to information than rural mothers.

The result of this review revealed that attendance of four or more ante natal visits increases the likelihood of health facility delivery. This finding is consistent with a primary studies conducted in Kenya (AOR=3.01; 1.74,5.20) [58], Tanzania (AOR=1.97;95% CI 1.12-3.47) [59],an analysis of 2013 Nigeria DHS data set (AOR=2.16) [55],an analysis of Nepal Demographic and Health survey 2011(AOR=4.94)[49] and 2011 Bangladeshi Demographic Health survey (AOR=3.639) [54]. Making four or more ANC visits were the recommended ANC visit by WHO and which might reflect the woman's concern of her pregnancy related issue and the need for professional help and visiting ANC frequently increasing their familiarity with medical personal which expose the women to more health education and counseling which are more likely to increase the utilization of delivery service.

Strength and limitation

This systematic review and meta-analysis is the national estimation conducted in Ethiopia. The strength of this review includes all of the included studies used women who had given birth in the two years preceding the survey as study participants and they may not have been subject to recall bias, able to conduct a methodologically rigorous meta-analysis, report an adjusted odds ratio, sensitivity analysis, and sub-group analysis and the employment of a quality indictor to select only sound publications has ensured the quality of the research findings. Few of the limitations were; ninety percent of the included studies are cross-sectional in nature, which limits our ability to assess cause-effect relationship, we are unable to show the pooled estimates for all variables associated with institutional delivery because the included studies classify the variables in different ways.

Policy implications

This review suggests that increasing women's participation in different health and health care activities will have a long-term positive effect on institutional delivery service utilization. Institutional delivery services and home delivery preventative activities in general, should be higher on the healthcare agenda. We also recommend further research into women's perceptions of institutional delivery services.

Conclusions

This systematic review and Meta-analysis revealed that the prevalence of Institutional delivery service utilization in Ethiopia remains low. It also showed that attitude towards institutional delivery, maternal age at first pregnancy, residence setting, educational status of mothers, availability of information source, ANC follow-up, frequency of ANC follow up, knowledge of institutional delivery & danger signs during pregnancy and place of birth the most recent birth as factors positively and significantly associated with institutional delivery service utilization. However, maternal occupation, pareity, distance to

health facility and presence of complication during birth preceding the most recent birth was not associated with institutional delivery service utilization.

This review may help policy-makers and program officers to design appropriate interventions on institutional delivery service utilization.

Declarations

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Availability of data and materials

All data generated or analyzed during this study are included in this published article.

Authors' contributions

AN conceived and designed the study. TA and MY established the search strategy. All the authors read the manuscript before they have given the final approval for publication.

Ethics approval and consent to participate

Not applicable because no primary data were collected.

Consent for publication

Not applicable.

Competing interests

The authors declared that they have no competing interest.

Abbreviations

ANC: Antenatal car

AOR: Adjusted Odd Ratio

CI: Confidence interval

DF: Degree of freedom

D-L: Dersimonian and laird

EDHS: Ethiopia Demographic and Health Survey

IDUS: Institutional delivery service utilization

I-V: inverse variance

JBI: Joanna Briggs Institute

OR: Odds Ratio

PRISMA: Preferred Reporting Items for Systematic Review and Meta-Analysis statement

SDG: Sustainable Development Goals

SNNPR: Southern Nation Nationality and Peoples Region

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Tables

Table 1: Characteristics and quality status of the studies

First author/year	Study region/Location	Study design	Participants/Subjects	Sample size	Prevalence (%)	Quality status by using JBI checklist	Remark
Assefa et al/2018	Afar	CS	women who gave birth in the last one years	423	35.2	Low risk	
Gedefaw et al/2018	Amhara	CS	women who gave birth in the last one years	360	74.7	Low risk	
Weldemariam et al/2018	Bie.Guz	CS	women who gave birth in the last one years	427	51.1	Low risk	
Fadele et al/2017	SNNPR	CS	women who gave birth in the last two years	765	78.3	Low risk	
Kiflie et al/2017	Oromiya	CS	women who gave birth in the last two years	561	28.7	Low risk	
Kidau et al/2017	Amhara	CS	women who gave birth in the last two years	674	34.0	Low risk	
Golicha et al/2017	Oromiya	CS	women who gave birth in the last two years	791	13.9	Low risk	
Ejeta et al/2015	Oromiya	CC	women who gave birth in the last one years	380	34.2	Low risk	
Bayu et al/2015	Amhara	Cohort	2 nd and 3 rd trimester pregnant women	393	62.3	Low risk	
Tekelab et al/2015	Oromiya	CS	women who gave birth in the last two years	798	39.7	Low risk	
Habte et al/2015	SNNPR	CS	women who gave birth in the last two years	816	31.0	Low risk	
Hagos et al/2014	Tigray&Oromiya	CS	women who gave birth in the last two years	4949	25.0	Low risk	
Abeje et al/2014	Amhara	CS	women who gave birth in the last one years	481	78.8	Low risk	
Wolelie et al/2014	Amhara	CS	women who gave birth in the last two years	394	15.7	Low risk	
Amano et al/2012	Oromiya	CS	women who gave birth in the last one years	855	12.3	Low risk	
Bogale et al/2014	Oromiya	CS	women who gave birth in the last one years	562	47.0	Low risk	
Shimeka et al/2012	Amhara	CS	women who gave birth in the last one years	371	12.1	Low risk	
Fikre et al/2012	Oromiya	CS	women who gave birth in the last two years	506	18.2	Low risk	
Abera et al/2011	Oromiya	CS	women who gave birth in the last one years	1074	16.4	Low risk	
Ahmed et al/2018	Afar	CS	women who gave birth in the last two years	1842	18.4	Low risk	
Dejene et al/2015	SNNPR	CS	women who gave birth in the last two years	756	14.6	Low risk	
Limenih et al/2016	Amhara	CS	women who gave birth in the last two years	404	80.1	Low risk	
Shigute et al/2017	Oromiya	CS	women who gave birth in the last one years	589	60.3	Low risk	
Mekonnen et al/2018	Gambiela	CS	women who gave birth in the last one years	798	63.2	Low risk	

Key:-CS=Cross-sectional; CC=Case Control

Table 2: The pooled proportion of IDUS, 95% CI and heterogeneity estimate with a p-value for the subgroup analysis

Variables	Characteristics	No of studies	Pooled proportion	(95% CI)		Weight	I ² (P-value)
By region (Fixed)	Afar	2	0.21	0.19	0.22	12.09	0.00 % (0.000)
	Amhara	7	0.47	0.46	0.49	15.81	0.00 % (0.000)
	Bie.Guz	1	0.51	0.46	0.56	1.46	0.00 % (0.000)
	SNNPR	3	0.39	0.37	0.40	12.33	0.00 % (0.000)
	Oromiya	9	0.24	0.23	0.25	32.77	0.00 % (0.000)
	Tigray&Oromiya	1	0.25	0.24	0.26	22.61	0.00 % (0.000)
	Gambiela	1	0.63	0.60	0.66	2.94	0.00 % (0.000)
	Over all	24	0.31	0.30	0.31	100.00	0.00 % (0.000)
By year of Publication (Fixed)	2017-2018	10	0.37	0.36	0.38	34.66	0.00 % (0.000)
	2015-2016	6	0.37	0.35	0.38	16.39	0.00 % (0.000)
	2011-2014	8	0.24	0.23	0.25	48.95	0.00 % (0.000)
	Over all	24	0.31	0.30	0.31	100.00	0.00 % (0.000)

Figures

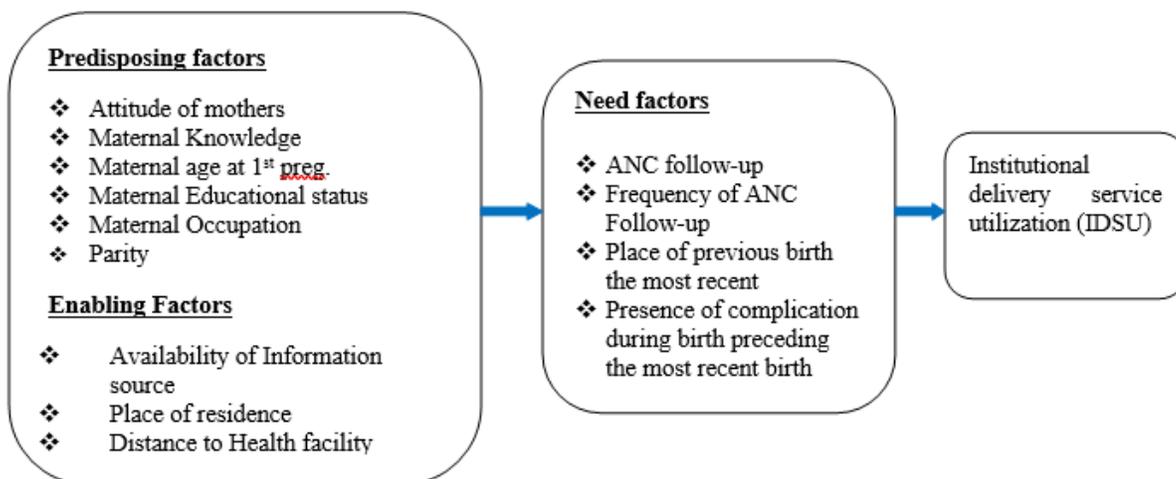


Figure 1

Conceptual framework of factors associated with the utilization of institutional delivery services in Ethiopia

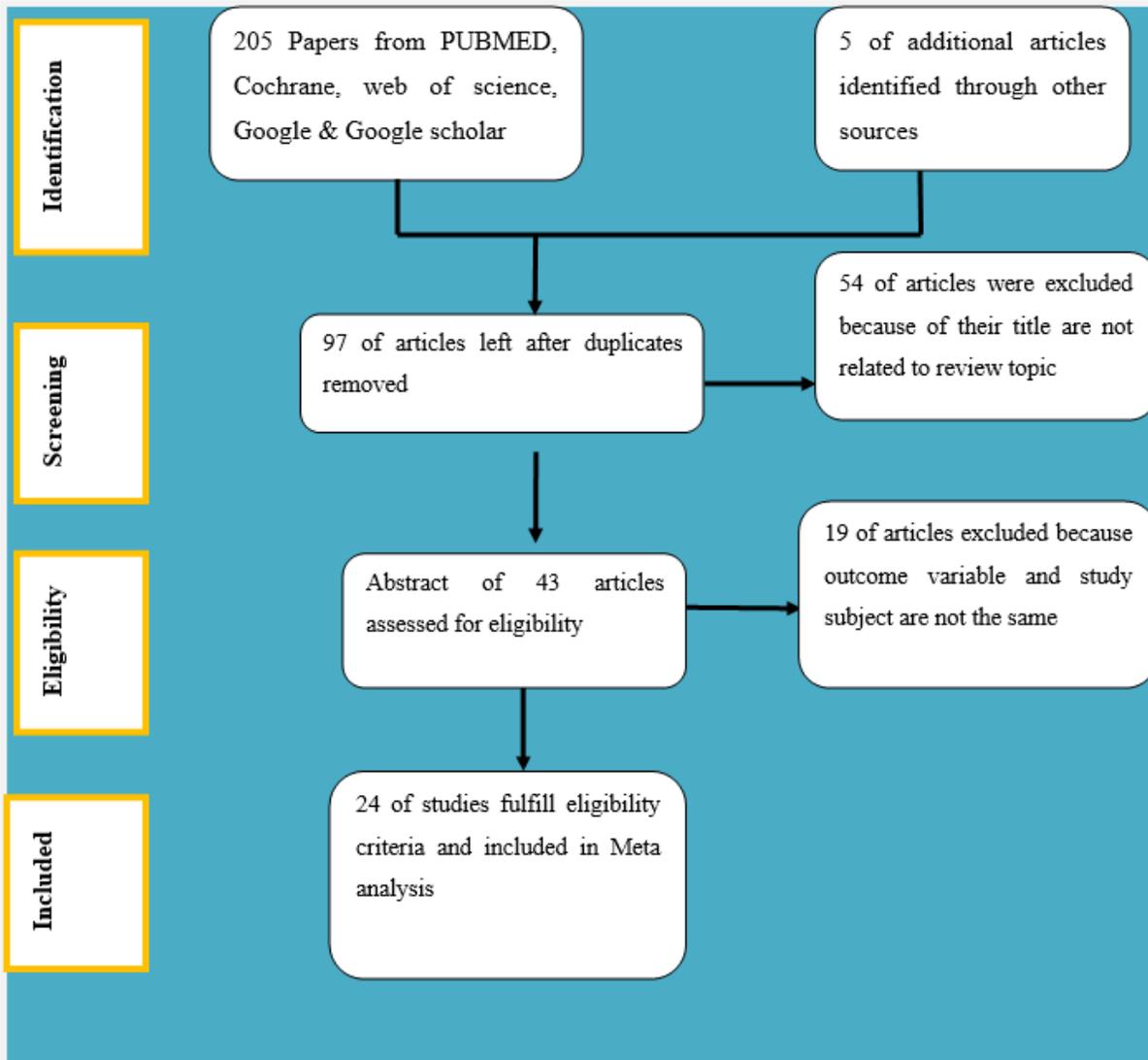


Figure 2

Study selection process

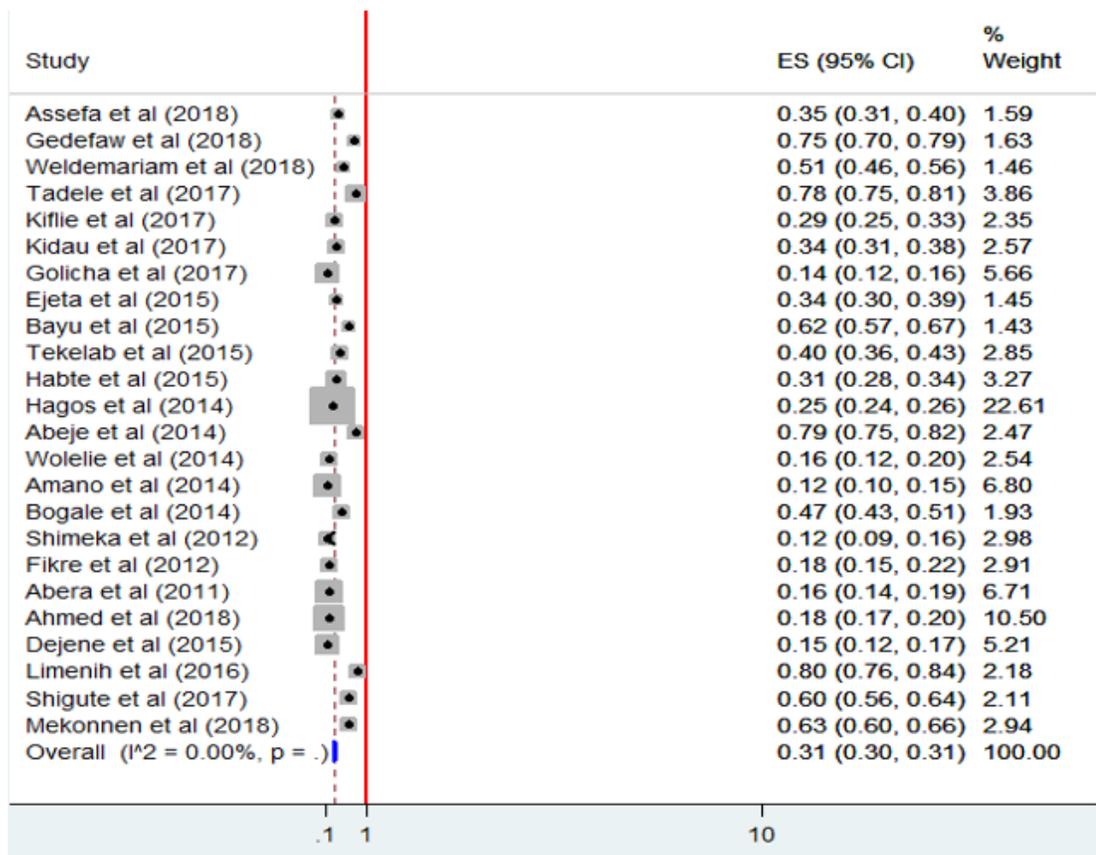


Figure 3

Forest plot of the Proportion of IDSU with corresponding 95% CIs

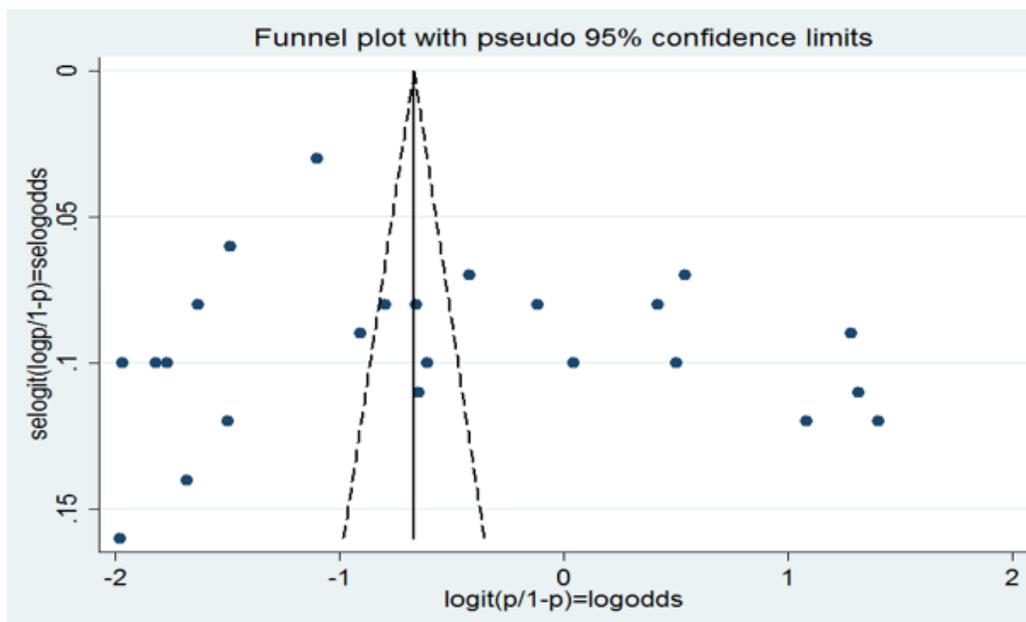


Figure 4

Funnel plot for publication bias.

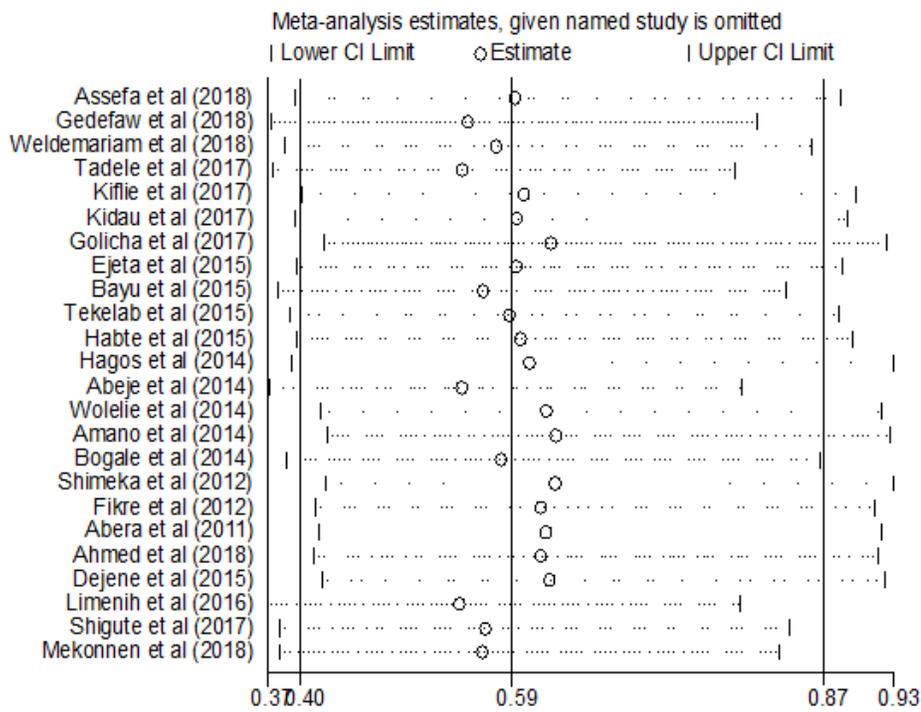


Figure 5

The sensitivity analysis showed the pooled proportion when the studies omitted step by step

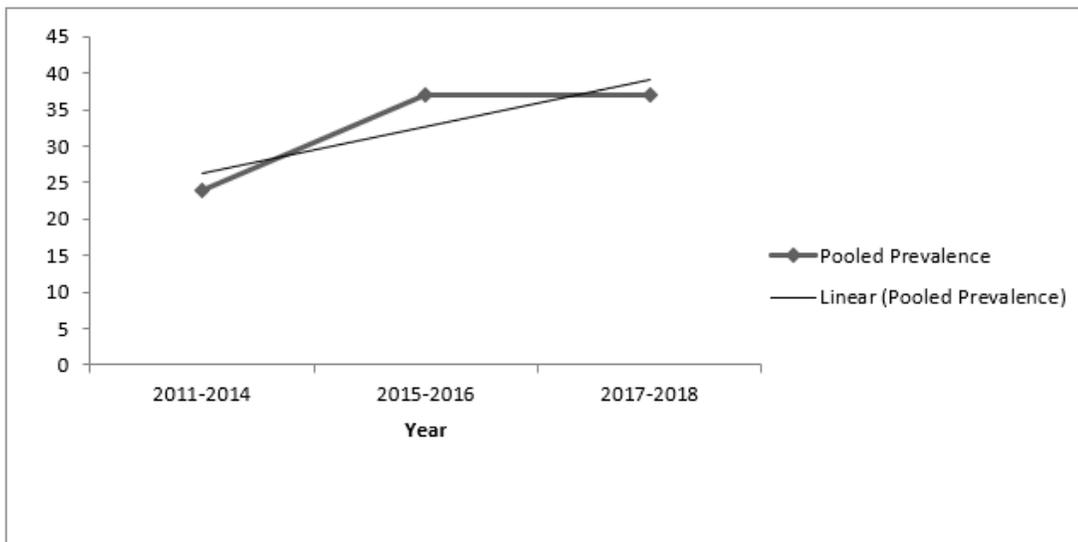


Figure 6

Time-trend analysis of the pooled prevalence of Institutional delivery service utilization in Ethiopia from 2011 to 2018

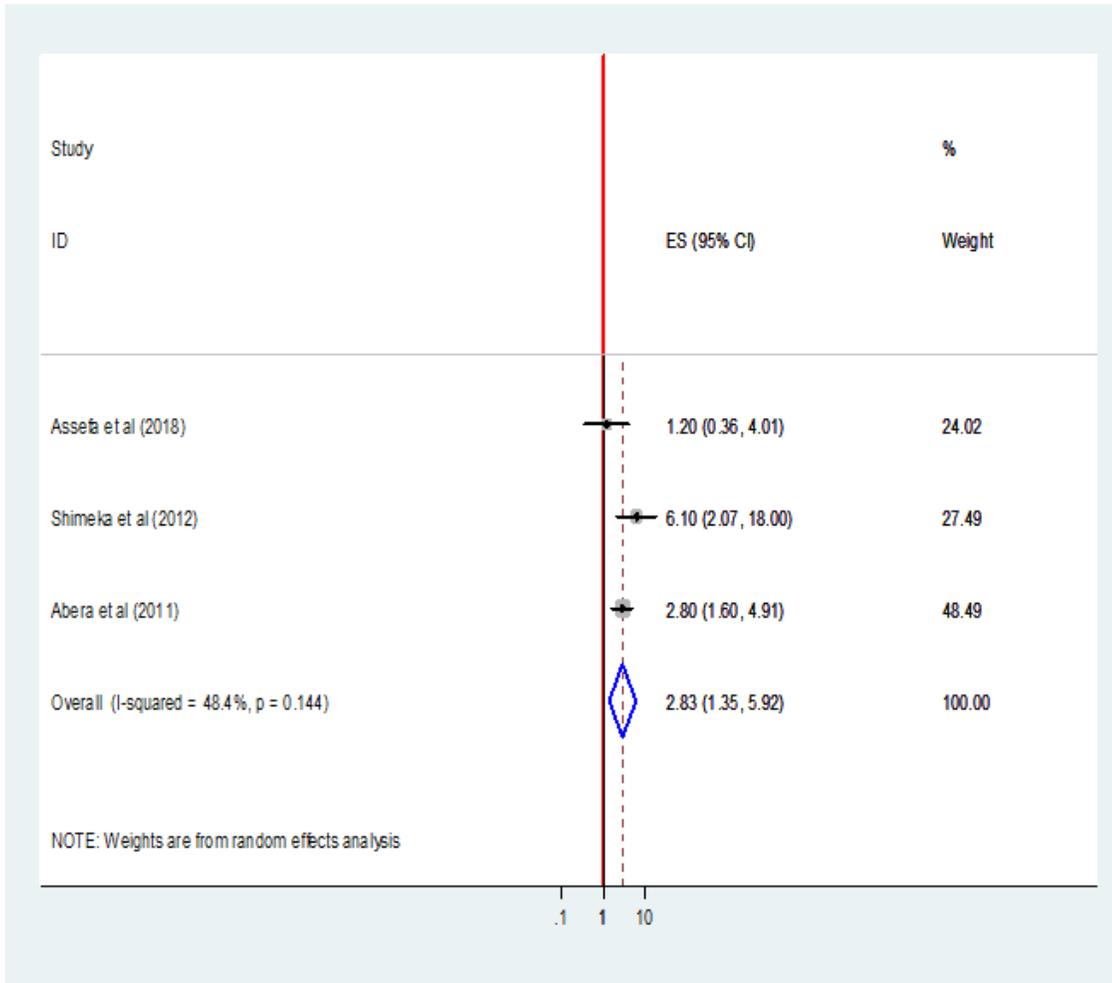


Figure 7

The pooled effects of maternal attitude on Institutional delivery service utilization.

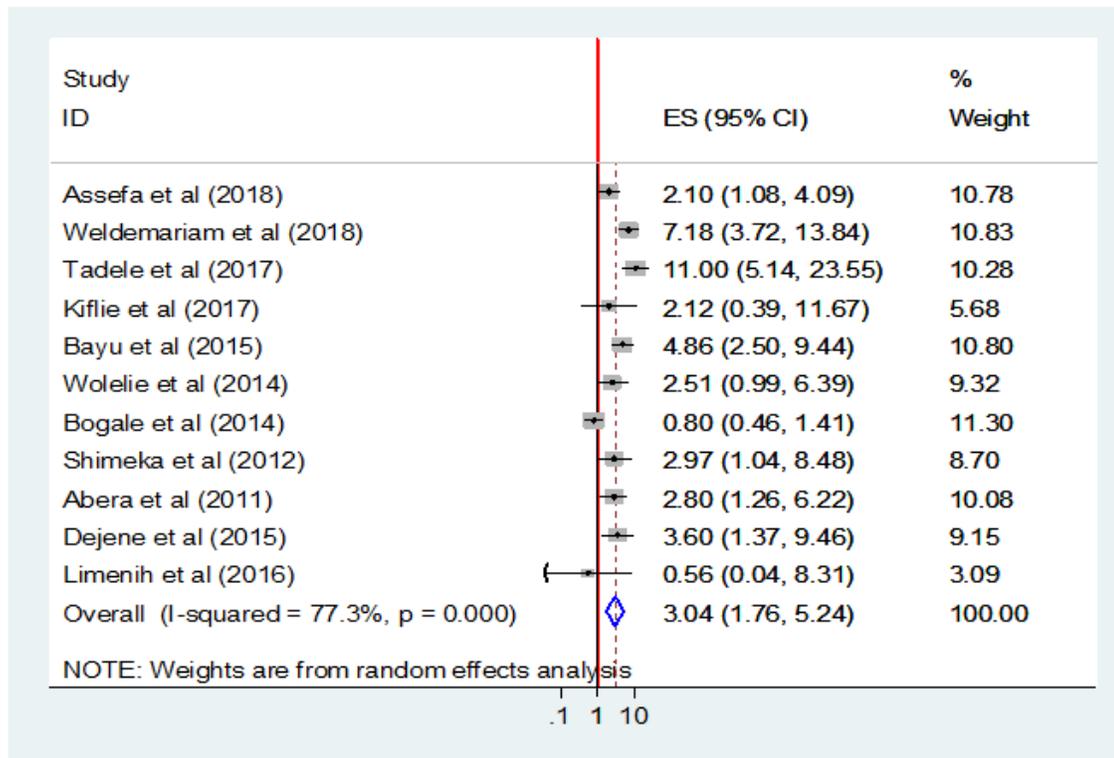


Figure 8

Association of knowledge of women's with institutional delivery service utilization in Ethiopia, 2010–2018. Abbreviations: CI, confidence interval; df, degrees of freedom; D–L, Dersimonian and laird.

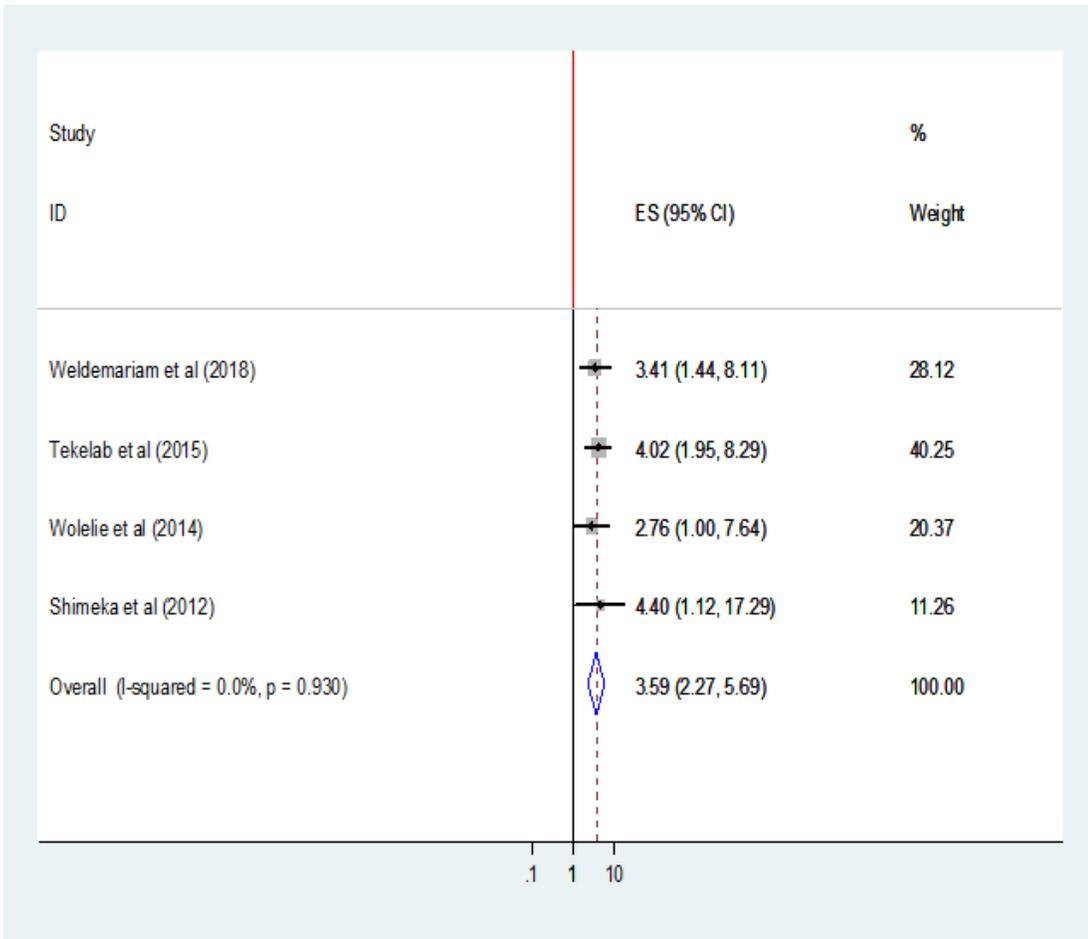


Figure 9

Association of age at first pregnancy (15-24yrs) with institutional delivery service utilization in Ethiopia, 2010–2014. Abbreviations: CI, confidence interval; df, degrees of freedom Inverse Variance.

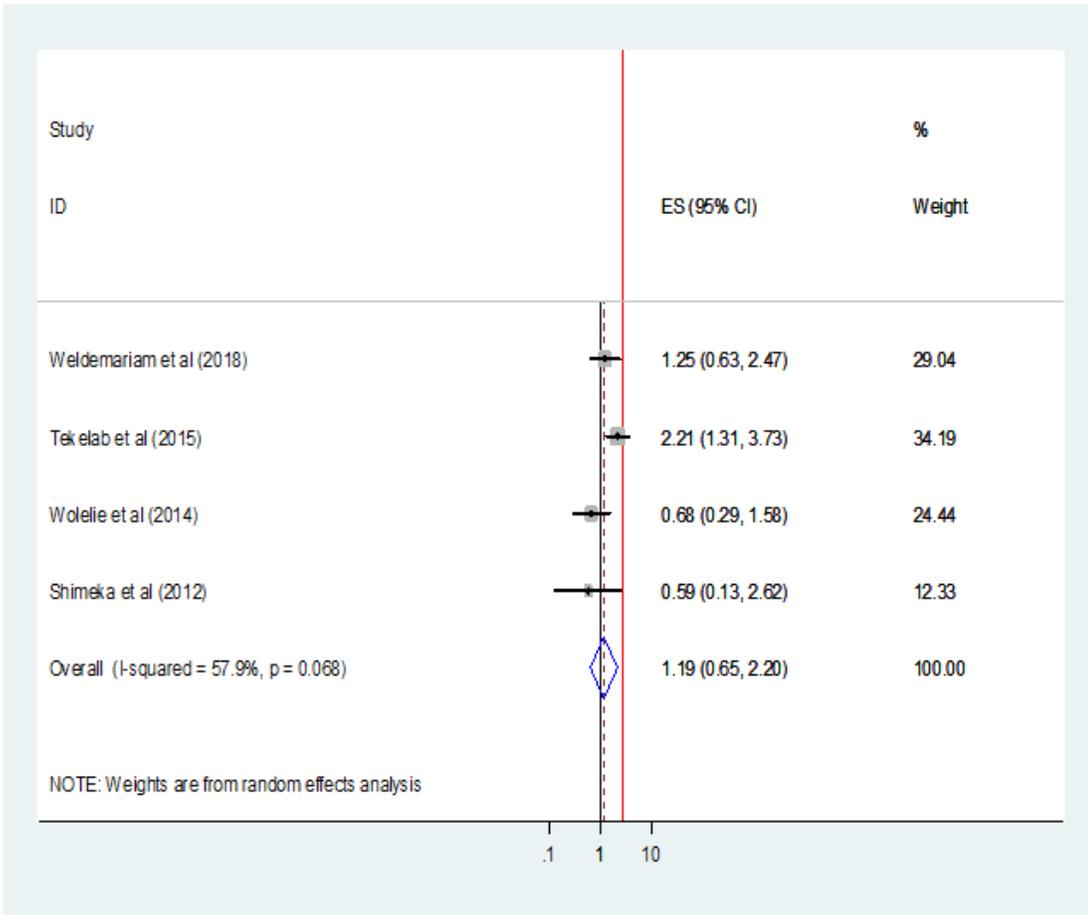


Figure 10

Association of age at first pregnancy (25-34yrs) with institutional delivery service utilization in Ethiopia, 2010–2018. Abbreviations: CI, confidence interval; df, degrees of freedom; Inverse Variance.

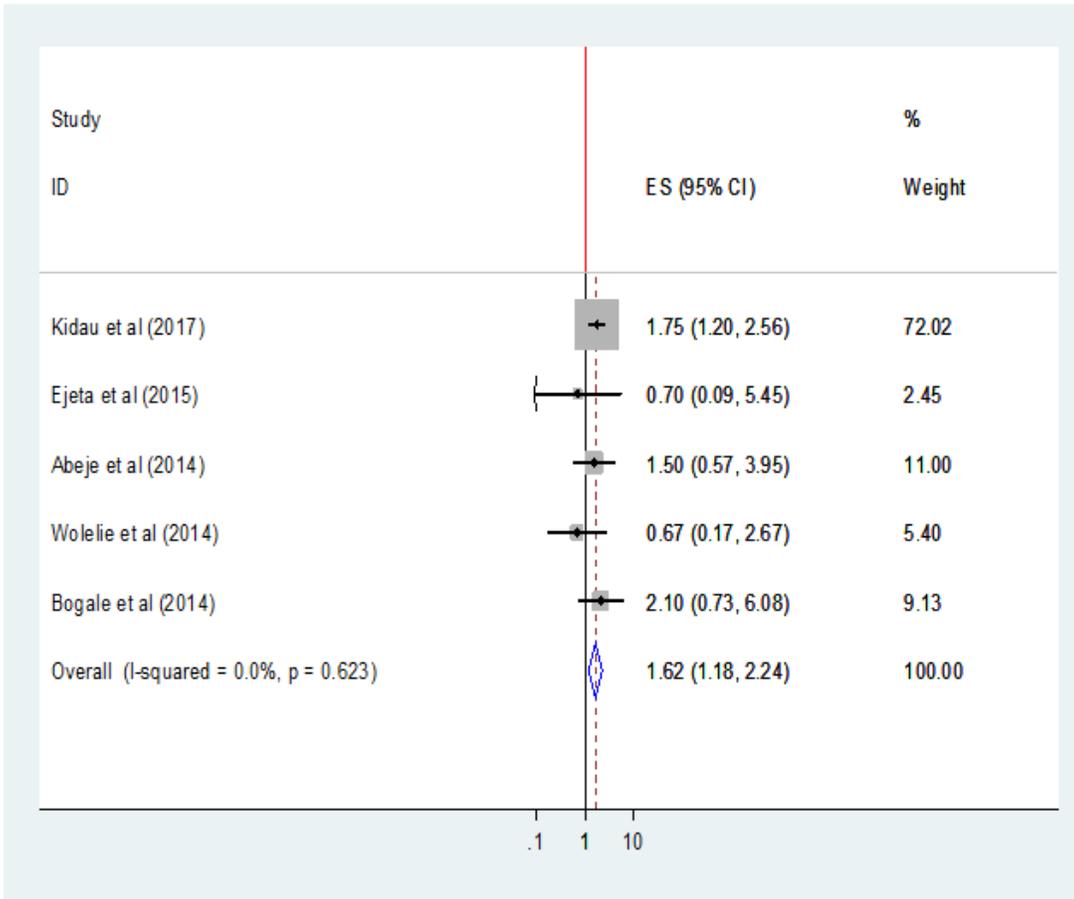


Figure 11

Association of educational statuses (can read and write) of the women with institutional delivery service utilization in Ethiopia, 2010–2018. Abbreviations: CI, confidence interval; df, degrees of freedom; I-V, Inverse Variance.

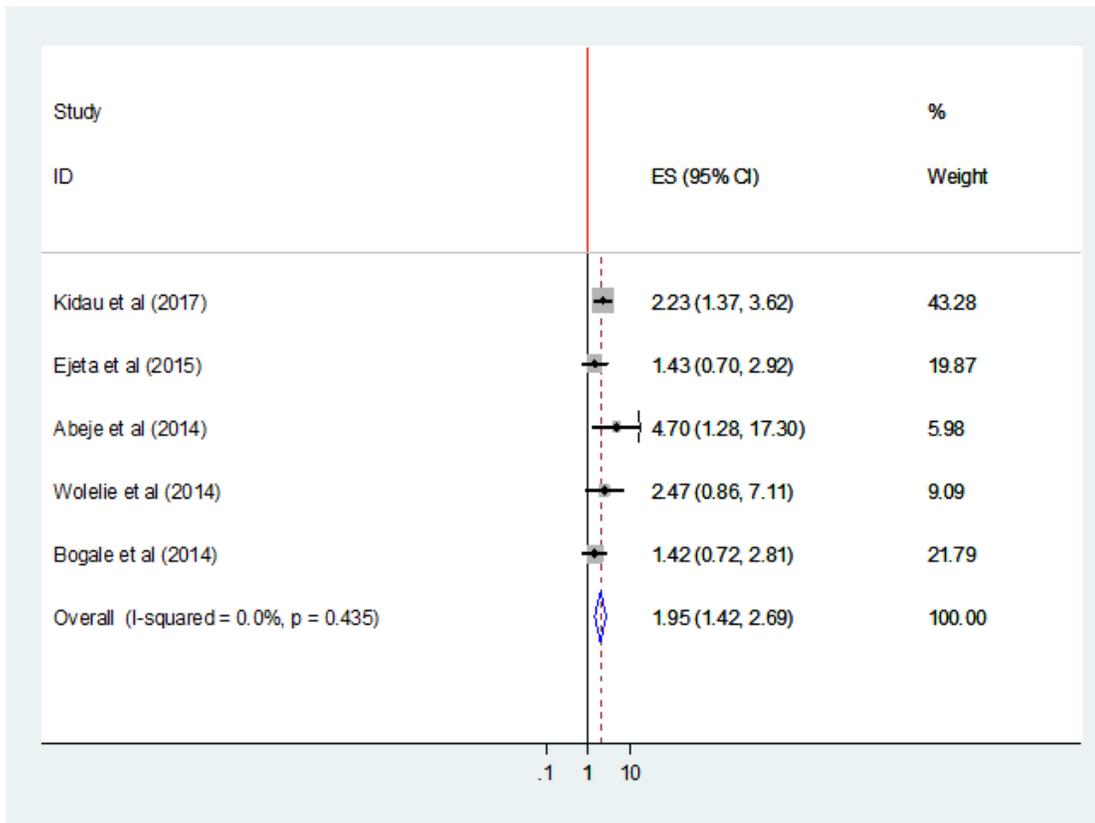


Figure 12

Association of educational statuses (Primary school) of the women with institutional delivery service utilization in Ethiopia, 2010–2018. Abbreviations: CI, confidence interval; df, degrees of freedom; Inverse Variance.

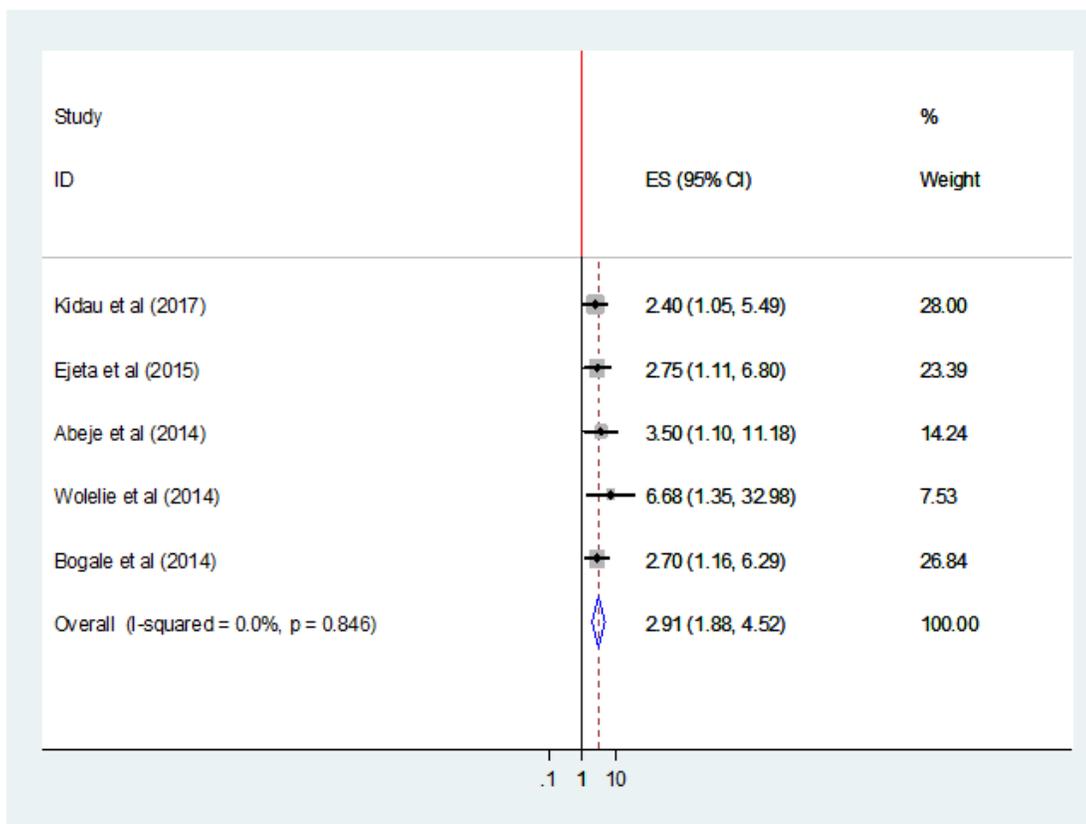


Figure 13

Association of educational statuses (Secondary school & above) of the women with institutional delivery service utilization in Ethiopia, 2010–2018. Abbreviations: CI, confidence interval; df, degrees of freedom; I-V, inverse variance.

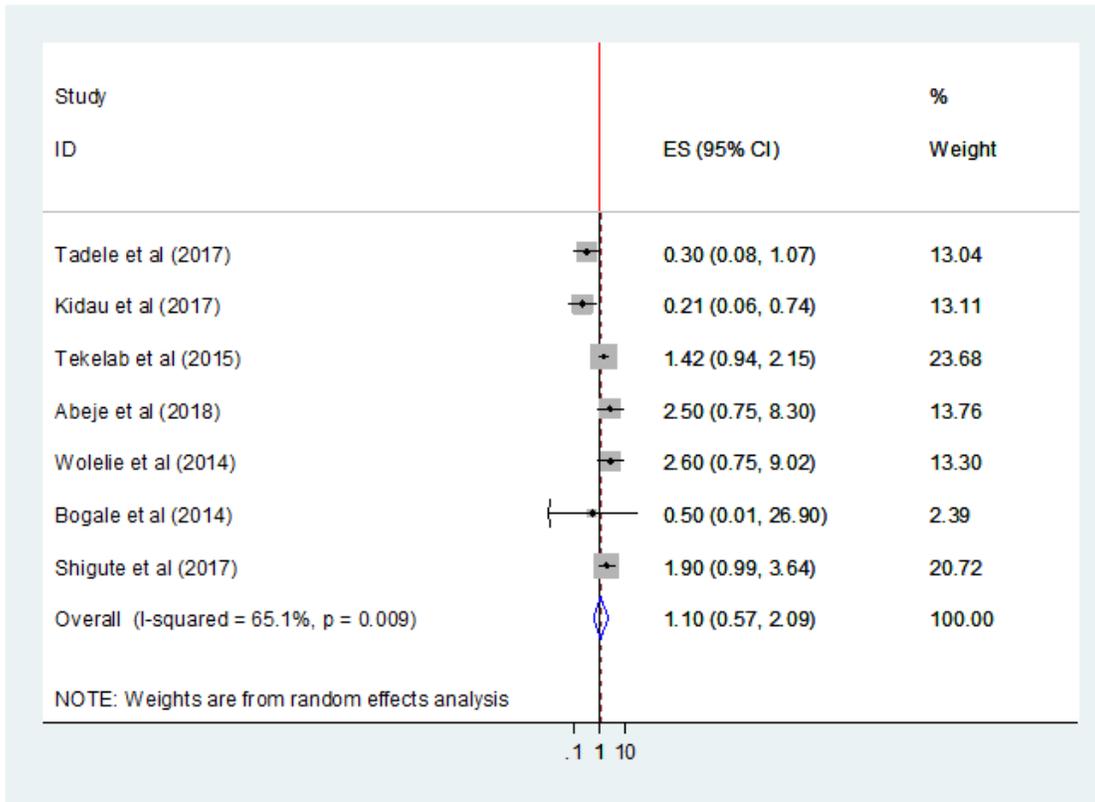


Figure 14

Association of Occupation of the women with institutional delivery service utilization in Ethiopia, 2010–2018. Abbreviations: CI, confidence interval; df, degrees of freedom; D-L, Dersimonian and laird.

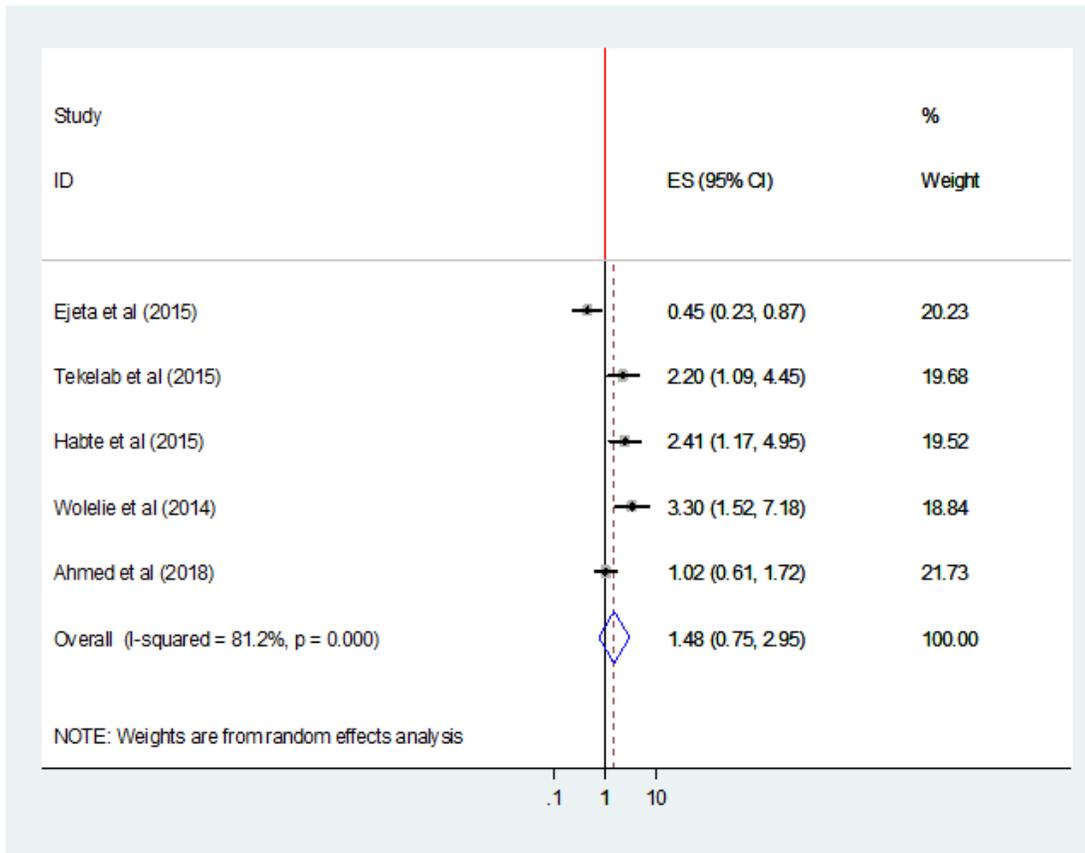


Figure 15

Association of parity (Parity=1) with institutional delivery service utilization in Ethiopia, 2010–2018. Abbreviations: CI, confidence interval; df, degrees of freedom; D-L, D-L, Dersimonian and laird.

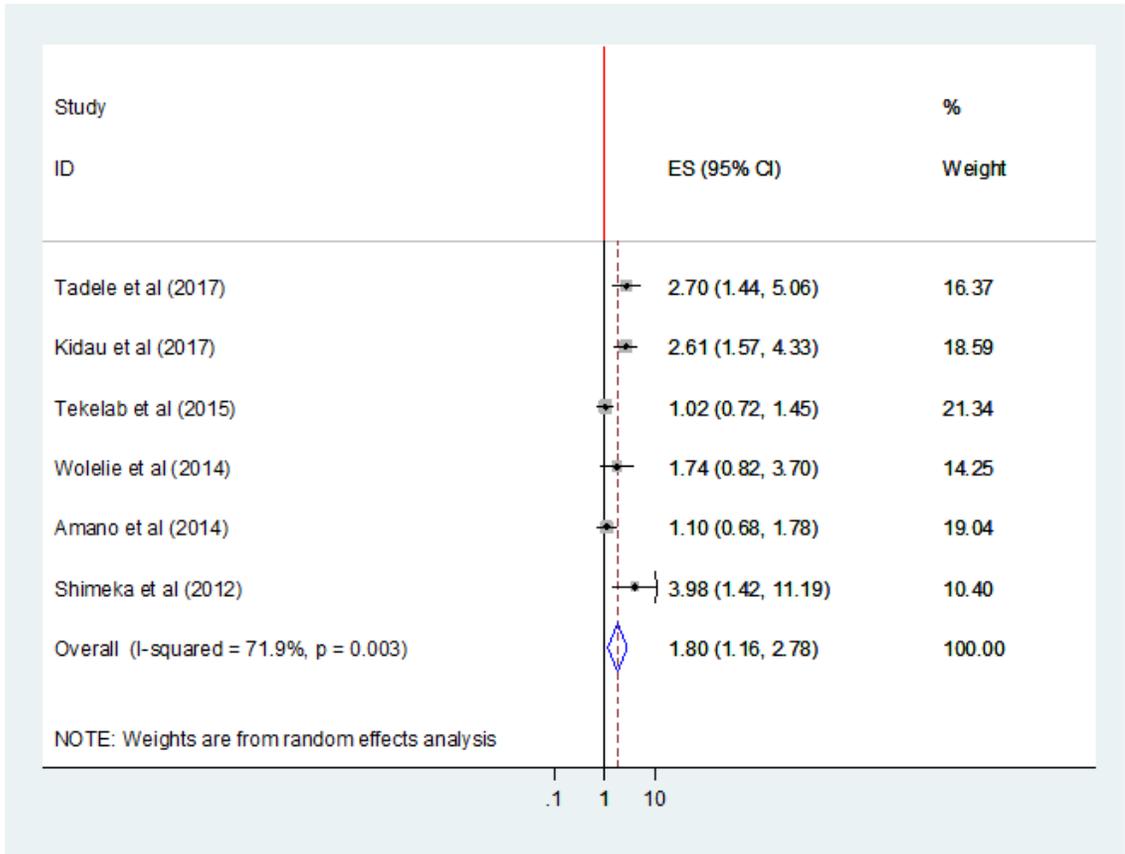


Figure 16

Association of availability of information source with institutional delivery service utilization in Ethiopia, 2010–2018. Abbreviations: CI, confidence interval; df, degrees of freedom; D-L, D–L, Dersimonian and laird.

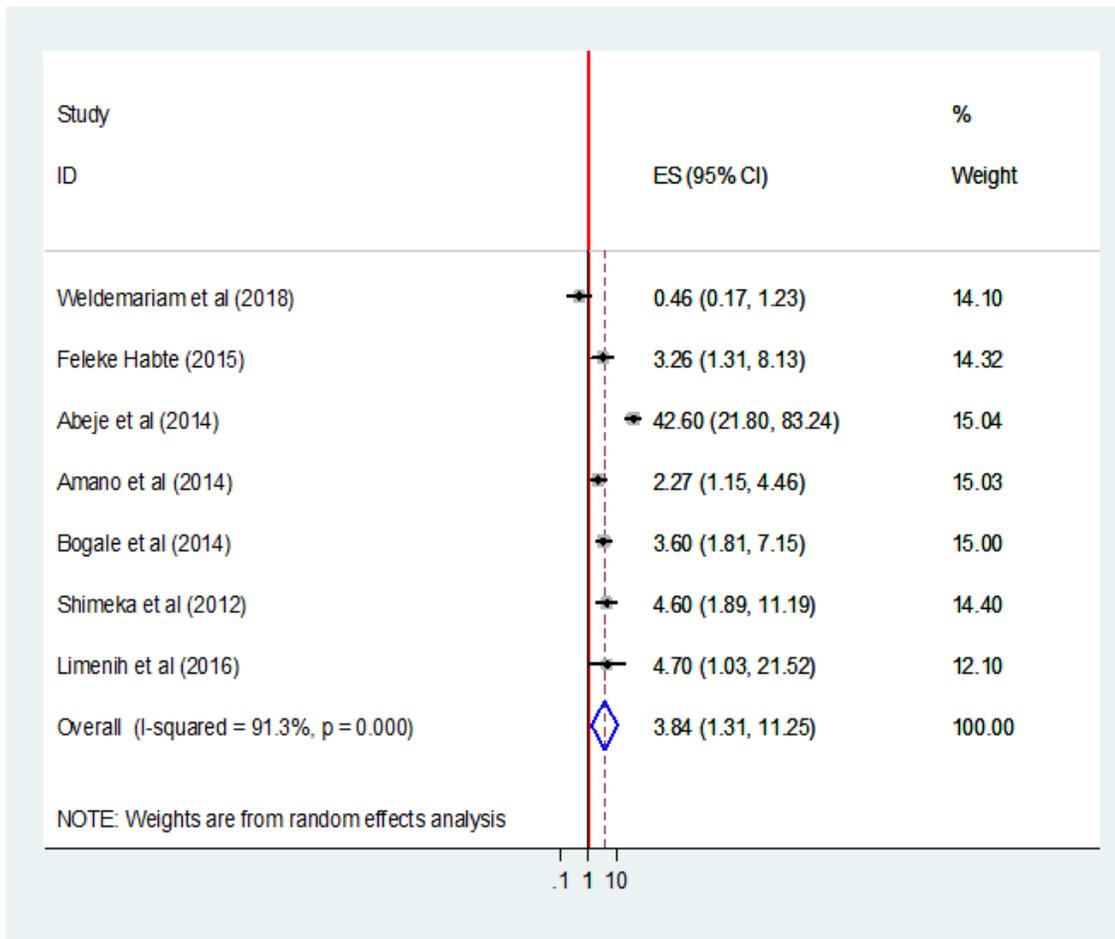


Figure 17

Association of place of residence with institutional delivery service utilization in Ethiopia, 2010–2018. Abbreviations: CI, confidence interval; df, degrees of freedom; D-L, D-L, Dersimonian and laird.

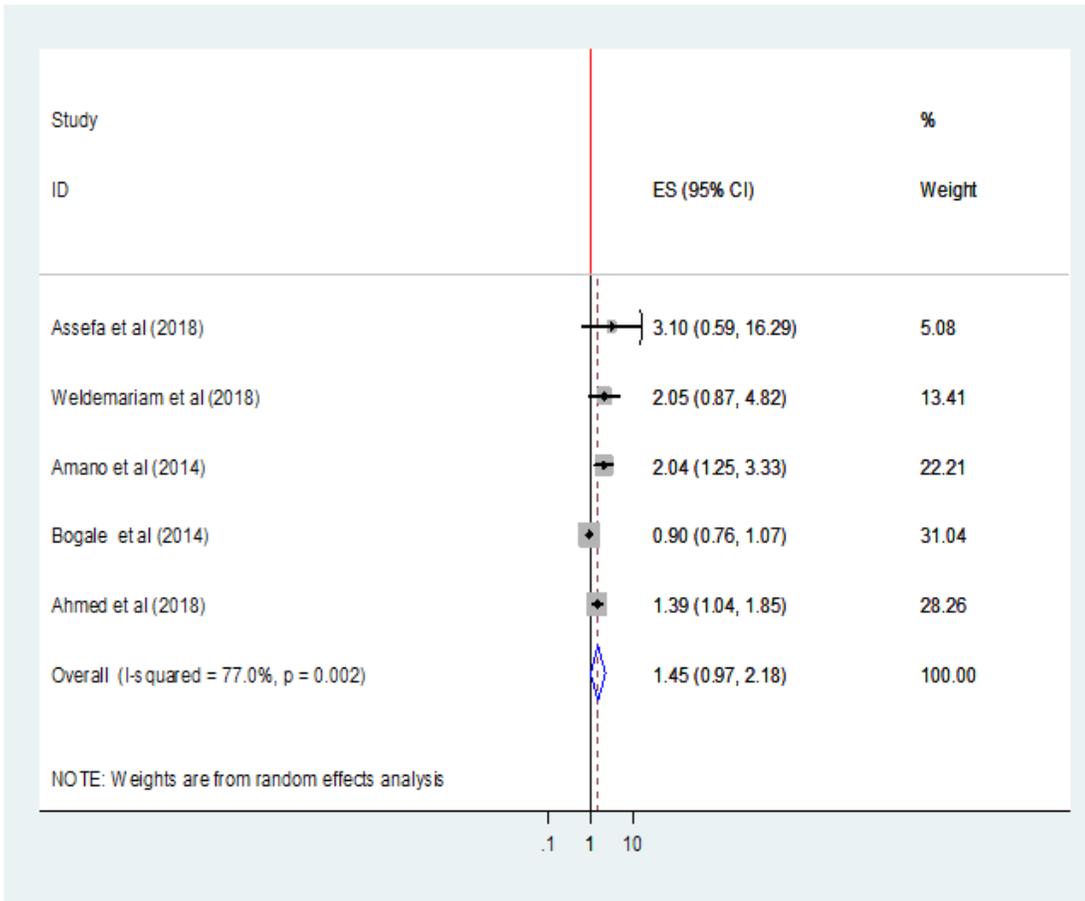


Figure 18

Association of distance to health facility with institutional delivery service utilization in Ethiopia, 2010–2018. Abbreviations: CI, confidence interval; df, degrees of freedom; D-L, D–L, Dersimonian and laird.

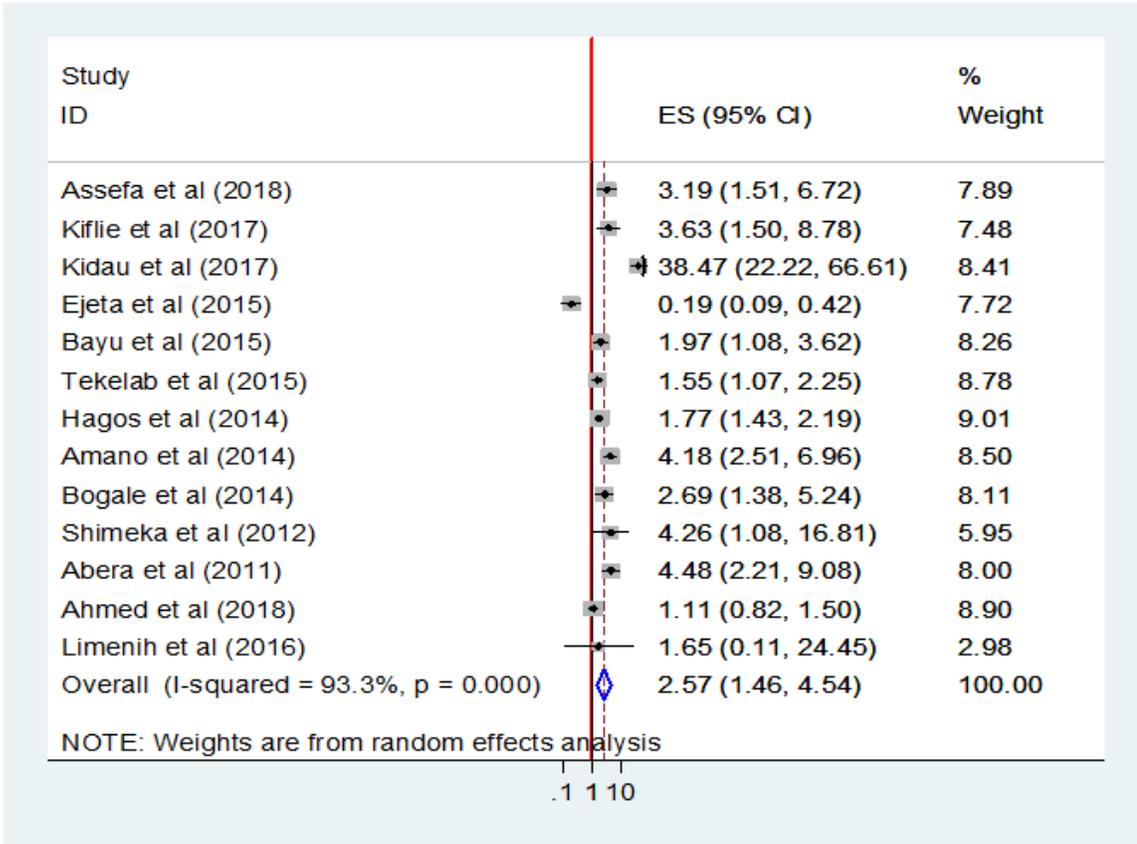


Figure 19

Association of ANC follow up with institutional delivery service utilization in Ethiopia, 2010–2018. Abbreviations: CI, confidence interval; df, degrees of freedom; D-L, D–L, Dersimonian and laird.

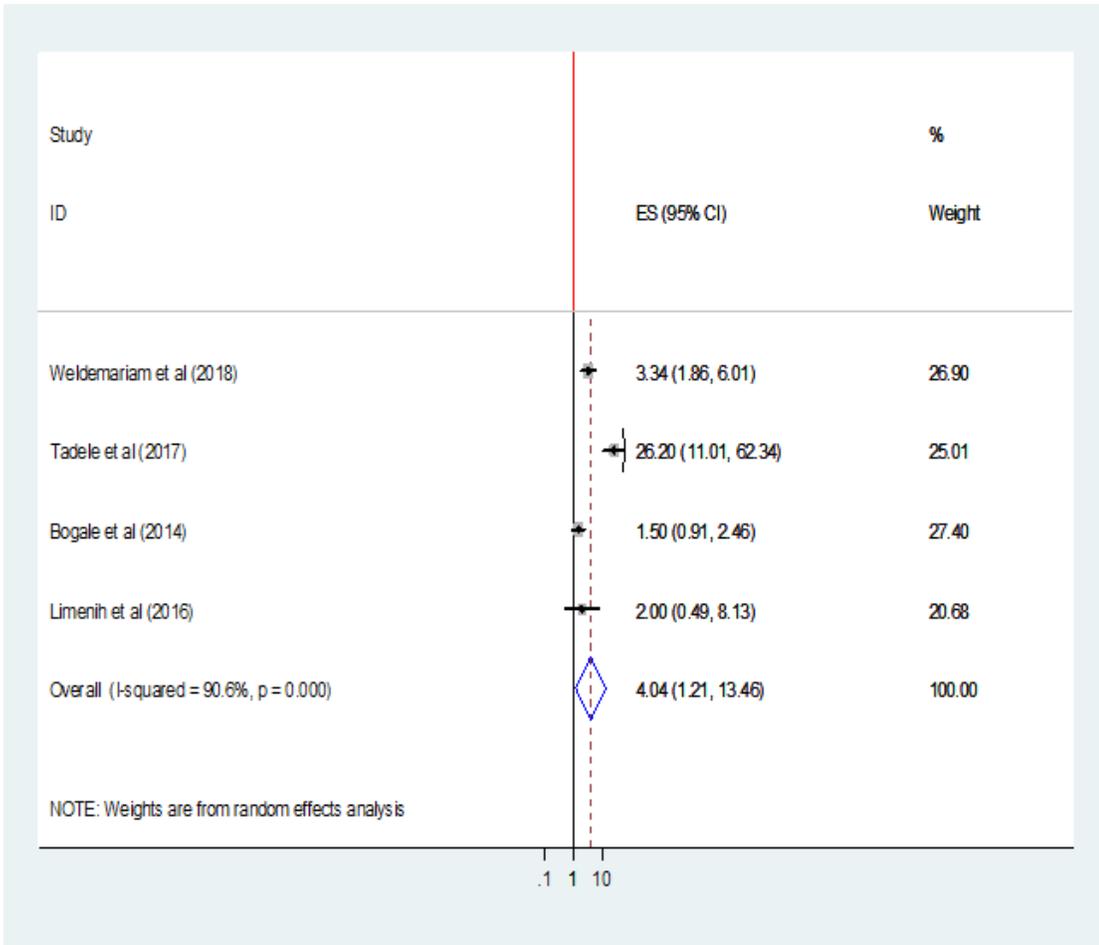


Figure 20

Association of Frequency of ANC follow up with institutional delivery service utilization in Ethiopia, 2010–2018. Abbreviations: CI, confidence interval; df, degrees of freedom; D-L, D–L, Dersimonian and laird.

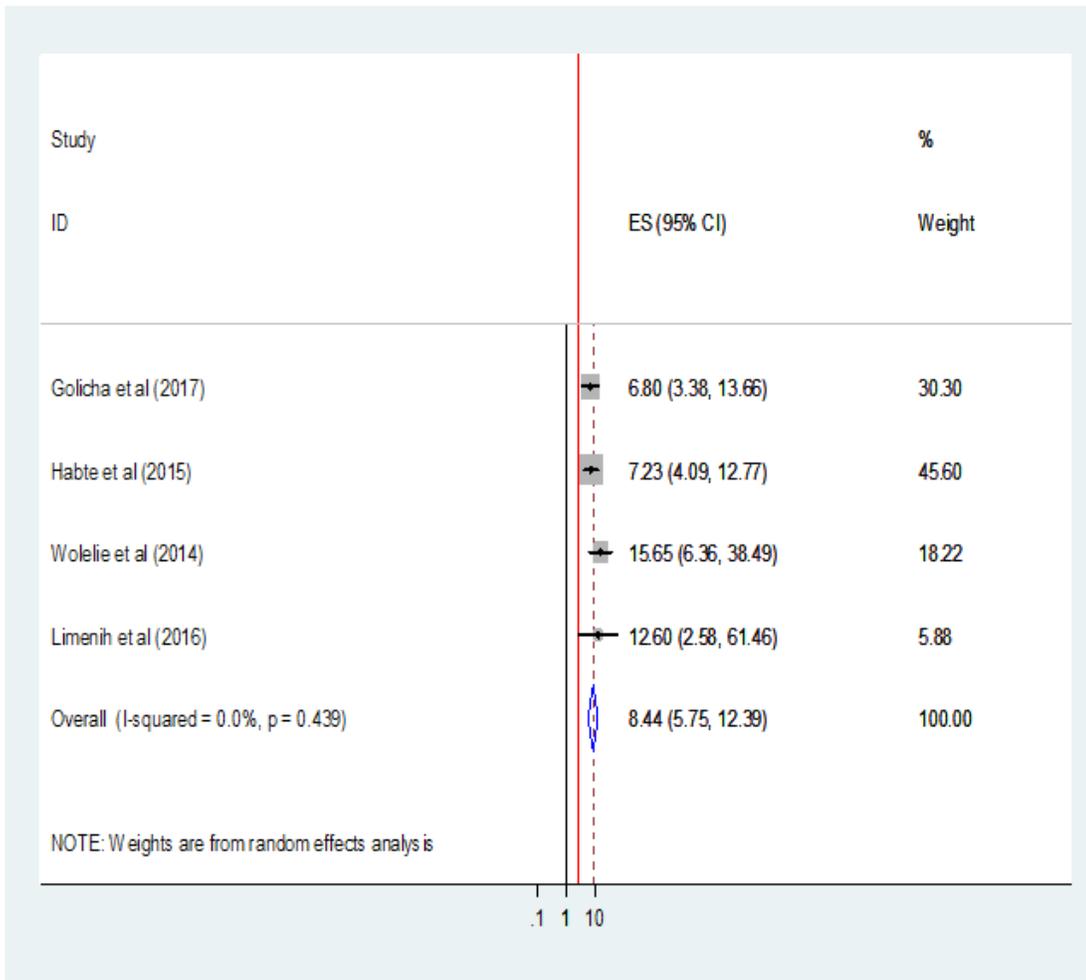


Figure 21

Association of Place of birth the most recent birth of the women with institutional delivery service utilization in Ethiopia, 2010–2018. Abbreviations: CI, confidence interval; df, degrees of freedom; I-V, inverse variance.

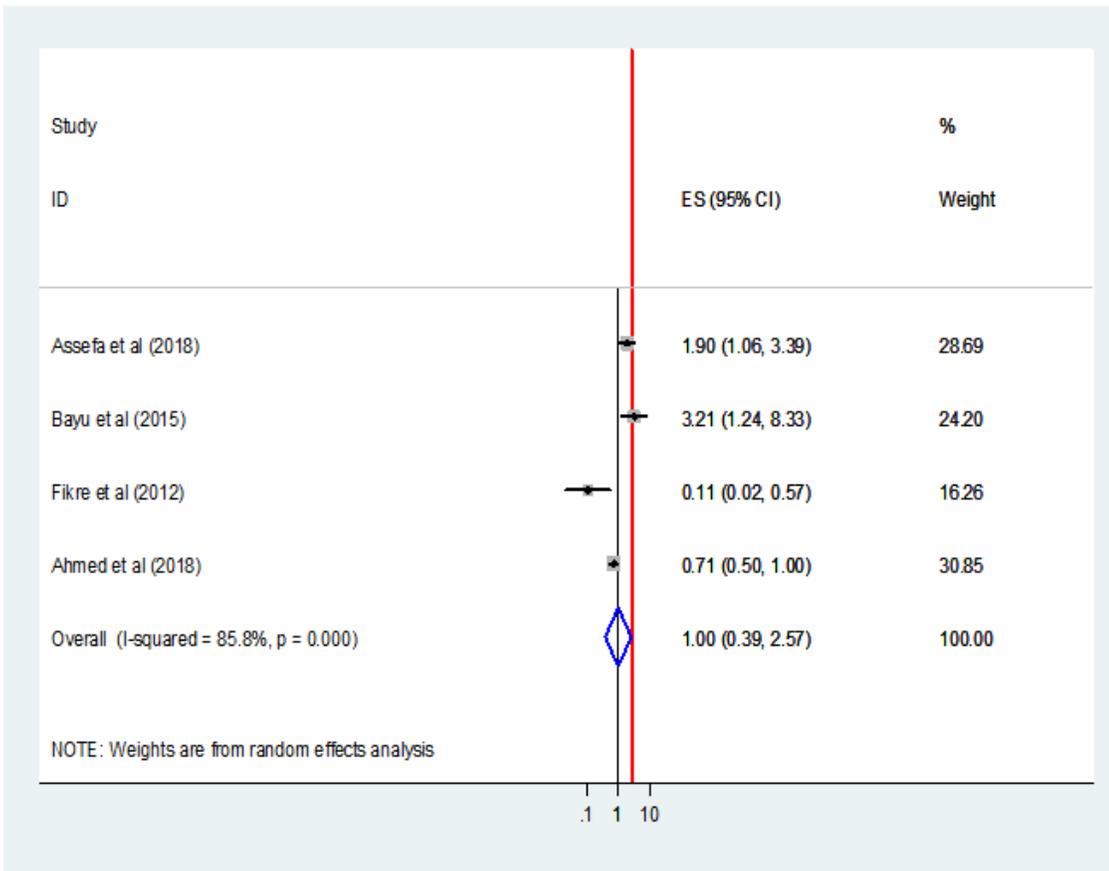


Figure 22

Association of Presence of complication during birth preceding the most recent birth with institutional delivery service utilization in Ethiopia, 2010–2018. Abbreviations: CI, confidence interval; df, degrees of freedom; D-L, D–L, Dersimonian and laird.

Supplementary Files

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