Prevalence of home delivery and associated factors in Ethiopia: A systematic review and meta-analysis

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Research article

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Abstract

Background

Globally, maternal morbidity and mortality remained a major public health challenge. Delivering at home is associated with a higher risk of maternal deaths. Findings on the prevalence and associated factors of home delivery are highly variable and inconsistent across Ethiopia. Therefore, the aim of this systematic review and meta-analysis was to estimate the pooled prevalence of home delivery and its associated factors in Ethiopia.

Method

Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guideline was followed. The databases used were; PubMed, Google Scholar, Cochrane Library, African Journals Online, Ethiopian's university research repository online library, and manual searching. The search was further limited to studies conducted in Ethiopia and reported in English. Two authors independently extracted all necessary data using a standardized data extraction format. STATA 11 software was used to analyze the data. The Cochrane Q and I² test were used to assess the heterogeneity of studies. The pooled estimate prevalence and the odds ratios with 95% confidence intervals were computed by a random effect model.

Result

A total of 13 studies were included in this meta-analysis with a sample size of 13,535. The national pooled prevalence of home delivery was 48.53 % (95% CI:35, 62). The pooled adjusted odds ratio (AOR) of home delivery for Place of rural residence was 4.3(AOR = 4.3; 95% CI 2.7, 6.8), husband preference was 5(AOR=5.1 95%CI:1.1, 22), not having ANC follows up was 3.3(AOR= 3.3,95%CI:2,6), Women who cannot read & write was 4(AOR=4.36,95% CI:3.1, 6.12), Primary level was 4(AOR=4.21, 95%CI:1.5, 11.6), and secondary & above was 1.9(AOR=1.9,95%CI:1.1, 3.45), distance from the health facility was 7(AOR= 7.33, 95%CI:5.75, 9.35), age of mothers 15-24 was 4(AOR =3.7,95%CI:2, 6.6), knowledge of danger sign of pregnancy was 4(AOR=4.60 95%CI:3, 6.8), and no media access was 3.4(AOR=3.495%CI: 1.5, 7.5).

Conclusion

This systematic review and meta-analysis showed that home delivery was high in Ethiopia. Place of residence, husband preference, no having ANC follows up, educational status of mothers, distance from health facility, age of mothers, knowledge of danger sign of pregnancy, and no media access increased the risk of home delivery.

Background

Globally, over 25 years between 1990 and 2015 a total of 13.6 million women have died due to maternal causes[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. 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[2].

Even though the maternal mortality of Ethiopia shows improvement from 2016 Ethiopian Demographic and Health Survey (EDHS), still it is one of the highest figure, accounting 412 deaths per 100,000 live births[3].

The highest number of maternal deaths occurs on the first day after delivery highlighting the critical need for good quality care during delivery. The majority of maternal deaths are due to obstetric complications that could have been prevented with adequate medical care by skilled attendants during and after delivery[4].

Globally, one-third of births take place at home without the assistance of skilled attendants. In Africa, less than 50% of births are attended by skilled health workers[5].

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[2, 6]. Even though many developing countries tried their best to optimize key and effective maternal health interventions to improve maternal health the progress made was low[7].

Nearly all maternal deaths can be prevented if mothers could deliver at a health facility under care of skilled birth attendant. The presence of skilled birth attendants during childbirth in a hygienic environment with necessary skills and equipment to recognize and manage any emerging complications reduces the likelihood of birth complications, infections, or death of either the baby or mother[8].

Despite the fact that delivery service utilization is essential for further improvement of mothers and newborns, in Ethiopia is majority of women give birth at home. Therefore, this systematic review and meta-analysis was aimed, to estimate the pooled prevalence of home delivery associated factors in Ethiopian context, thereby making the available evidence accessible for decision-makers.

**Methods**

**Search process and study selection**

We searched PubMed, Cochrane Library, Google Scholar, and African Journals Online databases for all available studies using the following search terms: “home delivery”, “prevalence” “outcome”, “determinants”, “home birth”, “factors”, “15-49 years of age”, “rural residence”, “trial of labour”, “ante natal care”, “distance of health facility”, “rural residents”, “determinants”, “outcome”, AND Ethiopia.

The search string was developed using "AND" and "OR" Boolean operators.

Particularly, to fit advanced PubMed database, the following search strategy was applied:
[(home delivery) [All Fields] OR home birth[MeSH Terms]) OR non facility delivery [MeSH Terms]) OR determinants [MeSH Terms]) AND (factors) [All Fields] OR factors [MeSH Terms]) AND (reproductive age women) [All Fields] OR rural area [MeSH Terms]) OR 15-49 years women) [All Fields] OR traditional birth attendant [MeSH Terms]) AND [Ethiopia].

For unpublished studies, master's thesis and PhD dissertation, the official website of Ethiopian's University research repository online library (University of Gondar and Addis Ababa University) was searched. Also, a manual search of the reference lists of included articles was performed.

Inclusion and exclusion criteria

The studies were included if they met the following inclusion criteria: (1) studies conducted in Ethiopia; (2) observational studies, including cross-sectional, case-control and cohort studies; (3) studies that reported prevalence and/or risk factors; (4) the outcome uterine rupture (4) both published and unpublished studies at any time were included. Additionally, we excluded editorials, commentaries, reviews, studies conducted in non-regular (extension and summer) students and those not published in the English language were excluded.

Data extraction and quality assessment

Two authors (AAA,BFZ) independently extract the data and review the screened articles independently. Any disagreement was handled by the third reviewer (AAN) and repeated reading of the articles independently. Finally, consensus was reached through discussion between authors.

A prespecified form which was designed to extract data of methodological and scientific quality was used. The following data were extracted from each study: first author's name, study setting, study period, study design, method of data collection, sample size, response rate, odds ratio (OR), and the possible associated factors of uterine rupture. The reviewer contacted the corresponding author(s) for further information whenever pertinent data were missed from the included studies.

The quality of each article was evaluated using Joanna Briggs Institute (JBI) quality appraisal criteria adapted for studies reporting prevalence data, cross-sectional, cohort and case-control studies [9]. The following items were used to appraise cross-sectional studies: (1) inclusion criteria; (2) valid and reliable measurement of exposure; (3) description of study subject and setting; (4) objective and standard criteria used; (5) strategies to handle confounder; (6) identification of confounder; (7) appropriate statistical analysis; and (8) outcome measurement. The following items were used for appraising cohort studies: (1) similarity of groups; (2) similarity of exposure measurement; (3) identification of confounder; (4) validity and reliability of measurement; (5) strategies to deal with confounder; (6) sufficiency of follow up time; (7); appropriateness of groups/participants at the start of the study; validity and reliability of outcome measured (8) completeness of follow-up or descriptions of reason to loss to follow-up; (9) strategies to address incomplete follow-up; and (10) appropriateness of statistical analysis. The following items were used for appraising case-control study: (1) comparable groups; (2) appropriateness of cases and
controls; (3) standard measurement of exposure; (4) criteria to identify cases and controls; (5) handling of confounder; (6) similarity in measurement of exposure for cases and controls; (7) strategies to handle confounder; (8) appropriateness of duration for exposure; (9) appropriateness of statistical analysis; and (10) standard assessment of outcome. Studies considered low risk whenever fitted to 50% and or above quality assessment checklist criteria’s.

Statistical analysis

A weighted inverse variance random-effects model [10] was used to estimate the overall pooled prevalence. Subgroup analysis was done by study region and year of study to adjust the variations in the pooled estimate of the prevalence. The heterogeneity of studies was assessed by using I2 test statistics. The values of 25%, 50%, and 75% were declared as low, moderate, and high heterogeneity respectively [11]. Publication bias across studies was checked using funnel plot and Egger regression[12] were used to declare publication bias. STATA version 11 statistical software was used for all statistical analyses.

Results

Study selection and data extraction

The search strategy identified 150 articles from PubMed, 90 articles from Google Scholar, 60 articles from Cochrane Library, 50 articles from African Journals Online, 10 articles from Ethiopian’s University research repository online library and 5 articles through manual search. Finally, 62 studies were screened for full-text review and 13 were included to the prevalence and/ or associated factors analysis (Fig. 1).

Characteristics of included studies

In this review, 13 relevant studies were included with a sample size of 13,535. Ten of the studies were done by a cross-sectional study design and the other two were conducted by case-control and one cohort study design. six (6) Studies were found in Amhara region [13–19], two in Oromia[20, 21], three in Southern Nation Nationalities and People (SNNPR) (22–24), and two in Afar [17, 22] (Table 1).
Table 1
Descriptive summary of included studies on uterine rupture based on year of study, study design, sample size, region of study, response rate, and prevalence (n = 13).

| Author (year)       | study design(setting) | Sample size | Response rate | Study region | P(%)  | Quality |
|---------------------|-----------------------|-------------|---------------|--------------|-------|---------|
| Ayele G.et al(2016) | Cross-sectional       | 8022        | 100           | Amhara       | 67.1  | Low risk|
| Yilkal M.et al(2015)| Cross-sectional       | 499         | 99.6          | SNNP         | 75.3  | Low risk|
| Shabeza A.et al (2016)| cross sectional    | 276         | 97.1          | Amhara       | 49.3  | Low risk|
| Zemenu T.et al (2016)| Cross-sectional      | 343         | 99.4          | Oromia       | 56    | Low risk|
| Adane N.et al (2014)| Cross-sectional       | 610         | 91.2          | Afar         | 55.6  | Low risk|
| Melese S.et al (2017)| Cohort               | 554         | 99.6          | SNNP         | 13.1  | Low risk|
| Abebe A.et al (2018)| Cross-sectional       | 772         | 98.9          | Amhara       | 51.4  | Low risk|
| Gistane A. et al (2012)| Cross sectional | 481         | 99.7          | Oromia       | 38    | Low risk|
| Momina A.et al (2016)| Cross-sectional      | 318         | 97.2          | Amhara       | 74    | Low risk|
| Teklemarian G.et al (2016)| Cross-sectional | 285         | 99.7          | SNNP         | 19    | Low risk|
| Tilahun W.et al (2018)| cross-sectional      | 576         | 96.5          | Afar         | 35.2  | Low risk|
| Resom T.et al (2014)| Case control          | 275         |               | Amhara       | N/A   | Low risk|
| Fantu A.et al (2018)| Case control          | 324         |               | Amhara       | N/A   | Low risk|

Quality of studies
The JBI quality appraisal criteria established for cross-sectional, case-control, and cohort studies were used. The studies included in this systematic review and meta-analysis had no considerable risk (has low risk). Therefore, all the studies were considered [14–25] (Table 1).

**Prevalence of home delivery in Ethiopia**

We excluded 2 case-control studies on the prevalence estimation. As indicated in the forest plot, the pooled estimate for the prevalence of home delivery from 11 studies in Ethiopia was 48.53% (95% CI: 35.03, 62.04). We identified a high and significant heterogeneity between studies ($I^2 = 99.2\%$; $p$-value = 0.000), indicating great variability in prevalence across studies so a random effect analysis model was used to estimate the pooled prevalence of the home delivery in Ethiopia (Fig. 2).

Publication bias

A funnel plot showed a symmetrical distribution (Fig. 3). Egger's regression test p-value was 0.87 which indicated the absence of publication bias.

Sensitivity and subgroup analysis

Due to considerable heterogeneity in this review, Subgroup analysis was done by year of studies and study regions. Based on this, the prevalence of home delivery found to be 74%, 51.68%, 37.8%, and 28.5% in Afar, Amhara, SNNPR, and Oromiya studies respectively. On the other hand the prevalence of home delivery was found to be 58.39% between the year of 2012–2014, 46.79% between years 2015–2016, and 29% between the years of 2017–2018(Table 2). A sensitivity analysis was done to identify outlier studies. According to the analysis, no influential studies were detected so all of the studies were included in the final analysis.
Table 2, subgroup analysis based on region and year of study

| Subgroup | Included studies | Prevalence (95%CI) | P value | $I^2$ |
|----------|-----------------|-------------------|---------|------|
| Region   |                 |                   |         |      |
| Amhara   | 4               | 51.8(40.8,63.9)   | 0.000   | 97.3 |
| SNNPR    | 3               | 37.88(9.89,65.7)  | 0.000   | 99.4 |
| Oromia   | 2               | 28.5(9.98,47.2)   | 0.000   | 97.1 |
| Afar     | 2               | 74(69.18,78.82)   | 0.000   | 96.8 |
| Year of study | |                   |         |      |
| 2017–2018| 3               | 29.67 (11.46,47.89) | 0.000 | 99  |
| 2015–2016| 6               | 45.79 (33.64,57.94) | 0.000 | 96.2 |
| 2012–2014| 2               | 58.39 (47.64,69.14) | 0.000 | 97  |

Associated factors for home delivery in Ethiopia

A total of 13 studies were included for analysis of associated factors for home delivery. We identified eight main associated factors with the pooled odds ratio ranging from 1.98 to 7.33. These associated factors were place of residence, husband preference, no ANC follow up, educational status of mothers, distance from health facility, age of mothers, knowledge of danger sign of pregnancy, and no media access.

The pooled effects of five studies [17,19,20,23,26] showed that rural residency was a significant associated factors with home delivery. Women who lived in the rural area were 4.3 times (AOR = 4.3; 95% CI 2.7, 6.8) more likely to give birth at home as compared to those women who lived in the urban area (Fig. 3a). Similarly, this study showed that not having ANC follow up was significantly associated with home delivery practice. Women who had no ANC follow-up were 3.4 times more likely to give birth at home than those who had ANC follow up (AOR = 3.3, 95%CI:2,6) (Fig. 3f). Furthermore, maternal age less than 25 years old yield a statistically significant association with home delivery. Women who were in the age range of 15–24 years were 4 times (AOR = 3.7,95%CI:2, 6.6) more likely to deliver at home as compared to those women whose age were greater than 25 years(Fig. 3b).

Moreover, having poor knowledge of danger signs of pregnancy showed statistically significant association with home delivery practice. Women who had no knowledge of danger signs of pregnancy were five times (AOR = 4.6,95%CI:3,6.8) more likely to give birth at home as compared to women who had knowledge of one or more danger signs of pregnancy(Fig. 3d).
This review indicated the significant association between women's educational status and home delivery. Women who cannot read & write were 4.4 times (AOR = 4.4, 95% CI: 3.10, 6.12), Primary level were 4 times (AOR = 4.21, 95% CI: 1.52, 11.64) and secondary & above were 1.9 times (AOR = 1.98, 95% CI: 1.13, 3.45) more likely to deliver at home (Fig. 3e,j).

On the other hand women who had no access to media were 3 times (AOR = 3.4, 95% CI: 1.5, 7.5) more likely to give birth as compared to women who had access to media (Fig. 3c).

Distance from health care facility increased the probability of giving birth at home. Women who lived in a distance of more than 2 hour from health facility were 7 times (AOR = 7.33, 95% CI: 5.75, 9.35) more likely to give birth at home as compared to those women who lived in the nearby health facilities.

Husband preference also showed statistically significant association with home delivery. Women whose husband prefer home delivery were 5 times (AOR = 5.17, 95% CI: 1.18, 22.60) more likely to give birth at home as compared to those women whose husband prefer institutional delivery (Fig. 3h).

**Discussion**

This research is important for understanding current home delivery practices and factors that affect them in order to intervene to increase the institutional delivery service utilization by individuals, families, and communities, and for policymakers to establish criteria for improving the utilization of institutional and skilled birth attendant service utilization. Despite the fact that the World Health Organization's recommendation for every pregnant woman to give birth at the health facility and by the skilled birth attendant, the rate remains low in developing countries, including Ethiopia. This may be because women need effective support to decrease home delivery practice. It is therefore important to improve women, family, and community awareness about institutional delivery, ANC follows up, and knowledge of danger sign of pregnancy.

Moreover, expanding media access about maternal health, improve woman empowerment, decision-making capacity, creating access to health facilities, improve infrastructures like transportation system including ambulance service would decrease home delivery practice.

In this review, thirteen studies comprising a total of 13,535 participants were analyzed to estimate the best available evidence for the prevalence and factors associated with home delivery 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.

This meta-analysis was estimated the national prevalence of home delivery in Ethiopia. Accordingly, the national pooled prevalence of home delivery was 48.53% (95% CI: 35.03, 62.04). The result is in line with Senegal[23] Guinea-Bissau[24]. This finding higher than the studies [25, 26], quite possibly due to socioeconomic differences between the study areas, socio-cultural variation, the study period and setting, sample size, and/or target population. Other possible explanations may be due to maternal health.
services coverage varying in different countries based on increased awareness and information about institutional delivery and skilled birth attendant service utilization.

Our study findings revealed that not having antenatal care during pregnancy was a statistically significant association with home delivery as compared with those who had antenatal care during pregnancy. This can be explained by the fact that mothers who received antenatal care during pregnancy may get better counseled about birth preparedness and complication readiness plan, maternal health, and complication of delivery which could better understand the risk of the home delivery practice.

Place of women's residence, the rural residency was significantly associated with home delivery practice (AOR = 4.3; 95% CI 2.7, 6.8). This finding was consistent with studies in Nigeria[27] and Bhutan[28].

This might be explained in terms of the characteristics of the rural residents, namely less proportion of educated mothers, poor knowledge on institutional delivery service, less decision-making capacity of woes, less antenatal care follow up service, less availability of health care services nearby, and poor access to information than urban mothers.

The result of this review revealed that not having antenatal care attendance increases the likelihood of home delivery (AOR = 3.3; 95% CI: 2.6). This finding is consistent with studies conducted in Eretria [29] and Bhutan[28]. The reason might be visiting ANC increasing women familiarity with medical personal which exposes the women to more health education and counseling which are more likely to decrease home delivery. Moreover, women who had ANC follow up might be better awarded about birth preparedness and complication readiness plan, danger sign of pregnancy, when to visit the health facilities, and might also increase her decision making power to choose her place of delivery.

The odds of women's age 15–24 years were nearly 4 times (AOR = 3.7; 95% CI: 2.6) more likely to deliver at home as compared to those women whose ages were greater than 25 years. The possible explanations might be that younger women are more likely to have an unplanned pregnancy, and more likely to be early married and in turn might be less capacitated to decide on her pace of delivery, more influenced by husband, family, and cultural values. Additionally, young age women might have lower knowledge of danger signs of pregnancy, birth preparedness, and complication readiness plan since they have no childbirth experience.

Moreover, poor knowledge of the danger sign of pregnancy showed a statistically significant association with home delivery practice. Women who had no knowledge of danger signs of pregnancy were five times (AOR = 4.6; 95% CI: 3.6.8) more likely to give birth at home as compared to women who had knowledge of one or more danger signs of pregnancy. 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 the time of labor which in turn home delivery practice.
This review indicated the significant association between women's' educational status and home delivery. Women who cannot read & write were 4.4 times (AOR = 4.4, 95% CI: 3.10, 6.12), Primary level was 4 times (AOR = 4.21, 95% CI: 1.52, 11.64) and secondary & above were 1.9 times (AOR = 1.98, 95% CI: 1.13, 3.45) more likely to deliver at home. The reason behind might be as education makes mothers to be more concerned for their health, increased their capacity to understand health-related information, and have more autonomy, increased 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, so as women educated more, less likely to give birth at home and vice versa.

On the other hand, women who had no access to media were 3 times (AOR = 3.4, 95% CI: 1.5, 7.5) more likely to give birth as compared to women who had access to media. Having inadequate exposure to the media might decrease the woman's concern and awareness of her pregnancy-related issue and the need for professional help and having inadequate exposure to the media decreasing their familiarity with medical personal which expose the women to less health education, literacy, and counseling which are more likely to increase home delivery practice.

The result of this review revealed that distance from the health care facility increased the probability of giving birth at home. Women who lived at a distance of more than 2 hours from a health facility were 7 times (AOR = 7.33, 95% CI: 5.75, 9.35) more likely to give birth at home as compared to those women who lived in the nearby health facilities. The reason might be as the distance from health facility increases women might have no transport access to get health care services for ANC, childbirth, or and service and might increase the probability of birth at home.

Husband preference also showed statistically significant association with home delivery. Women whose husbands prefer home delivery were 5 times (AOR = 5.17, 95% CI: 1.18, 22.60) more likely to give birth at home as compared to those women whose husbands prefer institutional delivery. This result is in line with the study done in Eretria [29]. The possible reason might be husbands are autonomous in Ethiopian culture, so their preference for home delivery increases their wives to give birth at home.

Limitation

This systematic review and meta-analysis is the national estimation conducted in Ethiopia. Time-trend analysis might not reflect the exact trend because all the years didn't have reported data.

Abbreviations

ANC
Antenatal care
AOR
Adjusted Odd Ratio
CI
Declarations

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Contributions
AAA and BFZ: developed the study design and protocol, literature review, selection of studies, quality assessment, data extraction, statistical analysis, and interpretation of the data and developing the initial drafts of the manuscript. AAA, BFZ and AAN: were also conducted in statistical analysis and interpretation, quality assessment, prepared the final draft of the manuscript. Finally, all authors read and approved the final manuscript.

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**Ethical declaration**

**Ethics approval and consent to participate**

Not applicable.

**Consent for publication**

Not applicable.

**Competing interests**

The authors declare that they have no competing interests.

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**Figure 1**

PRISMA 2009 Flow diagram for identification and selection of articles for inclusion in the review
Figure 2

Forest Plot for the Prevalence of home delivery in Ethiopia, 2020
Figure 3

funnel Plot for the distribution of home delivery, 2020
| Study               | ES (95% CI)   | Weight |
|---------------------|---------------|--------|
| Ayele G.et al       | 3.47 (2.80, 4.30) | 27.19  |
| Zemenu T.et al      | 2.92 (1.97, 4.32) | 23.90  |
| Momina A.et al      | 7.90 (5.77, 10.81) | 25.49  |
| Tilahun W.et al     | 5.50 (1.70, 17.83) | 10.01  |
| Fantu A.at al       | 3.60 (1.43, 9.04)  | 13.40  |
| Overall (I-squared = 82.0%, p = 0.000) | 4.32 (2.73, 6.85)  | 100.00 |

NOTE: Weights are from random effects analysis

Figure 4
Figure 5
Figure 6

| Study          | ES (95% CI)   | Weight |
|----------------|--------------|--------|
| Ayele G. et al | 3.10 (2.25, 4.27) | 32.80  |
| Tilahun W. et al | 1.90 (1.79, 2.02) | 34.60  |
| Resom T. et al | 7.20 (5.14, 10.08) | 32.61  |
| Overall (I-squared = 96.9%, p = 0.000) | 3.44 (1.57, 7.58) | 100.00 |

NOTE: Weights are from random effects analysis
Study ID

| Study               | d   | ES (95% CI)         | Weight |
|---------------------|-----|---------------------|--------|
| Shabeza A. et al    |     | 2.37 (1.13, 4.98)   | 20.34  |
| Melese S. et al     |     | 4.18 (1.80, 9.70)   | 16.87  |
| Momina A. et al     |     | 3.30 (1.35, 8.09)   | 15.31  |
| Teklemariam G. et al|     | 7.40 (3.36, 16.30)  | 18.58  |
| Resom T. et al      |     | 8.70 (2.30, 32.90)  | 7.90   |
| Fantu A. et al      |     | 6.20 (3.00, 12.81)  | 20.99  |
| Overall             |     | 4.60 (3.09, 6.84)   | 100.00 |

NOTE: Weights are from random effects analysis

Figure 7
| Study            | ES (95% CI)       | Weight |
|------------------|-------------------|--------|
| Ayele G.et al    | 6.00 (4.87, 7.40) | 22.23  |
| Zemenu T.et al   | 7.80 (6.07, 10.02) | 21.46  |
| Adane N.et al    | 2.18 (0.79, 6.05) | 7.63   |
| Melese S.et al   | 2.46 (1.15, 5.24) | 11.03  |
| Gistane A. et al | 2.84 (1.07, 7.51) | 8.13   |
| Momina A.et al   | 2.80 (1.48, 5.29) | 13.13  |
| Teklemariam G.et al | 5.23 (2.04, 13.41) | 8.49   |
| Fantu A.at al    | 4.20 (1.55, 11.36) | 7.90   |
| Overall (I-squared = 67.4%, p = 0.003) | 4.36 (3.10, 6.12) | 100.00 |

NOTE: Weights are from random effects analysis
| Study                  | ID       | ES (95% CI)       | Weight |
|-----------------------|----------|-------------------|--------|
| Ayele G et al         |          | 1.02 (0.66, 1.57) | 14.39  |
| Zemenu T et al        |          | 5.00 (3.88, 6.46) | 15.31  |
| Adane N et al         |          | 1.99 (1.21, 3.30) | 13.92  |
| Melese S et al        |          | 2.27 (1.14, 4.51) | 12.59  |
| Teklemariam G et al   |          | 6.30 (4.75, 8.34) | 15.20  |
| Tilahun W et al       |          | 3.19 (1.53, 6.64) | 12.24  |
| Resom T et al         |          | 10.38 (2.91, 37.08) | 3.38  |
| Fantu A et al         |          | 8.17 (2.14, 31.14) | 7.98  |
| Overall (I-squared = 89.2%, p = 0.000) | | 3.43 (2.01, 5.87) | 100.00 |

NOTE: Weights are from random effects analysis

Figure 9
Figure 10

| Study               | ES (95% CI)     | Weight |
|---------------------|-----------------|--------|
| Zemenu T.et al      | 6.90 (6.11, 7.80) | 44.00  |
| Melese S.et al      | 8.94 (7.64, 10.47) | 40.97  |
| Resom T.et al       | 5.10 (3.02, 8.61)  | 15.02  |
| Overall (I-squared = 76.9%, p = 0.013) | 7.33 (5.75, 9.35)  | 100.00 |

NOTE: Weights are from random effects analysis
Figure 11

| Study ID | ES (95% CI)   | Weight |
|----------|---------------|--------|
| Shabeza A.et al | 5.90 (0.04, 891.54) | 3.65 |
| Adane N.et al | 2.20 (0.14, 34.52) | 28.74 |
| Teklemariam G.et al | 8.30 (0.92, 74.92) | 45.00 |
| yilkal M.et al | 5.80 (0.17, 195.42) | 7.61 |
| Overall (I-squared = 0.0%, p = 0.907) | 5.17 (1.18, 22.60) | 100.00 |

NOTE: Weights are from random effects analysis.
Figure 12
| Study            | ES (95% CI)       | Weight |
|------------------|-------------------|--------|
| Ayele G. et al   | 4.00 (0.03, 633.23) | 1.20   |
| Zemen H. et al   | 4.80 (0.56, 41.34)  | 6.66   |
| Adane N. et al   | 2.00 (0.73, 5.44)  | 30.79  |
| Melese S. et al  | 1.20 (0.48, 3.01)  | 36.37  |
| Gistane A. et al | 2.40 (0.21, 27.96) | 5.12   |
| Momina A. et al  | 2.00 (0.13, 30.27) | 4.18   |
| Teklemariam G. et al | 3.40 (0.10, 113.93) | 2.50   |
| Fantu A. et al   | 3.20 (0.11, 90.41) | 2.76   |
| Yilkal M. et al  | 4.00 (0.71, 22.38) | 10.41  |
| Overall (I-squared = 0.0%, p = 0.952) | 1.98 (1.13, 3.45) | 100.00 |

NOTE: Weights are from random effects analysis.