

# Partograph utilization as a decision making tool and associated factors among obstetric care providers in Ethiopia: A systematic review and Meta-analysis

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## Research

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# Abstract

## Background

Partograph is a prestigious obstetric tool used to monitor the fetomaternal condition and follow the progress of labour. It is a cost-effective and affordable health intervention that could prevent obstructed and prolonged labour, which is the major cause of maternal mortality that continues to be the global burden worldwide. There are various studies on partograph utilization and associated factors in different regions of Ethiopia. But no studies showed the national estimate of partograph utilization in Ethiopia. Therefore, this review was conducted to estimate the national pooled prevalence of partograph utilization and 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 I<sup>2</sup> 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 19 studies with 6237 participants were included in the meta-analysis. The national pooled prevalence of partograph utilization was 59.95% (95% CI:46.81,73.09). The pooled adjusted odds ratio (AOR) of partograph utilization for midwifery profession was 4 (95% CI: 2.63,5.99), female health care providers was 3.2 (95%CI:2.218,4.66), Emergency Obstetric and Newborn Care training was 2.9 (95%CI:2.19, 3.83), Knowledge of partograph was 2.5 (95%CI: 1.6, 3.87) and short term training on partograph was 5.66 (95%CI: 2.48,12.92), favorable attitude towards partograph was 2.3(AOR=2.3,95%CI:1.5,3), and working at health center was 3.5(AOR=3.5,95%CI:2.5,4.9).

## Conclusion

The prevalence of partograph utilization was low in Ethiopia. Being a midwifery profession, female obstetric care provider, Emergency Obstetric and Newborn Care training, knowledge of partograph, and short term training on partograph, favorable attitude towards partograph, and working at health center were found to be a significant associated factor for partograph utilization.

## Background

Partograph is a universal tool for monitoring maternal and fetal wellbeing, to follow the progress of labour and a decision-making aid when abnormalities are detected. It is designed for all maternal settings but

has different levels of functions at different levels of health care. It serves as an early warning system and assists in an early decision on transfer, augmentation and termination of labour. It helps to prevent prolonged and obstructed labour, its sequelae for the mother and newborn [1, 2].

Maternal mortality continued to be the global burden worldwide. Each year more than two millions become pregnant and large number of mothers dies as a result of complication of pregnancy and child birth [3]. The global maternal mortality ratio was 216. The vast majority of these deaths (94%) occurred in low resource settings. Sub Saharan African countries alone accounted for two-third of maternal deaths, while southern Asia accounted for nearly one fifth of maternal death [4, 5].

Ethiopia is still one of the developing countries with high maternal mortality rate of 412 per 100,000 live births. The top five causes of maternal mortality in Ethiopia; hemorrhage 25%, unsafe abortion 20–40%, hypertension 10–12%, infection and Obstructed Labor 10%, and uterine rupture cover 9% of maternal deaths. Among those causes of maternal death caused by obstructed labour, and prolonged labour like hemorrhage, infection, uterine rupture and can be prevented by using different strategies like universal partograph utilization during labour and delivery [6–8].

Universal utilization of partograph could improve care during labour, increase the frequency of follow up, decrease unnecessary intervention, and reduce prolonged labour and its sequelae including obstructed labour, maternal exhaustion, uterine rupture, stillbirths, birth asphyxia, and neonatal sepsis, postpartum hemorrhage, puerperal sepsis, obstetric fistula. [5, 9–11].

Obstructed labour and ruptured uterus contribute up to 70% of maternal mortality. Early detection of abnormal progress and prevention of prolonged labour can significantly reduce it. This can be prevented by accessing skilled delivery services such as plotting partograph during the progress of labour [4, 5].

Sex of health care providers, supportive supervision, professional difference among health care providers, job-related training like Emergency Obstetric Newborn Care, knowledge of partograph, training on partograph and institutional differences like referral hospital, health centers, and district hospitals, attitude of health care providers, work overload, educational status of health care providers, service year of health care providers, shortage of staff, age of health care providers, using different monitoring tools like (clinical records, monitoring charts, piece of papers) during labour were factors that determine partograph utilization [12–17].

The Ethiopian government is the first in Africa, rich in publicly stated commitments, and has adopted partograph for labour management in the country. However, different studies in the country revealed that poor utilization of partograph, poor documentation of components of partograph, and inconsistent findings in the country, ranging from 92.6 % in Dire Dawa to 6.9% in the Oromia region [19,18]. As a result, this systematic review and meta-analysis were conducted to assess the magnitude of partograph utilization and determinant factors in Ethiopia.

## Methods

The result is reported in accordance with the Preferred Reporting Items for Systematic review and Meta-Analysis Protocols (PRISMA-P) checklist, and the PRISMA extension statement for reporting of systematic reviews incorporating network meta-analyses of healthcare interventions (see checklist in Additional file 1).

#### 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: “partograph utilization”; “knowledge”; “intrapartum monitoring”; “midwives”; “documentation of partograph”; “decision making”; “attitude”; nurses “outcome”; “health institution”; “attitude”; “labour”; “health care providers”; “childbirth”; “factors”; “determinants”; “health center”; “components”; “partograph”; and “Ethiopia”. The search string was developed using “AND” and “OR” Boolean operators.

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) 4) the outcome partograph utilization (4) both published and unpublished studies reported in the English language were considered.

Studies focused on the assessment of knowledge, attitude, and partograph utilization without the outcome of interest of this study, studies available only as abstract with unclear outcomes, editorials, commentaries, reviews were excluded.

#### Definition of terms

Universal utilization of a Partograph was recommended by world health organization at every birth. In this review, partograph utilization was considered when Health care providers working in labour ward use and documenting all components partograph that are applicable for individualized women(4).

#### Outcome of interest

The primary outcome of this review was partograph utilization among health care providers to monitor the progress of labour and feto-maternal condition. Universal utilization of a Partograph was recommended by world health organization at every birth. Health care professionals working in labour and delivery unit used partograph and documenting all components that are applicable for individualized women were considered as partograph utilizer (4).

The secondary outcomes were: determinants of partograph utilization such as sex of health care providers, supportive supervision, the professional difference among health care providers, job-related training like Emergency Obstetric Newborn Care, knowledge of partograph, training on partograph and institutional differences like referral hospital, health centers, and district hospitals, an attitude of health care providers, work overload, educational status of health care providers, service year of health care providers, shortage of staff, age of health care providers, using different monitoring tools like (clinical records, monitoring charts, piece of papers) during labour.

#### Methods for data extraction and quality assessment

Two reviewers (AAA, BFZ) extract the data independently. Any disagreements between the reviewers were fixed by repeated reading of the articles independently, discussion, and consensus amongst the authors.

A prespecified form that was designed to extract data of methodological and scientific quality was used. As recommended by PRISMA [53], the following data were extracted from each study: first authors name, study setting, study period, study design, method of data collection, sample size, response rate, odds ratio (OR), and the possible associated factors of partograph utilization.

A modified version of NOS (the Newcastle-Ottawa Scale) [51] was used to assess the methodological quality of a study. The modified the Newcastle–Ottawa scales consists of three sections. The first section tool is rated up to five stars for methodological evaluation. The second section tool is ranked up to three stars for comparability assessment. The third section tool is evaluated up to two points that deal with the statistical analysis and the outcome of each study. The original study was assessed by two reviewers independently and any disagreement between the reviewers was resolved by taking the mean score of the two reviewers. Finally, the original studies with the scale of  $\geq 7$  out of 10 were considered as high quality after reviewing different literature.

## Data synthesis and statistical analysis

For further analysis, we imported the data into STATA Version 11.0 statistical software after extracting the data using Microsoft Excel format. Using the binomial distribution formula, Standard error was calculated for each study. We identify the heterogeneity between the studies using Cochran's Q statistics (Chi-square), inverse variance ( $I^2$ ), and  $p$ -values [51]. The statistical output showed that there was significant heterogeneity among the studies ( $I^2 = 99.4\%$ ,  $p = 0.000$ ) so a random-effects meta-analysis model was used to estimate the pooled prevalence and associated factors of partograph utilization in Ethiopia. A forest plot used to detect the presence of heterogeneity. Furthermore, subgroup analysis and meta-regression were used to identify the possible source of heterogeneity. The evidence of publication bias was checked using funnel plot symmetry. Besides, the statistical significance of publication bias was assessed using both Egger's and Beggar's test, subsequently, a trim-and-fill analysis was performed, with the  $p$ -value, less than 5% used to declare the presence of publication bias [34,55].

# Results

## Study selection and data extraction

The search strategy identified 80 articles from PubMed, 60 articles from Google Scholar, 45 articles from Cochrane Library, 10 articles from African Journals Online, 7 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. Of which, 134 were excluded due to duplication, 35 through review of titles and abstracts. Additionally, 31 full-text articles were excluded for not reporting the outcome variable and other reasons. Finally, 19 studies were included in this study [Fig.1].

### Characteristics of included studies

A total of 6237 Study participants were included in this systematic review with a range of 126 in SNNP [16] to 605 in Addis Ababa [58] in individual studies carried out between 2012 to 2019.

### Utilization of partograph in Ethiopia

The utilization of partograph from included studies ranged between 6.9 and 92.6 % (Table 1). As indicated in the forest plot, the pooled estimate for utilization of ENBC services from 19 studies in Ethiopia was 59.95% (95% CI:46.81, 73.09) (Fig. 2). we identified a high and significant heterogeneity between studies ( $I^2 = 99.4\%$ ;  $p$ -value = 0.000), indicating great variability in utilization across studies so a random effect analysis model was used to estimate the pooled prevalence of the utilization of partograph in Ethiopia (Fig. 2). we performed a subgroup analysis based on study area and year of study to identify the source of heterogeneity (Table 2). Beyond subgroup analysis, meta-regression for the included studies was conducted to identify factors for heterogeneity. However, there was no statistical significance from the meta-regression (Table 3).

*Table 1: Descriptive summary of included studies on partograph utilization based on year of study, study design, sample size, region of study, response rate, and prevalence (n=15).*

Table 2: Sub-group analysis of the prevalence of partograph utilization in Ethiopia by region and year of publication.

Table 3: Meta-Regression for the Included Studies to Identify the Source of Heterogeneity for partograph Utilization of in Ethiopia, 2020

| Author (year) (reference number) | Study design(setting) | Sample size | Response rate | Study region | P(95% :CI)  | Quality of score |
|----------------------------------|-----------------------|-------------|---------------|--------------|-------------|------------------|
| Fantu A.et al(2012)[21]          | Cross-sectional       | 381         | 88            | Amhara       | 29(24,33)   | 8                |
| Habtamu R.et al(2017)[29]        | Cross-sectional       | 224         | 90.2          | Oromia       | 89(85,93)   | 7                |
| Wakeshe W.et al(2015)[27]        | Cross-sectional       | 266         | 97.4          | Oromia       | 84(80,88)   | 9                |
| Negash W.et al(2013)[26]         | Cross-sectional       | 403         | 94.5          | Amhara       | 40(35,45)   | 8                |
| Haymanot M. et al(2015)[24]      | Cross-sectional       | 441         | 98            | Dire Dawa    | 92.6(90,95) | 8                |
| Tesfay H. et al(2017)[15]        | Cross-sectional       | 220         | 90            | Tigray       | 73(67,79)   | 7                |
| Desalegne A. et al(2015)[22]     | Cross-sectional       | 273         | 100           | Amhara       | 53(48,60)   | 9                |
| Kidist E. et al(2016)[28]        | Cross-sectional       | 300         | 93.3          | SNNP         | 51(45,57)   | 9                |
| Kidest G.et al(2016)[25]         | Cross-sectional       | 442         | 99            | SNNP         | 73(68,78)   | 9                |
| D.Markos et al(2014)[30]         | Cross-sectional       | 401         | 91            | SNNP         | 70(66,75)   | 8                |
| Engida Y.et al(2012)[23]         | Cross-sectional       | 202         | 96.5          | Addis Ababa  | 57(50,64)   | 7                |
| Sena B.et al(2012)[18]           | Cross-sectional       | 340         | 80.6          | Oromia       | 6.9(4,10)   | 9                |
| Gutema C. et al(2015)[32]        | Cross-sectional       | 309         | 89            | SNNP         | 54(48,59)   | 9                |
| Daniel B.et al(2016)[16]         | Cross-sectional       | 127         | 100           | SNNP         | 26(18,34)   | 9                |
| Haftom G et al(2015)[33]         | Cross-sectional       | 233         | 93            | Tigray       | 57(51,64)   | 7                |
| Guesh W.et al(2017)              | Cross-sectional       | 414         | 98.1          | Tigray       | 83(31,43)   | 8                |
| Yosef Haile.et al(2019)          | Cross-sectional       | 436         | 95            | SNNP         | 55.4(2,9)   | 9                |
| Tesfay H. et al(2019)            | Cross-sectional       | 220         | 98            | Tigray       | 73.3(21,32) | 9                |
| Azeb A.et al(2017)               | Cross-sectional       | 605         | 98.1          | Addis Ababa  | 69(36,45)   | 9                |

| Subgroup            | Number of studies included | Prevalence (95% CI)  | Test of heterogeneity, I <sup>2</sup> | p-value |
|---------------------|----------------------------|----------------------|---------------------------------------|---------|
| By region           |                            |                      |                                       |         |
| Amhara              | 3                          | 40.89 (27.40, 54.38) | 95.3                                  | < 0.001 |
| Oromia              | 3                          | 60.1(1.75, 118)      | 99.9                                  | < 0.001 |
| Addis Ababa         | 3                          | 73(52.56,93.7)       | 98.8                                  | < 0.001 |
| Tigray              | 4                          | 71.9 (61,82.59)      | 93.9                                  | < 0.001 |
| SNNP                | 5                          | 55.10 (43.6, 66)     | 97.4                                  | < 0.001 |
| By publication year |                            |                      |                                       |         |
| 2012-2014           | 5                          | 40.67 (15.61, 65.72) | 99.4                                  | < 0.001 |
| 2015-2017           | 11                         | 65.93 (55.06, 76.81) | 98.4                                  | < 0.001 |
| 2018-2019           |                            | 70.59 (53.28, 87.91) | 97.6                                  | < 0.001 |

| Variables   | Characteristics | Coefficient | P value   |
|-------------|-----------------|-------------|-----------|
| year        | Year of study   | 5.779168    | 0.420     |
| Sample size |                 | 0388121     | 0.536     |
| Region      | Amhara          | 26.33038    | 0.472     |
|             | Oromia          | 19.05547    | 0.619     |
|             | Tigray          | 6.0002      | 0.844     |
|             | SNNP            | -8.426123   | 0.808     |
|             | Addis Ababa     | Reference   | Reference |

## Publication bias

We observed publication bias using both Begg's and Egger's tests [36,55] with these tests yielding statistical evidence of publication bias at a  $p$ -value less than 0.05 and the funnel plot was asymmetry. In considering publication bias trim and fill meta-analysis was done [54]. However, based on this analysis, the prevalence of partograph utilization was 59.95 and no significant change was seen as compared with the main meta-analysis.

Sensitivity analysis

This systematic review and meta-analysis showed that the point estimate of its omitted analysis lies within the confidence interval of the combined analysis. Therefore, trim and fill Analysis was no further computed (fig 3).

## Associated factors of partograph utilization

A total of 19 studies were included for analysis of associated factors of partograph utilization. We identified seven main associated factors with the pooled odds ratio ranging from 2.12 to 5.66. These associated factors were midwifery profession, female health care provides, Emergency Obstetric and Newborn Care training, attitude, Knowledge of partograph, health center, and short term training on partograph, favorable attitude towards partograph, and working at health center.

The result of this systematic review showed a significant association between midwifery profession and partograph utilization. Obstetric care providers who are midwifery in profession were 4 times more likely to utilize partograph as compared to other Obstetric care providers working in labour ward (AOR: 3.97, 95%CI: 2.63, 5.99) (Fig. 4a).

Similarly, this study showed that female obstetric health providers were strongly associated with partograph utilization (AOR = 3.2, 95%CI: 2.2, 4.66) (Fig. 3b). Furthermore, Emergency Obstetric and Newborn Care training yielded a statistically significant association with partograph utilization as compared to health care providers who did not received the training [OR = 2.9, 95% CI: 2.19, 3.83] (Fig. 3c). Moreover, having training on partograph showed statistically significant association with partograph utilization. Obstetric care givers who had received training on partograph were around 6 times more likely to utilize partograph (OR: 5.66, (95%CI: 2.48, 12.92) as compared to those obstetric health care providers who did not received training on partograph (Fig. 3d).

Knowledge of partograph also yielded a significant association with partograph utilization. Individuals who had a good Knowledge of partograph were around 3 times more likely to utilize partograph (OR: 2.5, 95%CI: 1.6, 3.767) as compared to their counter parts (Fig. 3e).

Obstetric care providers who had favorable attitude were more likely to utilize partograph (AOR = 2.3, 95%CI: 1.5, 3) as compared to obstetric care providers who had unfavorable attitude towards partograph (Fig. 3f). Additionally, working at health center was significantly associated with partograph utilization. Obstetric care providers who worked at health center were around 4 times (AOR = 3.5, 95%CI: 2.5, 4.9) more likely to utilize partograph as compared to obstetric care providers who worked in Hospitals (Fig. 3g).

## Discussion

Most of the time, maternal deaths and complications are the result of obstructed and prolonged labor. Prolonged labor is a leading cause of death among mothers and newborns in the developing world. If the

labour does not progress normally, a woman may experience serious complications such as obstructed labor, dehydration, exhaustion, or rupture of the uterus. It may also contribute to maternal infection or hemorrhage and neonatal infection. This can be prevented by accessing skilled delivery services such as plotting partograph during the progress of labour [37]. However, the utilization was not routine, not consistent everywhere, and every time and even among those who used the partograph, it was not well documented and not used for decision making as to the recommended standard especially in the resource-limited country [38–40]. In this study, we derived the national estimate, making the pooled prevalence of partograph utilization of 57.21 % (95%CI: 40.77, 73.66).

Partograph utilization in our study was lower than the study report of South Africa [41], Gambia[42], and Kenya[11]. These differences might be due to differences in strategies and policies to implement partograph utilization, availability of health care providers, availability of tools, work overload, supportive professional environment from peers and leaders, with quality assurance systems, and promotion on the implementation of the partograph utilization.

The other reason might be level of empowerment of women to get better care, with delivery at health facilities and earlier admission, which would be more likely to increase partograph use.

In the studies of the Gambia and South Africa; the participants were only midwives by profession with a great chance to work in labour and delivery unit, to be trained on partograph use and might have better knowledge, skill, and commitment of using partograph to follow the progress of labour. But in our study all health care providers working in labour ward were included.

Midwifery profession were 5 times ((AOR: 4.9,95%CI:3.38,7.14) more likely to utilize partograph as compared to other health care professionals working in labour ward. This finding is supported by the study conducted in Nigeria[38] and South Africa[41]. This might be due to the fact that midwives might have adequate knowledge, frequently assigned in labour and delivery unit, have better awareness and over valued the use of partograph. The other reason might be midwives might have a better chance of getting partograph training, in-service emergency obstetric and newborn training, and they might also have a better skill of partograph use to follow the progress of labour and as a decision making tool than other health professionals.

Female health care providers were four times (AOR: 3.92, 95%CI: 2.64, 4.12) more likely to utilized partograph than male health care providers. This finding is in line with study conducted in India[46]. This might be due to the fact that females are closer to obstetric information as they tend to become midwives which makes them more likely to have good knowledge of the partograph. The other reason might be female health care providers are more committed, optimistic to complete the components, and over valued the use of partograph during childbirth.

According to this study, Health care professionals having Emergency Obstetric Care and Newborn care training were 2.7 times more likely to utilize partograph than their counterparts (AOR:2.7,95%CI:2.26, 3.22). This finding is in line with a study done in Malawi [47] and Nigeria[38]. The reason might be having

Emergency Obstetric Care and Newborn care training capacitate the health care providers to interpret components of the partograph, to use as a decision making tool, increase confidence use partograph, and to follow best practices during childbirth.

Additionally, This review showed that Knowledge of the partograph was other significant factors for partograph utilization (AOR: 3.3, 95%CI: 1.5, 6.87). This was supported by other studies [48] and [49]. This might be due to the fact that having good knowledge of partograph might enhance health care providers skill and competency to use partograph as a decision-making tool and interpret it.

This study also indicated that receiving short term training on partograph was positively associated with partograph utilization. Health care providers received short term training on partograph were 7 times more likely utilize partograph (OR: 7.28 (95%CI: 1.58, 33.64)). The reason might be health care providers who received training on partograph had better knowledge, skill, motivation, and attitude about partograph, which in turn improves partograph utilization.

Obstetric care providers who had favorable attitude were more likely to utilize partograph (AOR = 2.3, 95%CI: 1.5, 3) as compared to obstetric care providers who had unfavorable attitude towards partograph. Additionally, working at health center was significantly associated with partograph utilization. Obstetric care providers who worked at health center were around 4 times (AOR = 3.5, 95%CI: 2.5, 4.9) more likely to utilize partograph as compared to obstetric care providers who worked in Hospitals.

### Strength and limitation

This review used a predefined search strategy for both published and unpublished articles to reduce reviewer's bias and conducting data extraction and quality evaluation by two independent reviewers to minimize the possible reviewer bias. We also performed sensitivity and subgroup analysis based on the years of the study and study area. Besides, the effects of seven key predictors of partograph utilization were estimated.

On the other hand, included articles were restricted to English language only; this is a limitation of the study as it missed studies published in other languages. All studies included were cross sectional which cannot show a cause and effect relationship between partograph utilization and the characteristics presented.

## Conclusion

The utilization of partograph was low in Ethiopia. Midwifery profession, female health care provider, having short in-service Emergency Obstetric and Newborn Care training, Knowledge of partograph, short term training on partograph, working at health center, and favorable attitude towards partograph were significant predictors for partograph utilization.

## Abbreviations

AA: Addis Ababa

CI: Confidence Interval

EmOC: Emergency Obstetric Care

NC: Newborn Care

OR: Odds Ratio

PRISMA: Preferred Reporting Items for Systematic Reviews and Meta-Analyses

SNNP: Southern Nation Nationality and Peoples

WHO: World Health Organization

## Declarations

Ethics approval and consent to participate

Not applicable

Consent for publication

Not applicable

Availability of data and material

The data sets generated during the current study are available from corresponding author on reasonable request.

Competing interests

All authors declare that they have no competing interests

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Authors' contributions

Both authors (AAA) and (BFZ) contributed to the data analysis and read and approved the final manuscript.

Correspondence goes to AAA

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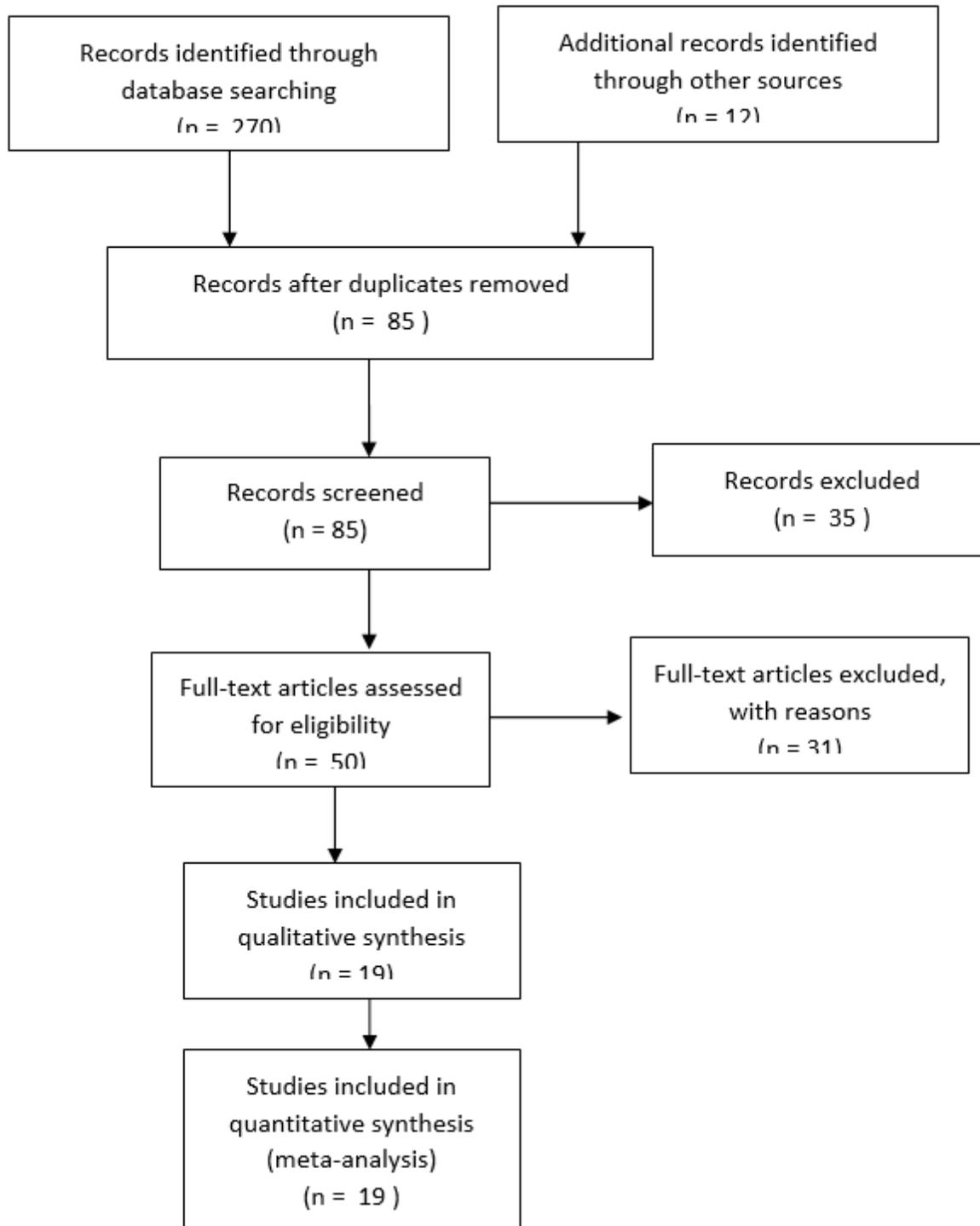
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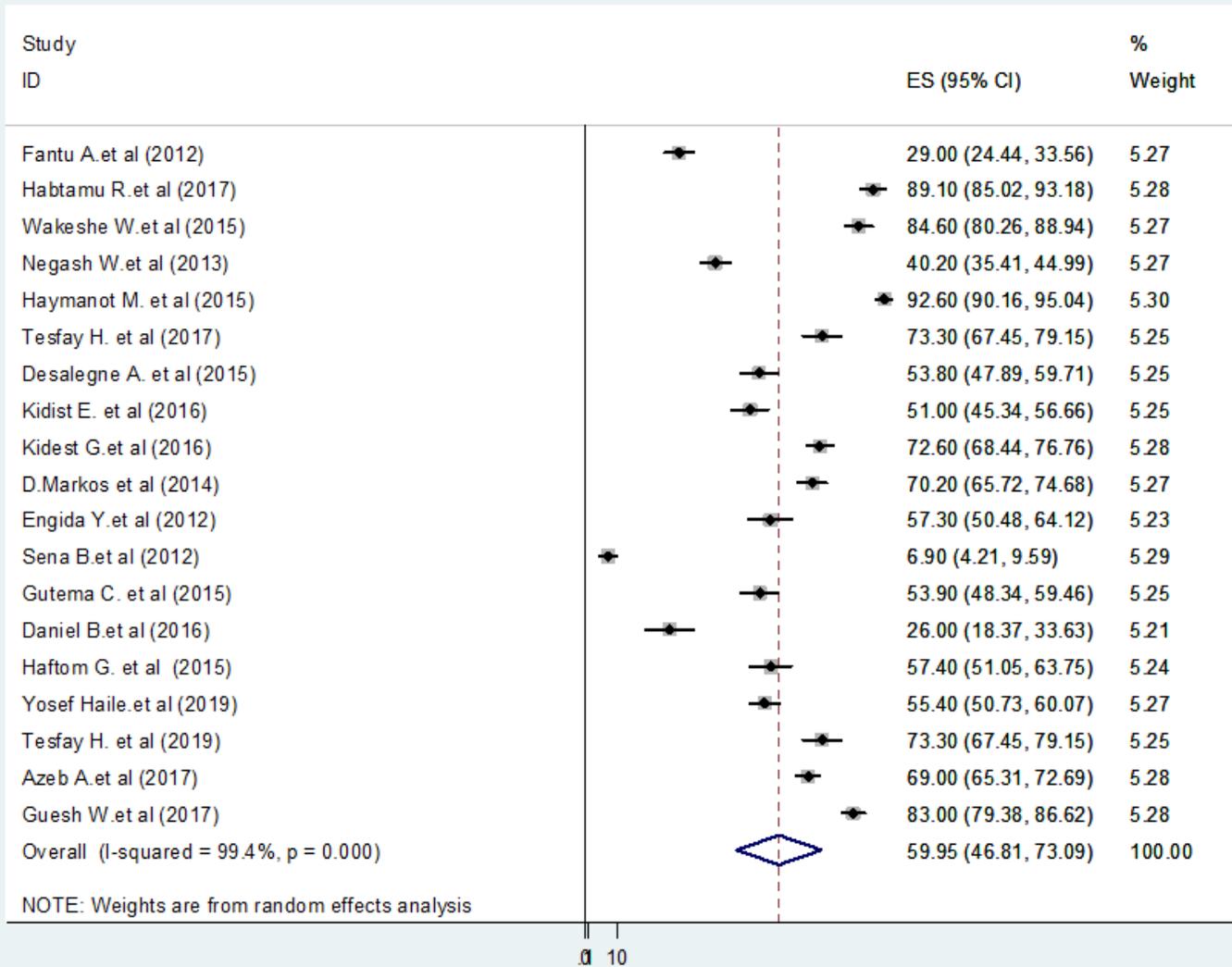
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## Figures



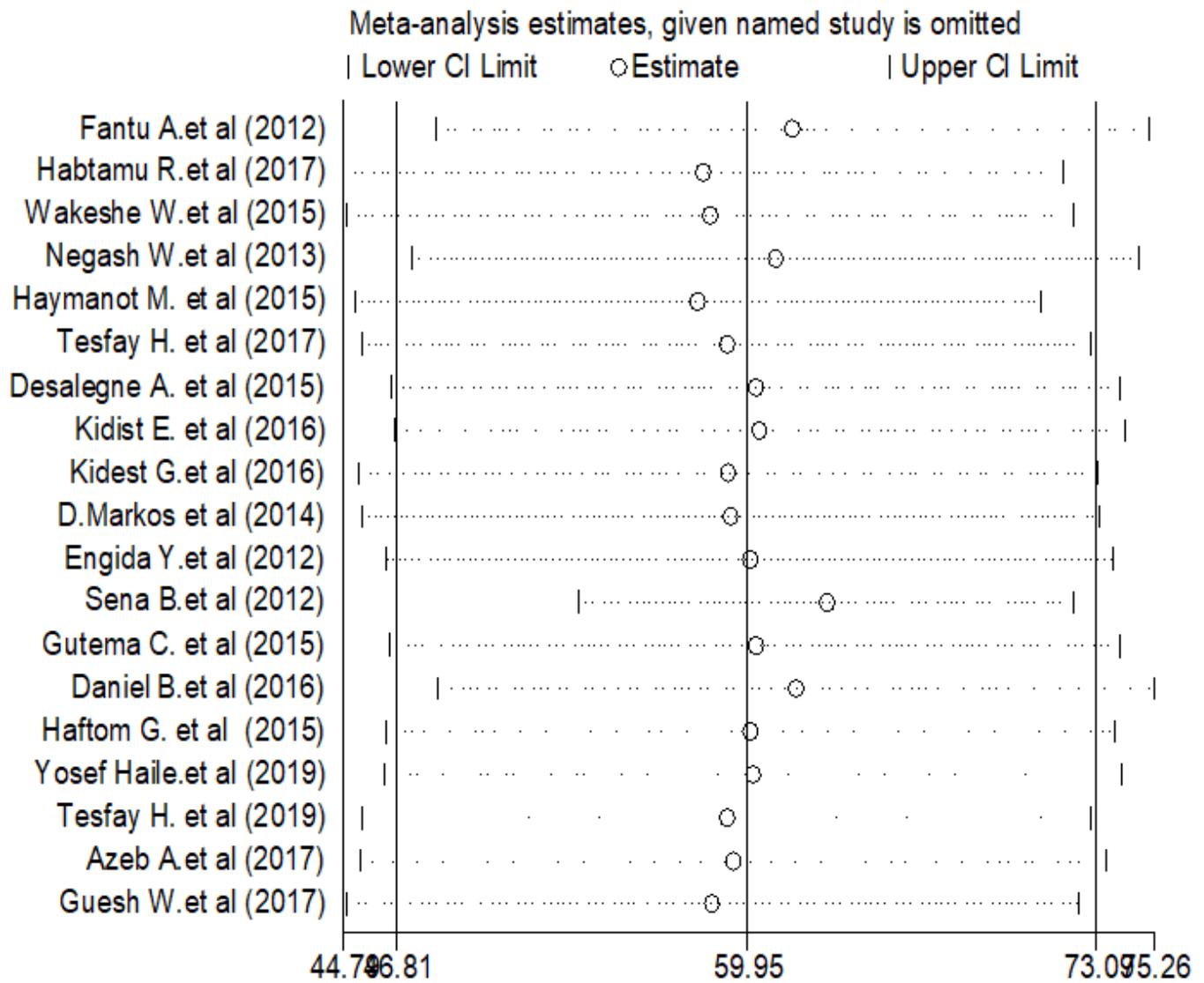
**Figure 1**

PRISMA flow diagram 2009 showing study selection and included studies for Partograph utilization as a decision making tool and associated factors among obstetric care providers in Ethiopia.



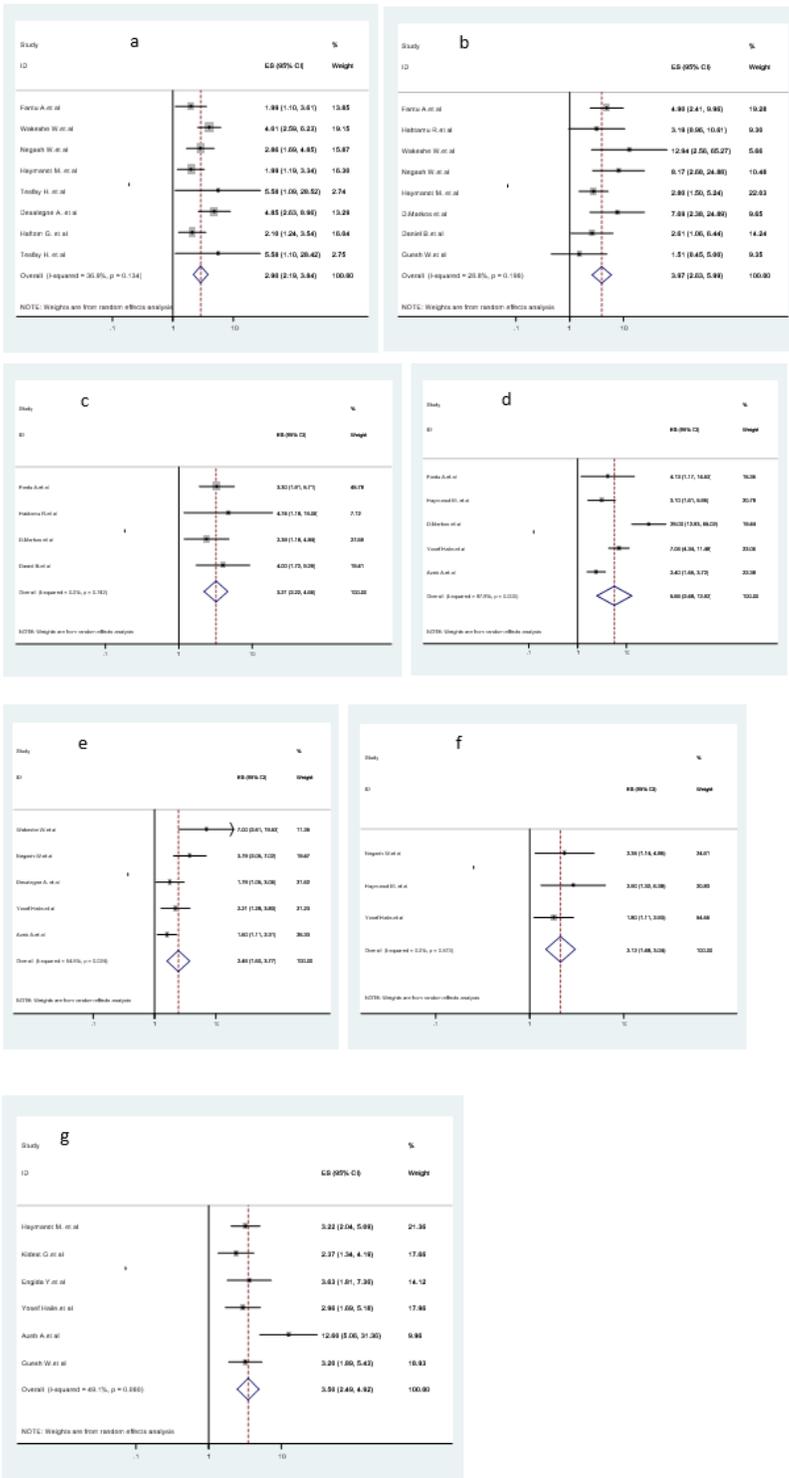
**Figure 2**

Forest Plot for the Prevalence of partograph Utilization in Ethiopia, 2020



**Figure 3**

Sensitivity analysis of the pooled prevalence of partograph utilization in Ethiopia.



**Figure 4**

Forest Plot Showing Pooled Odds Ratio of the Associated Factors for partograph Utilization. a midwifery proffession, b feale obstetricric care providers, c Emergency Obstetric and Newborn Care Traning, d traning on partograph, e Knowledge of partograph f favorable attitude, g health center

## Supplementary Files

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

- [PRISMA2009checklist1parto.doc](#)