

REVIEW**A META-ANALYSIS OF SOCIO-DEMOGRAPHIC FACTORS PREDICTING BIRTH IN HEALTH FACILITY****Yifru Berhan¹, Asres Berhan²****ABSTRACT**

BACKGROUND: *The low proportion of health facility delivery in developing countries is one of the main challenges in achieving the Millennium Development Goal of a global reduction of maternal deaths by 75% by 2015. There are several primary studies which identified socio-demographic and other predictors of birth in health facility. However, there are no efforts to synthesis the findings of these studies. The objective of this meta-analysis was to determine the strength of the association of birth in the health facility with selected sociodemographic factors.*

METHODS: *A meta-analysis of Mantel–Haenszel odds ratios was conducted by including 24 articles which were reported between 2000 and 2013 from developing countries. A computer-based search was done from MEDLINE, African Journals Online, Google Scholar and HINARI databases. Included studies did compare the women's health facility delivery in relation to their selected socio-demographic characteristics.*

RESULTS: *The pooled analysis demonstrated association of health facility delivery with living in urban areas (OR = 9.8), secondary and above educational level of the parents (OR = 5.0), middle to high wealth status (OR = 2.3) and first time pregnancy (OR = 2.8). The risk of delivering outside the health facility was not significantly associated with maternal age (teenage vs 20 years and above) and marital status. The distance of pregnant women's residence from the health facility was found to have an inverse relation to the proportion of health facility delivery.*

CONCLUSION: *Although the present meta-analysis identified several variables which were associated with an increase in health facility delivery, the most important predictor of birth in the health facility amenable to intervention is educational status of the parents to be. Therefore, formal and informal education to women and family members on the importance of health facility delivery needs to be strengthened. Improving the wealth status of the population across the world may not be achieved soon, but should be in the long-term strategy to increase the birth rate in the health facility.*

KEYWORDS: *community based studies, developing countries, health facility delivery, meta-analysis, socio-demographic variables*

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INTRODUCTION

While almost all births in high income countries occur with the help of skilled birth attendants. More than half of all births (53%) in low income countries, however, still take place without the help of skilled birth attendants (1). Similarly, the mean proportions of at least four antenatal care

visits in low income countries were estimated to be more than two and half times lower than those of the high income countries (96% vs 37%) (1). Probably, related to this low utilization of skilled attendants during pregnancy and delivery, more than 99% of maternal and perinatal deaths in the last decade occurred in developing

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countries (2, 3). It was also noted that the low proportion of skilled health personnel attended delivery in developing countries is one of the main challenges to achieve the Millennium Development Goal (MDG) of a global reduction of maternal deaths by 75% by 2015 (4, 5).

It has been stated that the reasons for the low utilization of skilled attendants during delivery by the women in developing countries are complex and multidimensional. Ineffective health decision making at the family level, the influence of traditional healers, low level of education, inadequate transportation facilities and insecurity at night, high cost of health services, and inhospitable health service providers among others were attributed to the low health facility delivery in developing countries (6-10). The long tradition of home delivery attended by a traditional birth attendant might have also a strong influence on intention to give birth in a health facility.

There are several primary researches that assessed various factors associated with the birth in the health facility or at home in developing countries in the last decade (11-34). However, there was no meta-analysis conducted to examine the pooled effect of the various factors on birth in the health facility. There were also several inconsistent findings with regard to association of health facility delivery with the mothers' age, parity, level of parents' education, area of residence, marital and wealth status (7, 35).

Thus, although all factors could not be included, the objective of this meta-analysis was to determine the strength of the association of birth in the health facility with the mother's age, area of residence, parents' level of education, wealth and marital status and parity.

METHODS

Search strategy

A computer based literature search was conducted by both authors (YB, AB) in the databases of HINARI, Medline, African Journals Online, Google Scholar, and the Cochrane Library. The literature search was further strengthened by searching the websites of major publishers (Elsevier Science-Science Direct, Nature Publishing Group, Oxford University Press, PsycARTICLES, Science, and Wiley-Blackwell)

via HINARI and by searching the reference lists of retrieved articles.

During literature search, the following preselected search terms were alternatively combined with health facility delivery using the Boolean logic (AND, OR, and NOT): maternal age, maternal education level, husband/partner/paternal educational level, distance from a health facility, antenatal care, residence, marital status, wealth status, and parity.

Inclusion criteria and study selection

The inclusion criteria for this meta-analysis were: (1) studies that assessed place of delivery in developing countries, (2) studies that were written in English, (3) studies published between 2000 and 2013 and (4) studies with cross sectional or case control design. Study selection was conducted by both authors independently. Firstly, the abstracts of all the retrieved articles were reviewed and grouped as "eligible for full document review" and "ineligible for full document review". Then, the final decision of either to include studies in the meta-analysis or to exclude them was reached by reviewing in detail the whole contents of the studies that were grouped as "eligible for full document review". When there was disagreement between the authors, it was resolved by discussion and by re-reviewing the specific articles jointly.

Data extraction

With a similar data extraction template, data extraction was performed by both authors independently using Excel Spreadsheets. Information was abstracted for the following variables: name of the first author, year of publication, mothers' age, mothers' education level, wealth status, residence, marital status, parity, and fathers' education level.

Data synthesis and statistical analysis

To make fit for meta-analysis software, all the selected variables were dichotomized purposely: age as < 20 years vs 20 years and above; residence as urban vs rural; educational level as primary or no education vs secondary and above; wealth status as low or lowest vs middle to highest; marital status as married vs unmarried; and parity as primigravida vs multiparous. Studies that

categorized the wealth status data like MEASURE DHS standard (lowest, low, middle, high and highest) were included. In the correlation analysis, equivalent/average estimation was made in km (for 50 km distance, one hour travel) for pregnant women's residence distance reported in hours for vehicle travel.

The proportion of births in the health facility was assessed using the random effects model. Odds ratios (OR) and the 95% CIs were computed with Mantel-Haenszel method. When the 95% CI did not include number 1, it was considered as statistically significant. The consistency of the included studies was evaluated by heterogeneity testing, chi-squared test (Cochran Q test) and I^2 statistics. When the value of I^2 was equal to or greater than 50%, the studies included in the analysis were considered as significantly inconsistent. Furthermore, sensitivity analysis (leave one study alternately during analysis) was conducted to assess the stability of the pooled values to outliers and the impact of individual studies. All the statistical analyses were carried

out using Review Manager (RevMan) Version 5.1 software.

RESULTS

Description of the studies

As shown in Figure 1, the literature search for the selected search terms initially identified 7,522 citations. Following a review of the titles for their relevance for this meta-analysis, 7,213 were excluded from retrieval. Out of 309 retrieved articles, 201 were excluded after reviewing their abstracts. The full document of 108 articles was reviewed and finally 24 articles were selected for this meta-analysis (11-34). Of the included studies, 16 were published between year 2011 and 2013; the majority were community based studies; and 12 were reported from Ethiopia (Table 1). Most of the included studies employed cross sectional study design. Significant heterogeneity was observed among the selected studies. But, the sensitivity analyses did not bring significant change in the overall odds ratios.

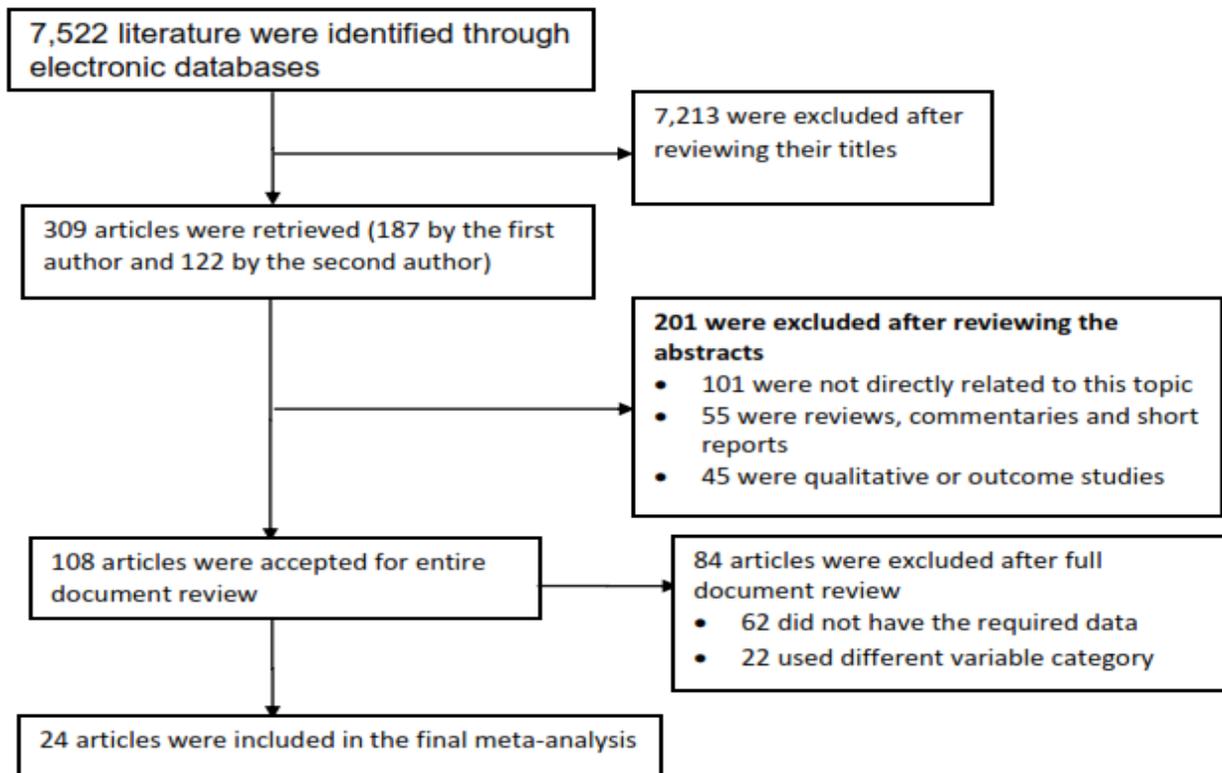


Figure 1: Flow diagram showing included studies selection

Table 1: General characteristics of studies included in this meta-analysis

Author	Year	Country	Study design	Sample size
Wado YD et al (12)	2013	Ethiopia	Community based survey	1370
Shiferaw S et al (13)	2013	Ethiopia	Community based cross sectional	909
Tsegay Y et al (14)	2013	Ethiopia	Community based cross sectional	1113
Mengesha ZB et al (15)	2013	Ethiopia	Community based nested case control study	1065
Worku AG et al (16)	2013	Ethiopia	Population based survey	1668
Nanjala M et al (17)	2012	Kenya	Community based cross sectional	380
Abebe F et al (18)	2012	Ethiopia	Health facility & community based case control	324
Amano A et al (19)	2012	Ethiopia	Community based cross sectional	855
Anyait A et al (20)	2012	Uganda	Community based cross sectional	500
Teferra AS et al (21)	2012	Ethiopia	Community based cross sectional	371
Kabakyenga JK et al (22)	2012	Uganda	Community based survey	759
Mekonnen MG et al (23)	2012	Ethiopia	Community based survey	7978
Fikre AA et al (24)	2012	Ethiopia	Community based cross sectional	506
Dhokal S et al (25)	2011	Nepal	Community based cross sectional	150
Wanjira C et al (26)	2011	Kenya	Hospital based cross sectional	409
Abera M et al (27)	2011	Ethiopia	Community based cross sectional	1074
Oguntunde O et al (28)	2010	Nigeria	Community based cross sectional	332
Babalola S et al (29)	2009	Nigeria	Community based survey	2158
Thind A et al (30)	2008	India	Community based cross sectional	5391
Hounton S et al (31)	2008	Burkina Faso	Community based cross sectional	81,536
Mpembeni RNM et al (32)	2007	Tanzania	Community based cross sectional	974
Idris SH et al (33)	2006	Nigeria	Community based cross sectional	496
Wagle RR et al (34)	2004	Nepal	Community based cross sectional	308
Mekonnen Y et al (35)	2003	Ethiopia	Community based cross sectional	478

Methodological quality of the included studies

As recommended by Cochrane collaboration, Evers checklist was used to assess the methodological quality of the included studies (36). Fourteen of the nineteen items were appropriate for this study to assess the methodological quality of the included studies. All included studies described well: the study population, the objective/research question, study design, outcome measures and values and ethical issues. They have also discussed the limitations and generalizability of the findings of the study. Their conclusions were based on their results. However, there was marked variation in their sample size. The extremely low and high sample

sizes were 150 and 81,536, respectively. The remaining studies used sample sizes ranging from 324 to 7978.

Findings of the review

This meta-analysis demonstrated that maternal age was not a predictor of birth in the health facility (Figure 2). However, in four of the studies (18, 19, 31, 34), the chance of delivering in health facilities was about 1.7-to 3.4-times higher in teenagers than in older women. Only one study (26) showed statistically significant association of home delivery among adult women. The chance of adult women giving birth in the health facility was by about 72% less than teenage women.

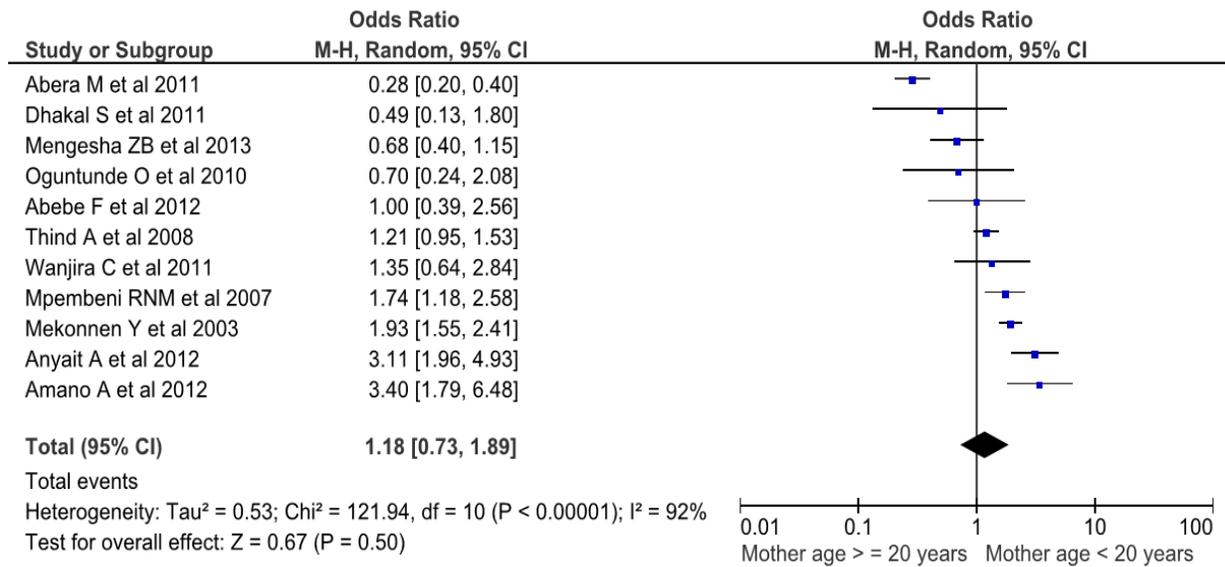


Figure 2: Odds ratio of women’s health facility delivery by age, ≥ 20 years vs < 20 years

As presented in Figure 3, birth in health facility was strongly associated with area of residence. The urban women were about 9.8 times more likely to deliver in the health facility as compared to their rural counterparts (OR = 9.8; 95% CI, 5.60

-17.24). However, the heterogeneity testing revealed significant variability among the included studies (I² = 97%). The sensitivity analysis did not show a significant change in the overall OR.

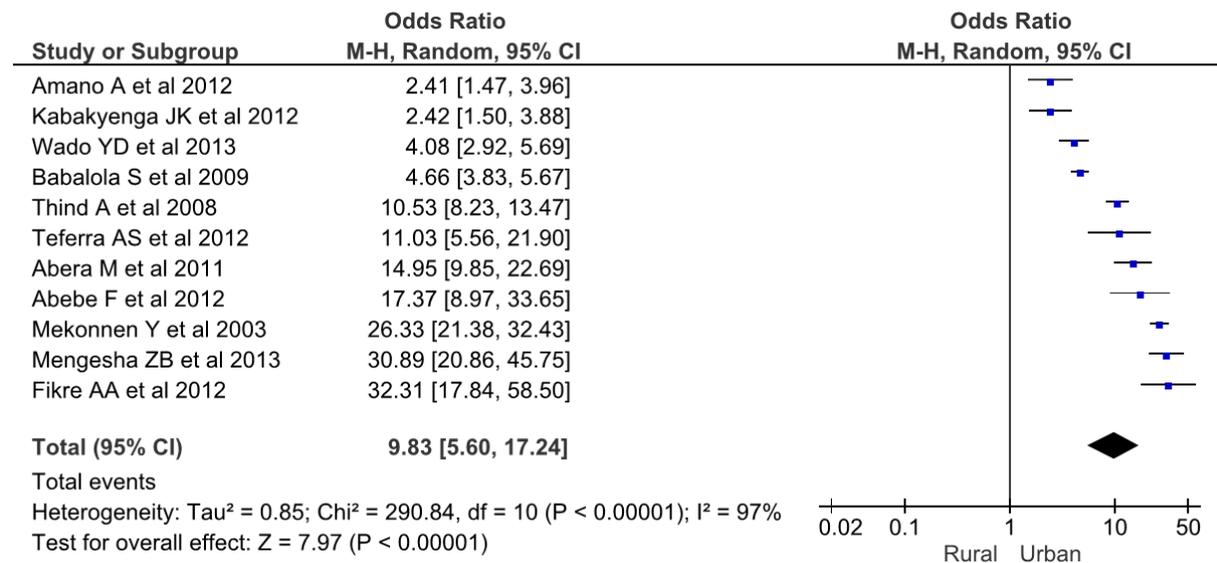


Figure 3: Odds ratio of women’s health facility delivery by area of residence, urban vs rural

Twenty-two of the twenty four included studies reported the level of maternal education. Eleven studies also included paternal educational level. As presented in Figure 4, the subgroup meta-

analysis (sub grouped by maternal and paternal educational level) of birth in the health facility has shown strong association with increased level of education. The odds of delivering in health facility

was about 5.7-fold among women educated to secondary and above level (OR = 5.7; 95% CI, 3.77-8.60) and about 3.9-fold among secondary and above level educated husbands (OR = 3.9; 95% CI, 2.80 - 8.60). As the overall OR showed, the chance of delivering in health facilities among educated couples was 5-fold higher than less

educated counterparts (OR = 5.0; 95% CI, 3.68-6.82). The heterogeneity testing still revealed significant variability ($I^2 = 95%$). The sensitivity analysis (with the exclusion of any of the included studies), however, revealed the stability of both the subgroup and the overall ORs.

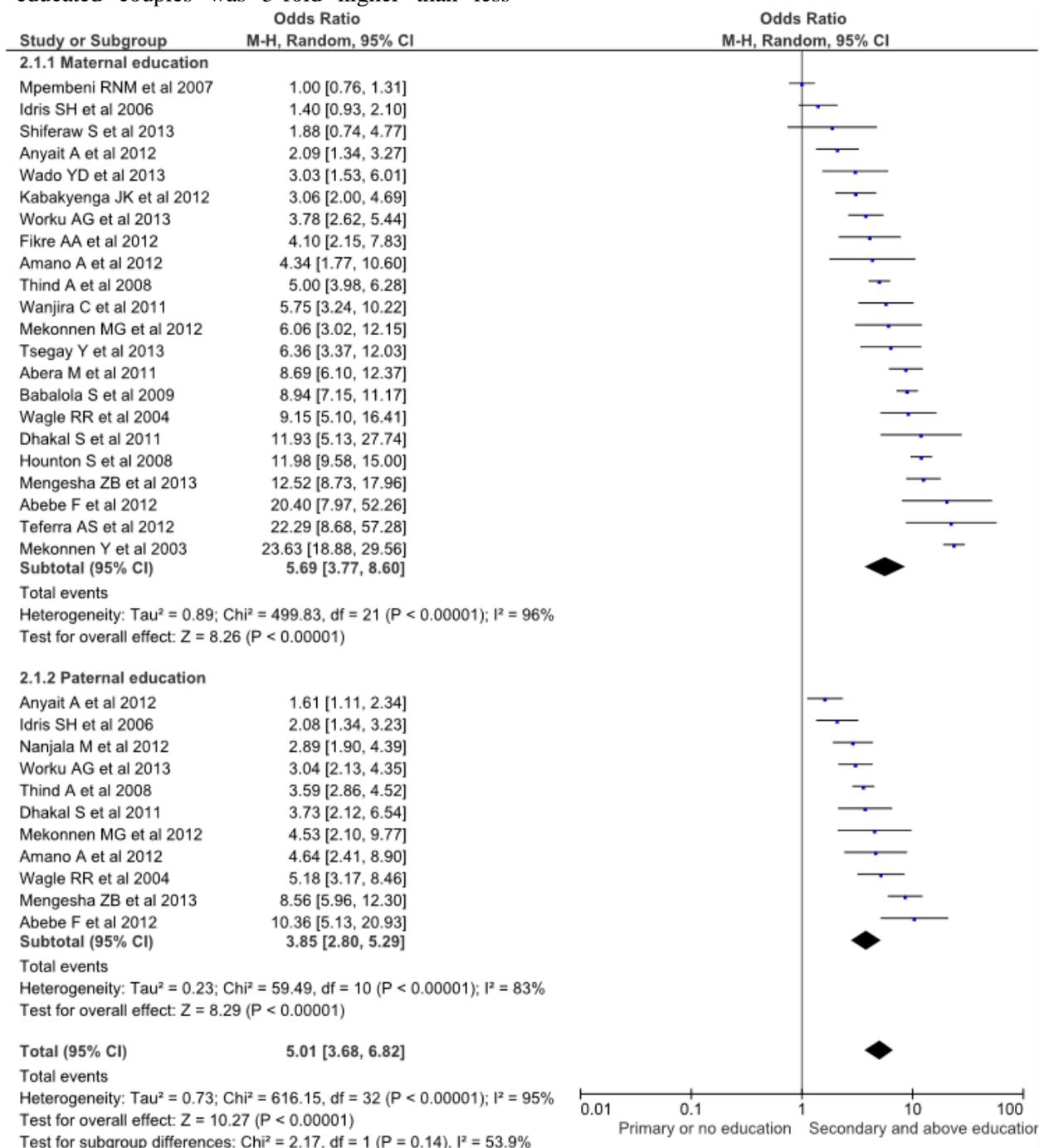


Figure 4: Odds ratio of women’s health facility delivery from a subgroup analysis by level of parents’ education, primary or no education vs secondary and above

Figure 5 shows the association of birth in the health facility with their wealth status. In two studies (16, 26), delivering in health facility was not associated with wealth status. In other included studies, however, women with middle to highest wealth status were about 2 to 5 times more likely to deliver in health facilities as compared to the women with low or lowest wealth status. As a

result, the pooled effect showed statistically significant association of birth in the health facility with middle to highest wealth status (OR = 2.3; 95% CI, 1.61 - 3.19). In the sensitivity analysis, the overall OR continued to be in the significant range. Heterogeneity testing revealed significant variability among the included studies ($I^2 = 91\%$).

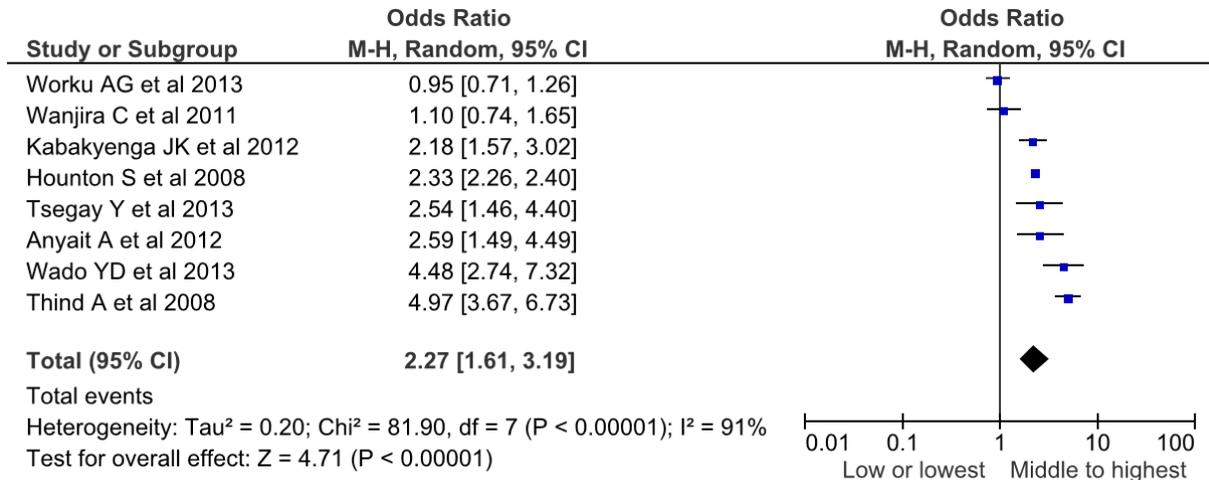


Figure 5: Odds ratio of women's health facility delivery by their wealth status, low or lowest vs middle to highest

As shown in Figure 6, in three studies (15, 32, 35), the chance of unmarried women's health facility delivery was about 71%, 38% and 59% less than married women. However, the overall OR did not demonstrate a statistically significant association

of birth in the health facility with marital status. It was noted that with the exclusion of Anyait A et al study (20), unmarried women were less likely to deliver in a health facility (OR = 0.6; 95% CI, 0.37 - 0.94).

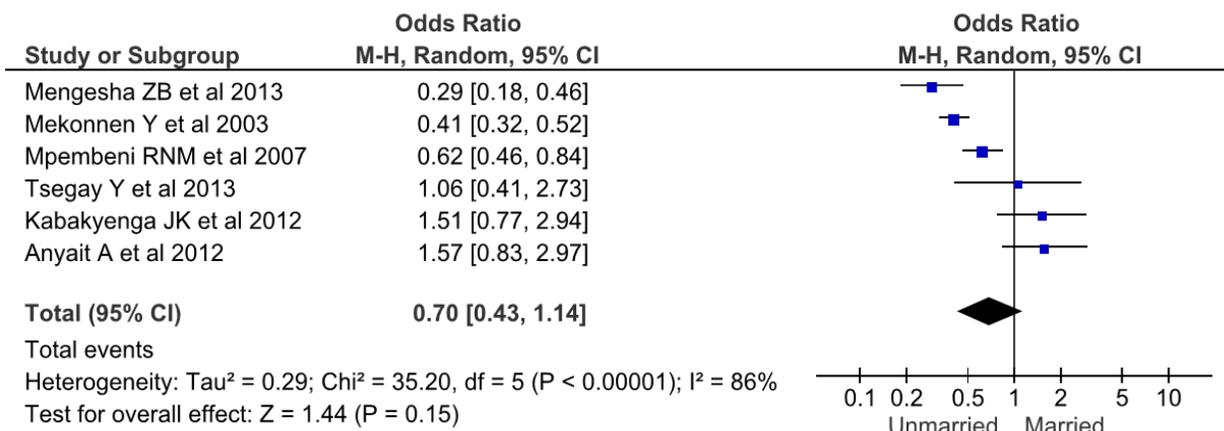


Figure 6: Odds ratio of women's health facility delivery by marital status, married vs unmarried (single, divorced, widowed)

With regard to parity, however, primigravid women (being pregnant for the first time) were more likely to deliver in health facilities than multiparous women (OR = 2.8; 95% CI, 2.16-3.70). In two studies (23, 28), health facility

delivery was not associated with parity. The sensitivity analysis attested the stability of the overall OR and the heterogeneity testing showed the presence of moderate variability among the included studies ($I^2 = 54%$).

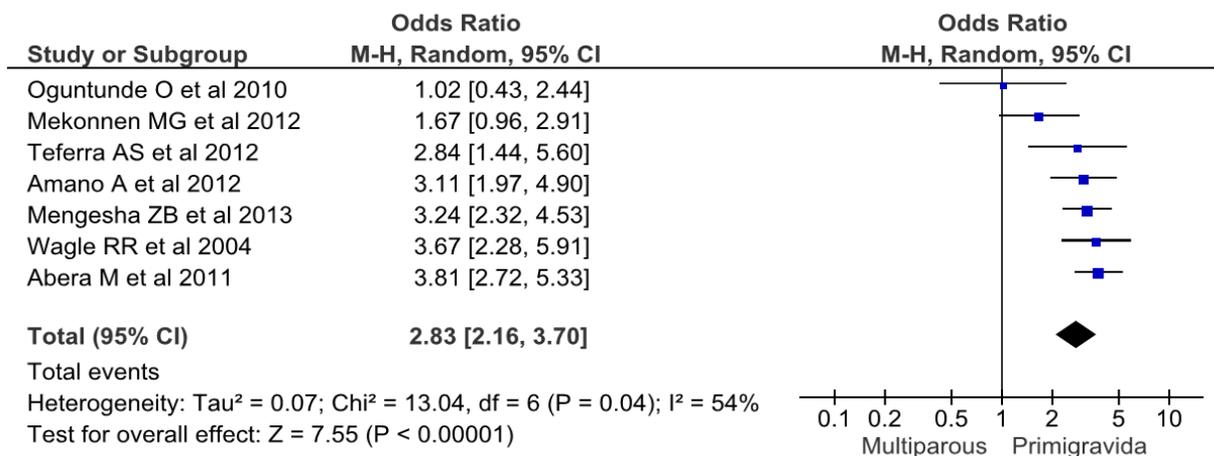


Figure 7: Odds ratio of women’s health facility delivery by parity, primigravida vs multiparous

Although the data were unfit for meta-analysis (because of variation in data grouping among primary studies), correlation analysis demonstrated an inverse relationship between

distance from the nearby health facility and proportion of health facility delivery (11, 18, 19, 21, 30, 31, 33).

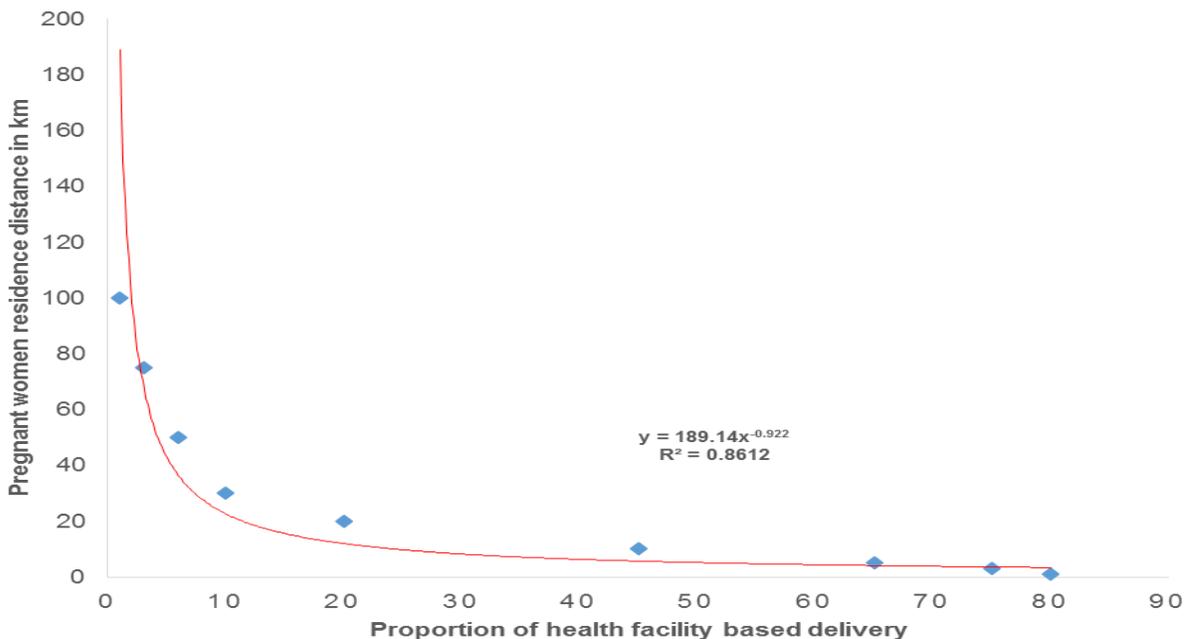


Figure 8: The correlation of distance from the nearby health facility with proportion of birth in the health facility

DISCUSSION

The present meta-analysis demonstrated increased birth in health facility among educated women, women having educated husbands, primigravid women, wealthy women and women living in urban areas. Although several variables which were associated with an increase in health facility delivery were identified, mothers' residential area was a very strong predictor. Nevertheless, secondary and above educational level of pregnant women and of their husbands seems easily amenable to intervention.

The finding of strong association of birth in the health facility with increased level of education is consistent with the findings of several other studies not included in this meta-analysis (7, 37, 38). The importance of education in maternal health service utilization and reduction of mortality was also noted in other reviews (39, 40).

Specific to Ethiopia, from where twelve of the twenty-four selected studies were reported, the message of this meta-analysis is a lot to work more on public education. Furthermore, the extremely low proportion of health facility delivery (6%-10%) during the last decade (41) was probably because of the low proportion of adult literacy rate (39%) in Ethiopia (1).

We also infer that the significant association of health facility delivery with primigravid and teenage (in some studies) may still strengthen the importance of education as the majority of the young women in the last decade have got the chance of formal education in several developing countries (42, 43). The strong association of health facility delivery with parity is consistent with our day-to-day observations in the clinical practice. Couples and family members are usually observed giving more care for first time planned pregnancies.

On the contrary, low utilization of maternal health services by the parous women is a commonly observed phenomenon. A previous study showed that being pregnant for the first time was a strong predictor for maternal health service utilization (44). Another study also showed the negative association of health facility delivery with parity (45). However, it should be noted that a study from Botswana reported the association of low parity with low health facility delivery (7).

In the meta-analysis, residential area was

the predictor with the largest effect size (OR) of place of birth. This much high association of health facility delivery in pregnant women coming from urban areas may still be linked to their level of education and wealth status. This is because, it is expected that living in urban areas is an advantage for the majority to have formal education, better wealth and living standard, better access to mass media and other sources, which all are likely to increase their awareness about the importance of maternal health service utilization and their freedom of making decision in terms of expenses (46).

However, it is also imperative to see the other side of the coin. Living in the rural area is living in the disadvantaged zone for transport and access to health facilities particularly in developing countries where infrastructures are not yet well established. It has been also observed that there was an inverse relation of distance from the nearest health facility with the proportion of health facility delivery. Several other studies have also identified lack of geographic access to emergency obstetric care as a key factor for most rural women to deliver at home without skilled care and to have high maternal and perinatal mortality (47-51).

In this meta-analysis, the statistically significant association of delivery in the health facility with middle to highest wealth status may indicate their economic capability to afford the health service costs. It is also expected that the majority of couples who are able to afford these types of costs are somehow educated and live in urban areas, and may have better awareness on birth preparedness and complication readiness (44).

This meta-analysis is not without limitations. Since the majority of the included studies were from Ethiopia, the findings may not be generalized to all developing countries. Due to lack or inconsistency of data grouping in the primary studies, several other quantitatively collected variables (like religion, occupation, polygyny, own radio/TV, birth order, knowledge about danger symptoms of pregnancy, discussion on the place of delivery and distance to the nearest health facility) that may determine the place of delivery were not meta-analyzed.

In conclusion, lack of health facility delivery is one of the major problems impeding the achievement of the MDG 4 and 5 in several

developing countries. The present meta-analysis gave insight into some factors contributing to failure to utilize health facility delivery services (low educational level of women and their husbands, living in a rural area, having low or the lowest wealth index and being multiparous). Directly or indirectly, educational level and wealth status of the couple have contributed much to the low delivery in the health facility. There are also other several works which support this statement (52-54). Therefore, to increase the proportion of health facility delivery in the studied areas, a lot has to be done to increase the educational level of parents to be in the near future and wealth status in the long term. Furthermore, why multiparous women take more risk by delivering outside health facilities is an area of investigation.

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