Journal: Texila Advanced Journal of Multidisciplinary Health Research
Publisher: Texila International Journal
ISSN: 3105-3564
Volume 6 Issue 1, 2026
DOI: 10.21522/TAJMHR.2016.06.01.Art023

Effect of Community Health Worker Interventions on Antenatal Care Utilization and Facility-Based Delivery in East Africa: A Systematic Review and Meta-Analysis

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Abstract

Local health workers are often used in low- and middle-income settings to boost maternal health care, especially in remote settings. But evidence on their effectiveness in enhancing service use is mixed. This study sought to assess the effect of community-based approaches on antenatal service utilization and institutional birth in Kenya, Tanzania, and Uganda. This study used the methodology of systematic reviews and meta-analysis in line with PRISMA 2020 guidelines. Articles published between 2015 and 2025 were found via searching PubMed, Scopus, Web of Science, and Google Scholar, complemented by grey literature. Studies reviewed assessed the effect of community-based programs on uptake of antenatal care or giving birth in health facilities. Random-effects models were used to calculate effect sizes, and the I^2 statistic was calculated to assess heterogeneity. Fourteen studies fitted the inclusion criteria (including randomized or quasi-experimental studies and cohorts). In general, the interventions exhibited a modest increase in the uptake of antenatal care services, but not to a statistically significant extent (OR 1.16, 95% CI 0.86 – 1.56; I^2 = 58.8%). A similar non-substantial positive trend was observed for facility-based childbirth (OR 1.56, 95% CI 0.55 – 4.46; I^2 = 91.7%). The diversity of study results was likely due to differences in the design and implementation. The results suggest that community-based strategies likely increase maternal health service use, especially during pregnancy. But improvements in facility-based delivery seem to rely on the health system factors. This suggests that a combination of strategies to improve community-based approaches with better service accessibility and quality may result in better outcomes in East Africa.

Keywords: *Antenatal Care, Community Health Workers, East Africa, Facility-Based Delivery, Meta-Analysis, Primary Health Care.*

Introduction

Despite the long-term international and regional endeavors to enhance maternal health outcomes, maternal mortality is a long-standing issue in sub-Saharan Africa. Poor access to quality antenatal care (ANC) services and skilled birth attendance remains among the major causes of maternal and neonatal deaths that can be prevented. Proper and timely antenatal care gives a chance to detect the complications of pregnancy in time, administer preventive measures, and provide the expectant mothers with the necessary health education [1–3].

Structural constraints including geographic inaccessibility, financial constraints, and poor awareness of services available lead to low

Received: 13.03.2026 ***Accepted: 14.04.2026*** ***Published on: 29.05.2026***
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utilization of formal maternal health services in many low- and middle-income settings. It is in this context that community-based strategies have become a significant tool to extend healthcare delivery to outside of facilities. CHWs play a major role as they facilitate the interaction between households and formal health systems and in most cases, they are drawn out of the communities that they serve. They often have responsibilities of home visits, health education, birth preparedness promotion, and referral support to health facilities [4–6].

In East Africa, especially Kenya, Tanzania and Uganda, CHW programs have been extensively used as an element within larger primary health care strengthening efforts. These programs are aimed at the gaps in the usage of services by creating awareness of maternal health and influencing timely care-seeking attitudes. Nonetheless, these interventions have not been equally effective in various settings. Whereas certain studies indicate a positive change in the antenatal care attendance as well as facility-based delivery following the involvement of CHWs, others depict insignificant or situation-specific changes. This variation can indicate the variation in the design of the program, the intensity of the implementation, health system capacity, and socio-cultural aspects that affect maternal health behaviors [1, 4, 7–11].

The literature presents possible opportunities of community-based intervention to enhance the outcomes of maternal health, but the synthesis of existing evidence in the context of the East African region is still necessary. The role of CHW interventions in terms of their ability to affect the utilization of antenatal care and facility-based delivery in this context is critical to inform policy decisions and maximize program implementation [12–14].

Materials and Methods

Study Design and Approach

This analysis was a combination of systematic reviews and meta-analytic analyses to evaluate the impact of community health worker (CHW) intervention on antenatal care utilization and facility-based delivery in East Africa. The review adhered to PRISMA 2020 reporting standards and was registered in the PROSPERO database (CRD420261340337).

Literature Search Strategy

To find pertinent literature, database searches were carried out on various platforms, such as PubMed, Scopus, Web of Science, and Google Scholar. The searched studies included those conducted between January 2015 and December 2025. The keywords and subject terms were chosen to demonstrate the community-based health intervention and the utilization of maternal health services. They contained words like community health worker, village health team, antenatal care, maternal services, and facility delivery, along with country names, with Boolean operators. Other records were found through screening reference lists of sampled articles and looking at pertinent grey literature sources.

Eligibility Criteria

Included studies that:

1. Looked at interventions provided by community health workers or such cadres.
2. Outcomes reported on antenatal care attendance or delivery at the facility.
3. Were done in Kenya, Tanzania, or Uganda.
4. Published in the period 2015 – 2025. Used quantitative study designs.

Exclusion criteria involved any studies that did not have outcomes of interest, were not done in the study area, or were not primary research.

Study Selection Process

The screening was done by pooling all the records retrieved and removing duplicates. Abstracts and titles were assessed initially, then full-text assessment of potentially eligible studies was conducted. The inclusion decision

was determined based on pre-defined criteria and any disagreements were resolved through discussing these disagreements with the reviewers.

Screening was carried out by compiling all the retrieved records and eliminating duplicates. Abstracts and titles were assessed initially, then full-text assessment of potentially eligible studies was conducted. The decision on inclusion was made according to preset criteria, and any disagreements were decided by discussing them with the reviewers.

Data Extraction

A structured template was used to extract the data. Study characteristics such as the location, design, intervention details, sample size and outcomes were captured. Where possible, the estimates of effects and confidence intervals were documented and ready to be analyzed.

Quality Assessment

The quality of the studies was calculated with the assistance of the corresponding tools based on the type of design. The Cochrane risk-of-bias approach was used to evaluate randomized studies and established appraisal frameworks were used to evaluate observational studies. The major areas covered selection methods, measurement of outcomes and control of confounding.

Statistical Analysis

A meta-analysis was done through a random-effects model to explain the variation between the studies. The measures of effects were standardized before analysis. The I^2 statistic was used to assess and measure statistical heterogeneity. Sensitivity analyses were conducted to determine the effect of each study and subgroup analyses were done by study design. The possibility of publication bias was investigated with the help of funnel plots, and the small size of the included studies was taken into consideration. The entire analyses were carried out in R statistical software.

Results

Study Selection

A database search was conducted to identify 1,403 records, which were further narrowed down by eliminating duplicates with 53 duplicates eliminated. Therefore, there were 1,350 records that were left over and were subjected to title and abstract screening, where 1,264 were eliminated because they did not conform to the inclusion criteria. Eligibility was determined on the full text of 86 articles, and eight articles were excluded due to non-availability of full text, leaving 78 studies to be screened on the full-text. Following a comprehensive evaluation, 64 articles were eliminated based on factors such as the unavailability of relevant outcomes, wrong study design, or lack of community health worker intervention. Finally, 14 articles were included in the systematic review as they met the inclusion criteria. Out of these, 12 studies were included with data that could be used in the quantitative synthesis, whereas four offered further details to the ANC1 results narrative synthesis. Figure 1 summarizes the study selection process.

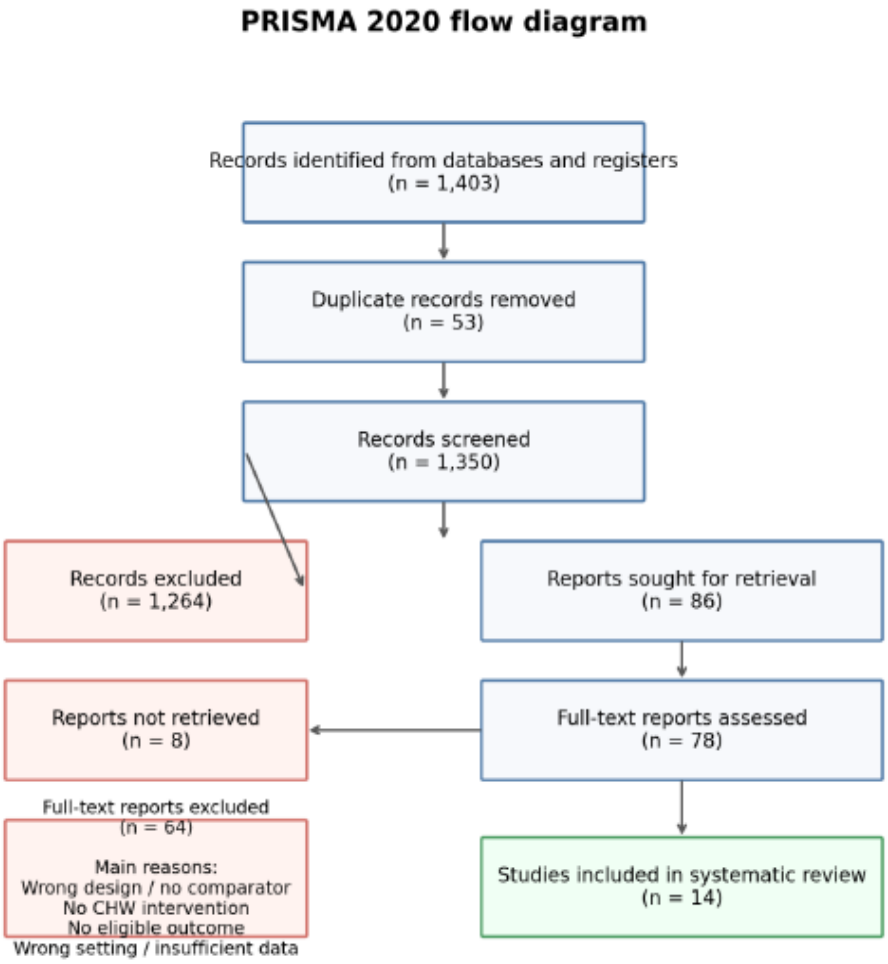

Figure 1. PRISMA Flow Diagram Selection Process

Study Characteristics

The 14 studies involved were done within the three countries in East Africa: Uganda, Tanzania, and Kenya. The research designs were three randomized or cluster-randomized, eight quasi-experimental, and three observational cohort designs. The interventions were usually characterized by community health workers (CHWs) providing maternal health promotion programs that included household visits, health education, referral of pregnant women to health care facilities, follow-up of missed visits to antenatal care, and community mobilization. The key findings that were described in the studies were:

1. Four or more antenatal care visits (ANC4+) uptake.
2. Facility-based delivery.
3. Antenatal care (ANC1) initiation.

The size of study samples and nature of intervention were diverse among the studies, as they represented the differences in program implementation and evaluation designs.

Table 1 shows detailed characteristics of the included studies**.**

Table 1. Characteristics of Included Studies

Study (Author, Year)	Country	Study design	Sample size (n)	Population	CHW intervention	Comparator	Outcome(s)
Baynes et al., 2023	Tanzania	Quasi-experimental	2,150	Pregnant women in community health program	CHWs conducted home visits, maternal counseling, and referral support	Standard care	Facility delivery
Ssetaala et al., 2022	Uganda	Quasi-experimental	2,400	Pregnant women in community health program	CHW home visits and maternal health education	Standard care	ANC utilization
Regan et al., 2023	Tanzania	Cluster randomized trial	1,600	Pregnant women in rural communities	CHW household visits and counseling	Control clusters	ANC4+ attendance
Matovelo et al., 2021	Tanzania	Quasi-experimental	3,200	Pregnant women attending maternal health services	CHW maternal health promotion and follow-up	Routine care	ANC4+ attendance
Geldsetzer et al., 2019	Tanzania	Cluster randomized trial	4,200	Women of reproductive age in rural communities	Community health worker mobilization and maternal health education	Standard health services	ANC4+, facility delivery
Wafula et al., 2024	Uganda	Pre–post comparison	1,950	Pregnant women participating in CHW program	CHW pregnancy tracking and referral support	Pre-intervention baseline	ANC utilization
Mangwi Ayiasi et al., 2016	Uganda	Community intervention trial	2,100	Pregnant women in rural districts	CHW maternal health education and referral facilitation	Routine care	Facility delivery
Maldonado et al., 2020	Kenya	Prospective cohort	3,400	Pregnant women in the maternal health program	CHW pregnancy monitoring and counseling	Non-intervention communities	ANC4+, facility delivery

Lee et al., 2018	Kenya	Cluster randomized trial	1,780	Pregnant women in community intervention areas	CHW maternal health counseling and referral	Standard care clusters	ANC4+ attendance
Avery et al., 2021	Tanzania	Quasi-experimental	2,650	Pregnant women receiving community health services	CHW home visits and pregnancy monitoring	Routine care	ANC4+ attendance
August et al., 2019	Tanzania	Observational	1,520	Pregnant women in rural communities	CHW community mobilization for maternal health services	Routine care	ANC utilization
Asiki et al., 2018	Uganda	Non-randomized intervention	2,200	Pregnant women in rural communities	CHW home visits and maternal health education	Non-intervention communities	Facility delivery
Edward et al., 2020	Tanzania	Quasi-experimental	2,000	Pregnant women receiving CHW services	CHW maternal health counseling and referral linkage	Routine care	Facility delivery

Risk of Bias Assessment

The risk of bias was evaluated with the help of the right tools depending on the study designs calculated with the assistance of the corresponding tools based on the type of design. The RoB 2 tool was used to evaluate randomized and cluster-randomized trials, whereas JBI critical appraisal tools of quasi-experimental and cohort studies were used to evaluate quasi-experimental and observational studies. In general, the majority of the studies showed a moderate risk of bias, mainly because of the constrained allocation concealment, the possibility of confounding in non-randomized trials, and the lack of reporting of the outcome measurement procedures. Most of the studies, however, clearly outlined the methods of intervention implementation and outcome measurement.

Table **2** provides a summary of the evaluation of risk of bias.

Table 2. Risk of Bias Assessment of Included Studies

Study (Author, Year)	**Study design**	**Bias from randomization / selection**	**Bias from confounding**	**Bias from outcome measurement**	**Bias from missing data**	**Overall risk of bias**
Baynes et al., 2023	Quasi-experimental	Moderate	Moderate	Low	Low	Some concerns

Ssetaala et al., 2022	Quasi-experimental	Moderate	Moderate	Low	Low	Some concerns
Regan et al., 2023	Cluster randomized trial	Low	Low	Low	Low	Some concerns
Matovelo et al., 2021	Quasi-experimental	Moderate	Moderate	Low	Low	Some concerns
Geldsetzer et al., 2019	Cluster randomized trial	Low	Low	Low	Low	Low
Wafula et al., 2024	Pre–post comparison	Moderate	Moderate	Low	Low	Some concerns
Mangwi Ayiasi et al., 2016	Community intervention trial	Moderate	Moderate	Moderate	Low	Some concerns
Maldonado et al., 2020	Prospective cohort	Moderate	Moderate	Low	Low	Some concerns
Lee et al., 2018	Cluster randomized trial	Low	Low	Low	Low	Low
Avery et al., 2021	Quasi-experimental	Moderate	Moderate	Low	Low	Some concerns
August et al., 2019	Observational	Moderate	Moderate	Moderate	Low	Some concerns
Asiki et al., 2018	Non-randomised intervention	Moderate	Moderate	Low	Low	Some concerns
Edward et al., 2020	Quasi-experimental	Moderate	Moderate	Low	Low	Some concerns

Effects of CHW Interventions on ANC4+ Attendance

Four studies were used to create a meta-analysis to evaluate the impact of community health worker (CHW) interventions on the attendance of antenatal care (ANC4+). Results in

Table **3** below indicate that CHW interventions were linked to an increase in ANC4+ utilization across the studies included in the study.

Table 3. Summary of Meta-Analysis Results for CHW Interventions on Maternal Health Service Utilization

Outcome	Number of studies (k)	Pooled effect model	Pooled OR	95% CI	p-value	Heterogeneity (I^2)	τ^2
Antenatal care attendance (ANC4+)	4	Random-effects (Hartung–Knapp)	1.16	0.86 – 1.56	0.22	58.8%	0.021
Facility-based delivery	8	Random-effects (Hartung–Knapp)	1.56	0.55 – 4.46	0.35	91.7%	0.637

The pooled analysis indicated that the CHW interventions were related to increased antenatal care attendance, but the pooled effect was not statistically significant (OR = 1.16, 95% CI 0.86 – 1.56; p = 0.22). The included studies had moderate heterogeneity (I^2 = 58.8%, 0.021) as shown in

Figure 2.

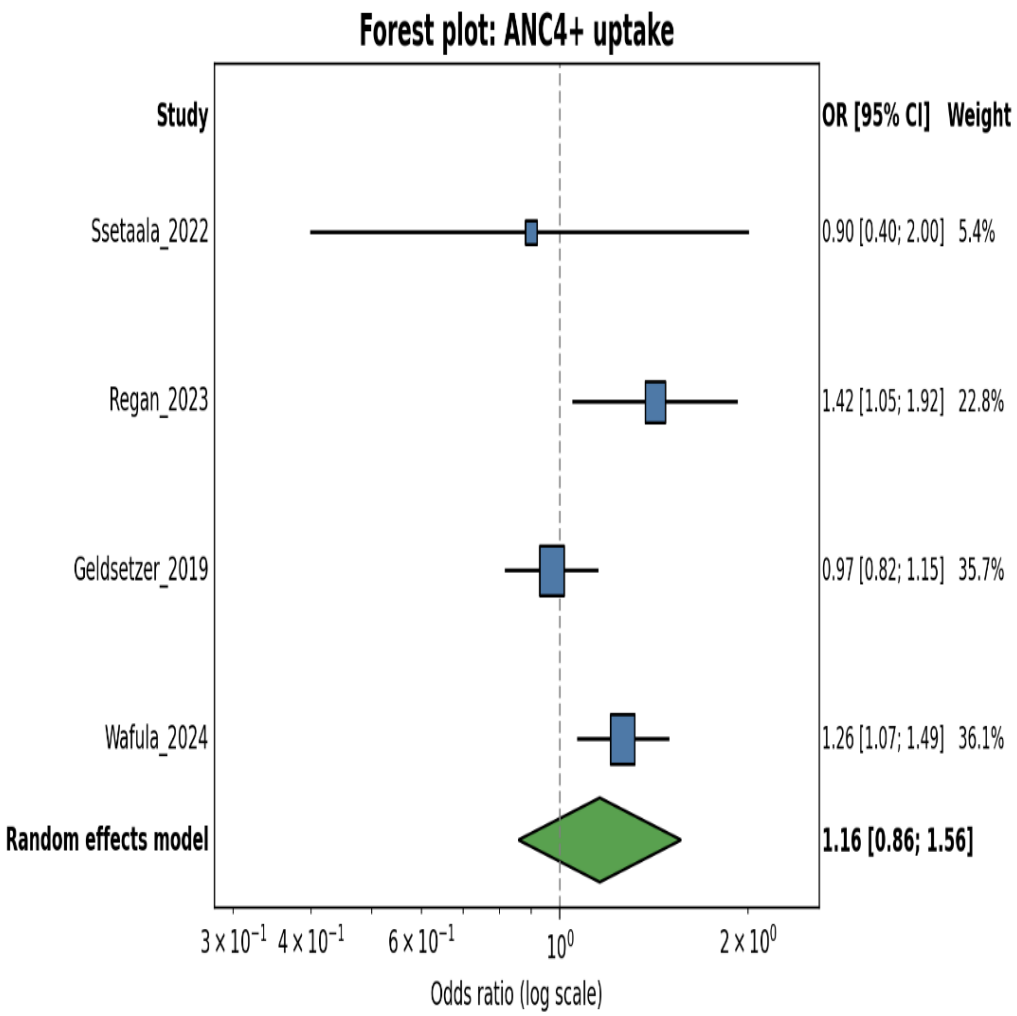

Figure 2. Forest Plot of the Effect of Community Health Worker Interventions on Antenatal Care Attendance (ANC4+)

Effects of CHW Interventions on Facility-Based Delivery

Eight studies were also conducted to determine the effect of CHW interventions on facility-based delivery. Findings indicated that CHW interventions were mostly linked to higher use of facility-based delivery services, which are indicated in

Table **3**. The overall outcomes showed a positive, yet not significant relationship between CHW interventions and facility-based delivery (OR = 1.56, 95% CI 0.55 – 4.46; p = 0.35) as shown in

Odds ratio (log scale)

Figure 3.

The pooled analysis showed a significant variation in the effect estimates among studies. Though there were studies that had strong positive effects, the heterogeneity was high in general (I^2 = 91.7%), which implied that differences in the results of the studies were significant, as depicted in

Odds ratio (log scale)

Figure 3. This implies that CHW intervention effects on the facility-based delivery showed a great deal of variation in context and intervention design.

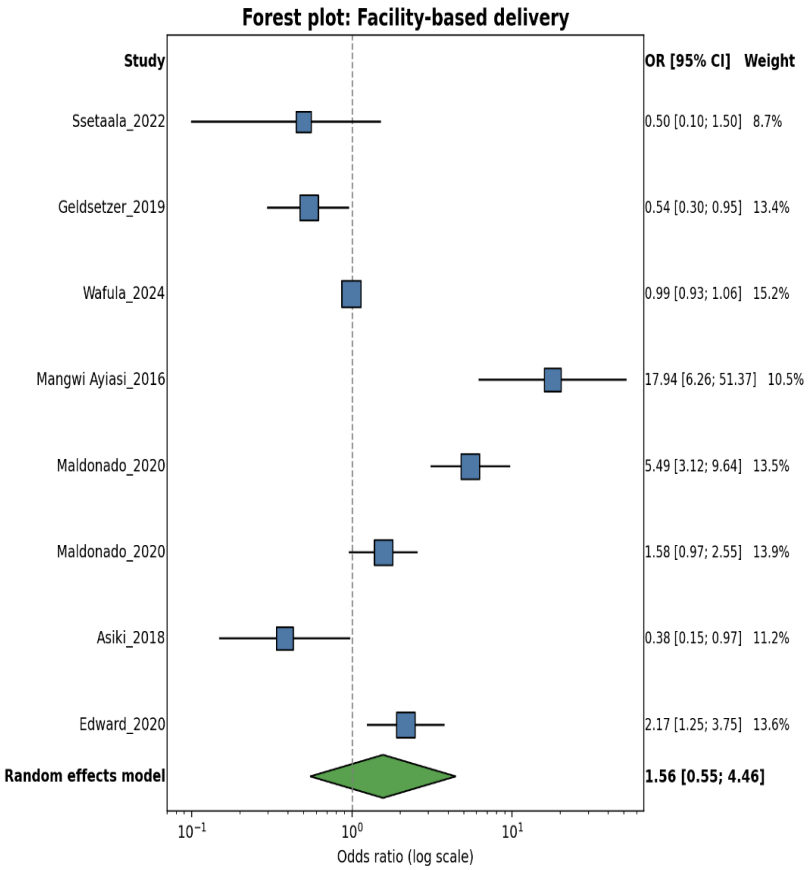

Figure 3. Forest Plot of the Effect of Community Health Worker Interventions on Facility-Based Delivery

Narrative Synthesis of ANC1 Outcomes

Four studies have reported results on the initiation of antenatal care (ANC1) but failed to give effect estimates that can be used to perform quantitative synthesis. The majority of the studies reported a higher early ANC initiation after CHW interventions, but the magnitude of the improvement was different in various settings [2, 10, 15, 16].

These results indicate that CHW interventions could be useful in enhancing initial access to antenatal care services, though the evidence is still quite diverse.

Influence and Sensitivity Analysis

The leave-one-out influence analysis was performed to determine the effect of each study on the pooled effect estimate and heterogeneity. The deletion of individual studies did not have significant effects on the total pooled estimate. Nevertheless, research with high intervention effects, especially that of Mangwi Ayiasi et al. and Maldonado et al. gave more impact on the heterogeneity on a larger scale. The omission of such studies led to only slight decreases in heterogeneity without changing the overall direction of the pooled effect.

Subgroup Analysis by Study Design

Subgroup analysis was done to determine whether the study design was a contributor to heterogeneity. Among quasi-experimental studies (k = 4) the pooled effect estimate was nearly null (OR = 0.94, 95% CI 0.28 – 3.09). Randomized trials (k = 3) showed a larger but imprecise effect estimate (OR = 2.31, 95% CI 0.03–184.59). The study included only a single cohort study, which reported a high intervention effect (OR = 5.49, 95% CI 3.12 – 9.65).

The subgroup difference test was statistically significant (p = 0.0009), and it may be believed that the variation in the study design could be one of the reasons behind the heterogeneity in the overall meta-analysis.

Assessment of Publication Bias

Funnel plots were used to visually estimate the presence of publication bias. Because there were only a small number of studies used in the meta-analysis (k = 8), no formal statistical tests of funnel plot asymmetry, e.g., the regression test of Egger, were conducted since it is thought that these tests are not reliable when fewer than ten studies are used.

Discussion

Principal Findings

This review has discussed the role of community health worker (CHW) interventions on the maternal health service use in the selected East African countries. The general results show that CHW programs are linked to increased attendance of antenatal care and facility-based delivery, but the degree of effect was relatively small and not statistically significant in the pooled analysis. The noted discrepancy in the literature indicates that the effect of CHW interventions is not universal and can be extremely context- and program-specific. Although the benefits of service uptake were significant and meaningful in a few of the interventions, the changes were slight or inconsistent in others, demonstrating the intricacies of the translation of community-based interventions into quantifiable results.

Interpretation of Findings

The importance of CHWs in closing the disparities between communities and formal health systems is still apparent throughout the studies that are included. CHWs seem to be effective in encouraging interaction with care by offering localized support and advice in the environment where access to maternal health services is limited by distance, lack of health awareness, and social-cultural constraints [14, 17, 18].

Nevertheless, findings also indicate that the community-level interventions cannot be used to ensure higher use of services like facility-based delivery. Elsewhere, even with the improvement of awareness and referrals, the structural constraints, such as lack of facilities, transport difficulties, and perceived quality of care probably affected the final service access by women [6, 7].

The more stable and robust patterns of antenatal care, as compared to the facility-based delivery, might be an indication of the differences in the extent of effort that goes into getting these services. Antenatal visits are generally more adaptable and less resource-heavy, unlike facility delivery, which involves addressing various logistical and systemic challenges. Perhaps this difference explains why CHW interventions seem to be more effective in promoting early and repeated antenatal care as compared to facility-based births.

Policy Implications and Practice

The results highlight the relevance of CHW programs in the broader maternal health programs in East Africa. Enhancement of such programs by increasing training, supervision, and incorporation into formal health systems can strengthen them in their capacity to change health-seeking behavior [1–6].

Simultaneously, the findings show that CHW interventions cannot be considered an independent solution. To realize long-term turnarounds in maternal health outcomes, community-based activities should be balanced by funding in health system capacity. This involves the enhancement of the accessibility of facilities, the provision of competent staff, transportation, and referral issues [13, 16, 19].

Moreover, the effectiveness differences in studies demonstrate the necessity to customize CHW programs to local settings and not to use standard models of interventions. The design of the program, which is specific to the needs of the community, the availability of resources, and cultural factors, can enhance the uniformity and effectiveness of the outcomes [16, 20].

Strengths of the Review

This paper presents a narrow scope of evidence synthesis in Kenya, Tanzania, and Uganda, presenting region-specific evidence on the role of CHW interventions. The incorporation of various study designs and peer-reviewed literature and grey literature helps to broaden the knowledge of the program effectiveness in a different implementation environment. A balanced evaluation of both the quantifiable effects and contextual effects can also be achieved by using quantitative synthesis and narrative interpretation.

Limitations

The findings have a number of limitations that should be taken into account. The quantitative analysis has included a relatively small number of studies, which could have restricted statistical power and precision of pooled estimates. Moreover, a high proportion of heterogeneity among different studies indicates varying design of interventions, study groups and health systems. Not all studies provided enough data to be included in the meta-analysis, which could have led to a lack of completeness in the quantitative synthesis. Lastly, a risk of publication bias cannot be ruled out, especially since there are only a few studies that can be formally evaluated.

Implications for Future Research

In future studies, using a solid study design and standardized outcome measures should be given priority to enhance comparability across studies. It is also necessary to investigate which particular items of CHW interventions, including frequency of home visits, type of health education, or referral mechanisms, are most likely to have an impact on maternal health behaviors. Moreover, more focus is needed on the interplay between community-based interventions and the more general health system factors. An insight into the mechanisms of CHW programs in various health system settings will be crucial in determining ways of integrating those programs to yield lasting change in maternal health outcomes [8–10, 13].

Summary

The overall evidence indicates that interventions of community health workers can facilitate the enhancement of maternal health service uptake in East Africa, especially during antenatal services. Nevertheless, their effects on facility-based delivery seem to be more random and dependent on contextual processes that are out of the reach of community-level interventions. Enhancing community-based initiatives and the infrastructure of the health system is thus critical in realizing substantial and enduring change in maternal health.

Conclusion

This detailed meta-analysis and systematic review study was conducted to evaluate the effects of community health worker (CHW) interventions on facility-based delivery and antenatal care utilization in Kenya, Tanzania, and Uganda. The results indicate that CHW programs can help in enhancing maternal health service uptake, especially through the promotion of antenatal care attendance and awareness of maternal health services among the community. The pooled meta-analysis, however, failed to provide a statistically significant overall impact on ANC4+ attendance or facility-based delivery, and there was significant heterogeneity across studies. These results demonstrate that although CHW interventions are critical towards bridging communities to health systems, the ability to increase the delivery of services in the facility may be based on the energy of the health system in other factors like accessibility of the health facilities, quality of care, transportation and referral systems. Enhancement of CHW programs in itself might not be enough to significantly boost facility delivery unless investments in health system capacity are made simultaneously. CHW programs must remain an option to policymakers in East Africa as part

of integrated primary health care strategies. Enhancing the skills of CHWs, their supervision and integration with health facilities can improve their capabilities to promote the utilization of maternal health services. In the meantime, community-based interventions, as well as the improvement of the access to and quality of care offered to mothers, should be combined to improve the outcomes of maternal health. Further studies are needed to evaluate CHW interventions rigorously and with the help of standardized outcome measures and with well-designed study designs. To better comprehend which elements of CHW programs are most effective in enhancing maternal health behaviors and the interaction of such interventions with more general health system factors is also in need of greater attention.

Declarations

Competing Interests

All authors declare that they do not have conflicts of interest with individuals, institutions and the government.

Ethics Approval and consent to Participate

Not applicable. This is a systematic review and meta-analysis of the published studies and does not require direct human involvement.

Consent for Publication

Not applicable.

Availability of Data and Materials

The analyzed and used datasets in the current study can be obtained by the respective author on a reasonable request.

Funding

The study received no specific funding from any funding bodies in the public, commercial or not-for-profit sectors.

Authors' Contributions

Mosses Simon Boniphace conceived and designed the study, undertook the literature search, data extraction, meta-analysis, and drafted the manuscript. The co-authors assisted in study selection, data extraction, interpretation of data, and critically reviewed the manuscript. All authors read and approved the final manuscript.

Acknowledgements

The authors would like to acknowledge the effort of all the authors of the studies included in this review.

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