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REVIEW PAPER

Male Partner Involvement in the Utilization of Hospital Delivery Services by Pregnant Women Living with HIV in Sub Saharan Africa: A Systematic Review and Meta-analysis

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Abstract
Objective The level of male partner involvement in hospital delivery by pregnant women living with HIV in sub Saharan Africa (SSA) is low. We conducted a systematic review and meta-analysis to identify the approaches that are used in improving male partner involvement and their impact on the utilization of hospital delivery services by pregnant women living with HIV in SSA. *Methods* Ovid Medline, Embase, PsycINFO, Cochrane library, ClinicalTrials.gov, Web of Science and Current Controlled Trials were searched. Only studies carried out in SSA that reported an approach used in involving male partners and the impact on the uptake of hospital delivery services irrespective of the language and date of publication were included. Odds ratios were extracted or calculated from studies and combined in a meta-analysis using the statistical package Stata version 11.0. A forest plot was used to show the impact of various male involvement approaches. A funnel plot was used to report publication bias. *Results* From an initial 2316 non-duplicate articles, 08 articles were included in the systematic review and meta-analysis. The overall pooled OR was 1.56 (95% CI 1.45–1.68). After stratification, the odds ratios were: 1.51 (95% CI 1.38–1.65), 1.58 (95% CI 1.38–1.80), 3.47 (95% CI 2.16–5.58) for complex community interventions without community health workers (CHWs), complex community interventions with community health workers, and verbal encouragement respectively. The overall I-square was 91.0% but after stratification into the three different approaches, the I-squared within the complex community intervention without CHWs group was 0.0%. *Conclusions for Practice* Complex community interventions and verbal encouragement increase the utilization of hospital delivery services by pregnant women living with HIV in SSA. The overall heterogeneity was high but very low for studies that used complex community interventions without CHWs. More well conducted studies (including randomized controlled trials) are needed in future to add to the quality of evidence.

Keywords Male partner involvement · PMTCT · Hospital delivery

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Abbreviations

SSA	Sub Saharan Africa
PMTCT	Prevention of mother to child transmission
HIV	Human immunodeficiency virus
CHWs	Community health workers
PRISMA	Preferred reporting items for systematic reviews and meta-analyses

Significance

In sub Saharan Africa, the low level of involvement of male partners in supporting women who are living with HIV may serve as a disincentive for the uptake of hospital delivery services, hence a clear knowledge of approaches that can improve the involvement of male partners and ultimately

increase the utilization of such services by women living with HIV is needed.

Background

An estimated 35 million people live with HIV globally with marked differences in the distribution between the developed and developing countries (Kharsany and Karim 2016). Among developing regions of the world, the sub Saharan Africa (SSA) region is not only faced with challenges of resource limitation but also much more affected by HIV with more than 24.5 million people (approximately 71%) and 2.6 million children (91% of global burden) living with the virus (Ortblad et al. 2013). Despite great strides towards ensuring a marked reduction in new HIV infections in children, the challenge still remains daunting due to factors that may impede the uptake of crucial prevention of mother to child transmission of HIV (PMTCT) services such as hospital delivery by pregnant women living with HIV (Ng'anjo Phiri et al. 2014).

Prevention of mother to child transmission of HIV services such as the use of highly active antiretroviral treatment (HAART) and intrapartum procedures such as caesarean delivery can reduce HIV transmission from mother to child to less than 5% (Mahy et al. 2010). With the exception of HIV testing and treatment that can be implemented at home, the success of most PMTCT programmes is hinged on the accessibility to continuous care in health care facilities for women living with HIV before and after delivery (Adetokunboh and Oluwasanu 2016). In addition, serious challenges exist such as delayed testing of pregnant women living with HIV and delayed initiation of antiretroviral therapy that are associated with a high prevalence of home deliveries in some remote settings, which may significantly increase the exposure of infants born to women living with HIV (Chea et al. 2018).

Current evidence suggests that PMTCT interventions would be very effective if pregnant women living with HIV are present at the health facility during delivery in order to receive the optimum package of care (Tukur et al. 2007). However, several factors such as the perceptions of pregnancy and childbirth, economic, sociocultural and familial factors have been suggested to either deter or encourage pregnant women living with HIV to utilize hospital based delivery services in developing settings (Kitui et al. 2013). Furthermore, among the familial factors, the involvement of male partners in encouraging hospital delivery may also encourage pregnant women living with HIV in utilizing such services (Kakaire et al. 2011). Despite this pivotal role of male partners, studies in sub Saharan Africa have reported a low level of male partner involvement in PMTCT services (Elias et al. 2017). Therefore, approaches to improve on the involvement of male partners in PMTCT in view of increasing the utilization of hospital delivery services are urgently needed in SSA.

High level evidence on the impact of male partner involvement on the utilization of hospital delivery by pregnant women living with HIV through systematic reviews is limited. Morfaw et al. in a systematic review mentioned only approaches that can be used in improving on male partner involvement in PMTCT (Morfaw et al. 2013) while another systematic review by Brusamento et al. (2012) provided evidence only on the impact of invitation letters and the uptake of voluntary counselling and testing by couples. Despite the robust methodology of these previous systematic reviews, they did not provide any clear evidence on the impact of male involvement on the uptake of hospital delivery by pregnant women living with HIV. Therefore, a systematic review to determine the approaches used in improving male partner involvement and the impact on the utilization of hospital delivery services by pregnant women living with HIV in SSA to adequately guide policy and implementation is urgently needed.

Objectives

1. To determine the interventions/approaches used to improve male partner involvement within the context of PMTCT, specifically hospital delivery services by pregnant women living with HIV in SSA.
2. To determine the impact of these approaches on the utilization of hospital delivery services by pregnant women living with HIV in SSA.

Methodology

Protocol and Registration

This systematic review with meta-analysis was conducted in accordance with the preferred reporting items for systematic review and meta-analysis (PRISMA) statement of 2015. The protocol for this systematic review was registered in the international prospective register of systematic reviews (PROSPERO). The registration number is CRD42016032673. The protocol was published in the British Medical Journal (BMJ) Open (Takah et al. 2016). In the protocol we considered other outcomes such as infant antiretroviral prophylaxis uptake, condom use and family planning. However, we decided in this review to focus on the hospital delivery service outcome due to its significant role in reducing the vertical transmission of HIV.

Eligibility Criteria

This review considered studies that were conducted in SSA. Studies out of the SSA were excluded. No restriction was placed on the setting of the study and the language of study. Randomized controlled trials, prospective and retrospective cohort studies, and serial cross-sectional studies were eligible for inclusion. Studies were included if they provided data on the impact of male partner involvement on the uptake of hospital delivery services. One-time cross-sectional studies and case-control studies were excluded because they did not present any evidence of the impact of male partner involvement. The participants were pregnant women living with HIV.

Information Sources and Search Strategy

A literature search was conducted from December 1st, 2015 through October 30th 2018 (inclusive). A search strategy was developed by the principal investigator (NFT) with inputs from MM and LNA using evidence from a US Centre for Disease Control and Prevention study on how to carry out a detailed systematic search in HIV prevention (Deluca et al. 2010). Six main databases were searched: Ovid Medline, Ovid Embase, Ovid Health and Psychosocial Instruments (HPSI), PsycINFO, Web of Science and Cochrane library. Current Controlled Trials and ClinicalTrials.gov were searched for ongoing and newly completed trials. A detailed search strategy is shown in Table 1.

The outputs of the search were exported to Mendeley desktop 1.16.1 and duplicates were removed. After removal of duplicates in Mendeley, the titles and abstracts of the studies were screened independently by NFT and MM. The full texts were obtained from the screened abstracts after inclusion and exclusion criteria were applied. Authors of articles were contacted for further information on any publication.

Data Collection Process and Data Items

A data extraction spreadsheet was developed in excel version 2013. The data extraction sheet captured characteristics of the studies such as: authors, country of study, study design/method, study population, approaches/intervention used, and odds ratios (ORs).

The outcome of interest was the uptake of hospital delivery services. Odds ratios were extracted from individual studies. Relative risks and proportions were converted to ORs. Two reviewers (NFT and MM) independently extracted these data from the included studies. Any disagreement was settled by a third reviewer (LNA).The proportions and relative risks were converted into odds ratios, noting the effect size and the 95% confidence interval (CI). The characteristics of included studies were summarized in Table 2.

Synthesis of Results and Data Analysis

The studies that were relevant after inclusion and exclusion criteria were applied were used in the synthesis. Studies with data on impact of male involvement on the uptake hospital delivery were considered for a meta-analysis that was performed using statistical software Stata version 11.0. Odds ratios were converted to natural logs and a forest plot was generated using the metan and eform commands. A funnel plot was used in reporting publication bias.

Heterogeneity was assessed using the I squared statistic generated. Heterogeneity refers to the variation between the included studies and it was assessed as follows: if the $I^2 = \leq 49\%$ we considered a "low" heterogeneity, if the $I^2 = 50–74\%$ we considered a "moderate" heterogeneity and if the $I^2 \geq 75\%$ we considered a "high" heterogeneity (Higgins et al. 2003).

A meta-regression was carried out to explore the sources of heterogeneity. In this study we used variables such as sample size, sub region where study was conducted (such as Southern Africa, East Africa, West Africa), and the category of approach used.

Quality Assessment of Studies

The Newcastle Ottawa scale was used in assessing the quality of non-randomized studies (Wells et al. 2009). This scale captured 8 core elements divided into three broad elements related to the study quality. The first element was to determine the representativeness of the exposed cohort. The second element was to determine if the study controlled for other variables. The third element was to determine measurement bias in the outcome. A score of less than 4 was considered to be of low quality; a score of 4–5 was considered moderate quality and a score of greater than 6 was considered high quality.

Results

The electronic search on Ovid Medline, Ovid Embase, Ovid Health and Psychosocial instruments, Web of Science, Cochrane library, ClinicalTrial.gov, Current controlled trials returned 3460 results and after removal of duplicates this reduced to 2316 results. The study selection process is shown on the PRISMA flow diagram in Fig. 1.

Eight studies were finally included in the systematic review and meta-analysis. All eight studies were cohort studies. Two of the studies were conducted in Southern Africa while six of the studies were conducted in East Africa.

Table 1 Search strategy

Embase, Medline and HPSI search strategy

Database: Ovid MEDLINE(R) without Revisions <1996 to Week 4 October 2018>, Embase <1996 to week 4 October 2018>, Health and Psychosocial Instruments <1985 to Week 4 October 2018>

Search Strategy:

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1 *HIV/ (31795)

2 *HIV infection/ (236817)

3 human immunodeficiency virus.mp. [mp=ti, ab, ot, nm, hw, kf, px, rx, ui, tn, dm, mf, dv, kw, ac, de, md, sd, so] (349081)

4 human immuno-deficiency virus.mp. [mp=ti, ab, ot, nm, hw, kf, px, rx, ui, an, tn, dm, mf, dv, kw, ac, sh, de, md, ip, vo, pg, sd, jn, pb, yr, ar, bs, bt, cf, dp, ja, pa, so] (344)

5 human immune-deficiency virus.mp. [mp=ti, ab, ot, nm, hw, kf, px, rx, ui, an, tn, dm, mf, dv, kw, ac, sh, de, md, ip, vo, pg, sd, jn, pb, yr, ar, bs, bt, cf, dp, ja, pa, so] (1157)

6 human immunedeficiency virus.mp. [mp=ti, ab, ot, nm, hw, kf, px, rx, ui, an, tn, dm, mf, dv, kw, ac, sh, de, md, ip, vo, pg, sd, jn, pb, yr, ar, bs, bt, cf, dp, ja, pa, so] (31)

7 (human immun* and deficiency virus).mp. [mp=ti, ab, ot, nm, hw, kf, px, rx, ui, an, tn, dm, mf, dv, kw, ac, sh, de, md, ip, vo, pg, sd, jn, pb, yr, ar, bs, bt, cf, dp, ja, pa, so] (856)

8 *AIDS/pc (7243)

9 acquired immune-deficiency syndrome.mp. [mp=ti, ab, ot, nm, hw, kf, px, rx, ui, an, tn, dm, mf, dv, kw, ac, sh, de, md, ip, vo, pg, sd, jn, pb, yr, ar, bs, bt, cf, dp, ja, pa, so] (74090)

10 acquired immunedeficiency syndrome.mp. [mp=ti, ab, ot, nm, hw, kf, px, rx, ui, an, tn, dm, mf, dv, kw, ac, sh, de, md, ip, vo, pg, sd, jn, pb, yr, ar, bs, bt, cf, dp, ja, pa, so] (20)

11 acquired immunedeficiency syndrome.mp. [mp=ti, ab, ot, nm, hw, kf, px, rx, ui, an, tn, dm, mf, dv, kw, ac, sh, de, md, ip, vo, pg, sd, jn, pb, yr, ar, bs, bt, cf, dp, ja, pa, so] (20)

12 (acquired immune* and deficiency syndrome).mp. [mp=ti, ab, ot, nm, hw, kf, px, rx, ui, an, tn, dm, mf, dv, kw, ac, sh, de, md, ip, vo, pg, sd, jn, pb, yr, ar, bs, bt, cf, dp, ja, pa, so] (72961)

13 vertical transmission.mp. [mp=ti, ab, ot, nm, hw, kf, px, rx, ui, an, tn, dm, mf, dv, kw, ac, sh, de, md, ip, vo, pg, sd, jn, pb, yr, ar, bs, bt, cf, dp, ja, pa, so] (15315)

14 vertical infectious disease transmission.mp. [mp=ti, ab, ot, nm, hw, kf, px, rx, ui, an, tn, dm, mf, dv, kw, ac, sh, de, md, ip, vo, pg, sd, jn, pb, yr, ar, bs, bt, cf, dp, ja, pa, so] (8)

15 mother-to-child transmission.mp. [mp=ti, ab, ot, nm, hw, kf, px, rx, ui, an, tn, dm, mf, dv, kw, ac, sh, de, md, ip, vo, pg, sd, jn, pb, yr, ar, bs, bt, cf, dp, ja, pa, so] (7237)

16 Parent-to-child transmission.mp. [mp=ti, ab, ot, nm, hw, kf, px, rx, ui, an, tn, dm, mf, dv, kw, ac, sh, de, md, ip, vo, pg, sd, jn, pb, yr, ar, bs, bt, cf, dp, ja, pa, so] (207)

Table 1 (continued)

17 Maternal-to-child transmission.mp. [mp=ti, ab, ot, nm, hw, kf, px, rx, ui, an, tn, dm, mf, dv, kw, ac, sh, de, md, ip, vo, pg, sd, jn, pb, yr, ar, bs, bt, cf, dp, ja, pa, so] (169)
18 maternal-fetal infection transmission.mp. [mp=ti, ab, ot, nm, hw, kf, px, rx, ui, an, tn, dm, mf, dv, kw, ac, sh, de, md, ip, vo, pg, sd, jn, pb, yr, ar, bs, bt, cf, dp, ja, pa, so] (2)
19 MTCT.mp. [mp=ti, ab, ot, nm, hw, kf, px, rx, ui, an, tn, dm, mf, dv, kw, ac, sh, de, md, ip, vo, pg, sd, jn, pb, yr, ar, bs, bt, cf, dp, ja, pa, so] (1607)
20 PMTCT.mp. [mp=ti, ab, ot, nm, hw, kf, px, rx, ui, an, tn, dm, mf, dv, kw, ac, sh, de, md, ip, vo, pg, sd, jn, pb, yr, ar, bs, bt, cf, dp, ja, pa, so] (2168)
21 pPTCT.mp. [mp=ti, ab, ot, nm, hw, kf, px, rx, ui, an, tn, dm, mf, dv, kw, ac, sh, de, md, ip, vo, pg, sd, jn, pb, yr, ar, bs, bt, cf, dp, ja, pa, so] (78)
22 male partner*.mp. [mp=ti, ab, ot, nm, hw, kf, px, rx, ui, an, tn, dm, mf, dv, kw, ac, sh, de, md, ip, vo, pg, sd, jn, pb, yr, ar, bs, bt, cf, dp, ja, pa, so] (6310)
23 spouse*.mp. [mp=ti, ab, ot, nm, hw, kf, px, rx, ui, an, tn, dm, mf, dv, kw, ac, sh, de, md, ip, vo, pg, sd, jn, pb, yr, ar, bs, bt, cf, dp, ja, pa, so] (39866)
24 husband*.mp. [mp=ti, ab, ot, nm, hw, kf, px, rx, ui, an, tn, dm, mf, dv, kw, ac, sh, de, md, ip, vo, pg, sd, jn, pb, yr, ar, bs, bt, cf, dp, ja, pa, so] (40999)
25 couple*.mp. [mp=ti, ab, ot, nm, hw, kf, px, rx, ui, an, tn, dm, mf, dv, kw, ac, sh, de, md, ip, vo, pg, sd, jn, pb, yr, ar, bs, bt, cf, dp, ja, pa, so] (441164)
26 fathers*.mp. [mp=ti, ab, ot, nm, hw, kf, px, rx, ui, an, tn, dm, mf, dv, kw, ac, sh, de, md, ip, vo, pg, sd, jn, pb, yr, ar, bs, bt, cf, dp, ja, pa, so] (28088)
27 men*.mp. [mp=ti, ab, ot, nm, hw, kf, px, rx, ui, an, tn, dm, mf, dv, kw, ac, sh, de, md, ip, vo, pg, sd, jn, pb, yr, ar, bs, bt, cf, dp, ja, pa, so] (1998719)
28 sexual partner*.mp. [mp=ti, ab, ot, nm, hw, kf, px, rx, ui, an, tn, dm, mf, dv, kw, ac, sh, de, md, ip, vo, pg, sd, jn, pb, yr, ar, bs, bt, cf, dp, ja, pa, so] (23948)
29 prevention*.mp. [mp=ti, ab, ot, nm, hw, kf, px, rx, ui, an, tn, dm, mf, dv, kw, ac, sh, de, md, ip, vo, pg, sd, jn, pb, yr, ar, bs, bt, cf, dp, ja, pa, so] (806126)
30 reduc*.mp. [mp=ti, ab, ot, nm, hw, kf, px, rx, ui, an, tn, dm, mf, dv, kw, ac, sh, de, md, ip, vo, pg, sd, jn, pb, yr, ar, bs, bt, cf, dp, ja, pa, so] (4524890)
31 educat*.mp. [mp=ti, ab, ot, nm, hw, kf, px, rx, ui, an, tn, dm, mf, dv, kw, ac, sh, de, md, ip, vo, pg, sd, jn, pb, yr, ar, bs, bt, cf, dp, ja, pa, so] (1172156)
32 (awareness or health promotion or efficacy or efficiency or behav* or test* or notif* or contact tracing* or hosp deliv* or counsel*).mp. [mp=ti, ab, ot, nm, hw, kf, px, rx, ui, an, tn, dm, mf, dv, kw, ac, sh, de, md, ip, vo, pg, sd, jn, pb, yr, ar, bs, bt, cf, dp, ja, pa, so] (8218275)
33 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9 or 10 or 11 or 12 (466339)
34 13 or 14 or 15 or 16 or 17 or 18 or 19 or 20 or 21 (21121)
35 22 or 23 or 25 or 26 or 27 or 28 (2473213)
36 29 or 30 or 31 or 32 (12143165)
37 33 and 34 and 35 and 36 (1335)
38 remove duplicates from 37 (1048)

Table 2 Characteristics of included studies

Authors	Study population	Study design	Approach used	Odds ratio (OR)
Audet et al. (2016)	1772 HIV positive women attending clinic in Mozambique	Cohort	Complex community intervention	1.04 (0.9–1.2)
August et al. (2016)	1311 HIV positive women attending clinic in Tanzania	Cohort	Complex community intervention	3.42 (2.56–4.57)
Bannink-Mbazzi et al. (2013)	9445 HIV positive women attending clinic in Uganda	Cohort	Complex community intervention	1.49 (1.35–1.65)
Byamugisha et al. (2010)	1713 HIV positive mothers attending clinic in Uganda	Cohort	Complex community intervention	1.56 (1.24–1.93)
Ediau et al. (2013)	341 HIV positive women attending clinic in Uganda	Cohort	Complex community intervention	1.73 (1.02–2.94)
Kalembo et al. (2013)	476 HIV positive mothers attending clinic in Malawi	Cohort	Verbal encouragement	2.16 (1.11–4.22)
Kashitala et al. (2015)	2007 HIV positive women attending clinic in Zambia	Cohort	Verbal encouragement	1.53 (1.15–2.04)
Spangler et al. (2014)	145 HIV positive mothers attending clinic in Kenya	Cohort	Verbal encouragement	2.61 (1.25–5.44)

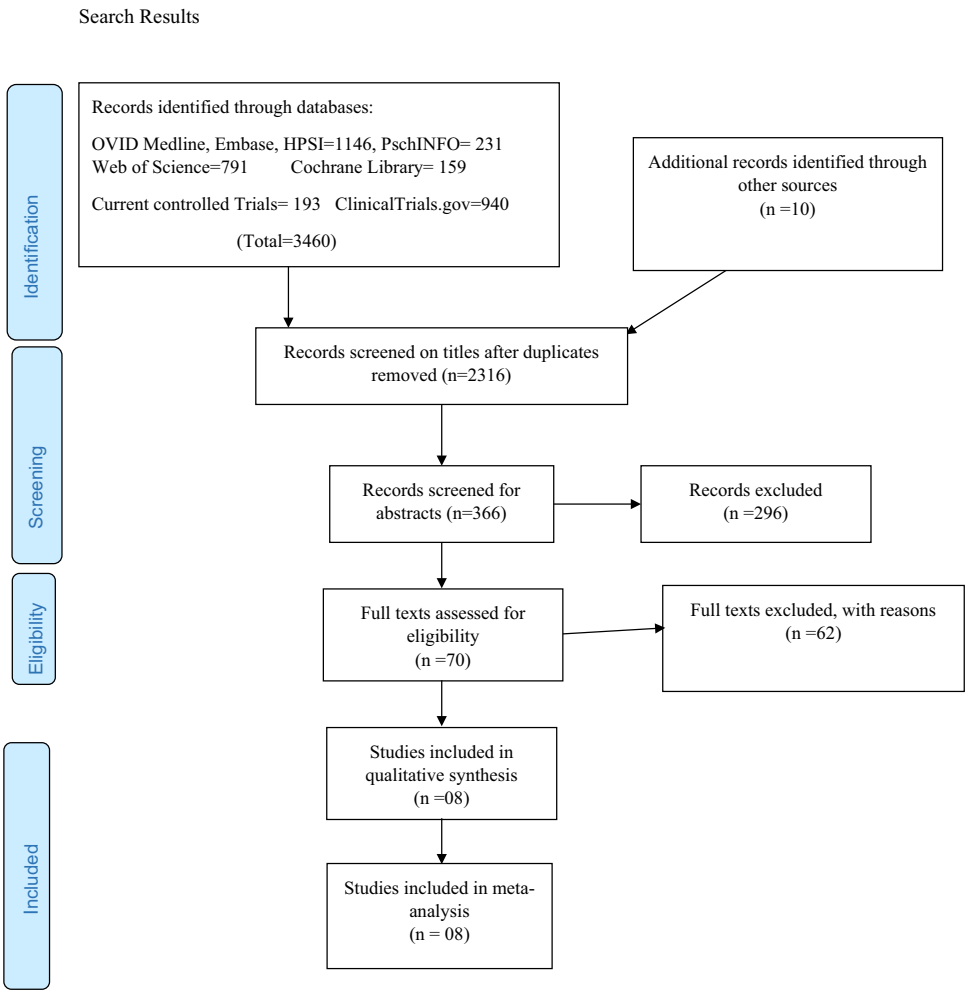

Fig. 1 PRISMA flow diagram showing databases searched, screening and inclusion of studies

Characteristics of Included Studies

Table 2 shows the characteristics of included studies. The studies included a total of 17,210 pregnant women living with HIV ranging from 145 to 9445.

In five of the studies, the authors used complex community interventions in which several approaches to involve male partners were coupled with other changes in health care delivery to improve on maternal and child care within the community (Audet et al. 2016; August et al. 2016; Bannink-Mbazzi et al. 2013; Byamugisha et al. 2010; Ediau et al. 2013). Within the complex community intervention category, three(03) of the studies used complex interventions without community health workers while two(02) studies used community health interventions with community health workers. Audet et al. and August et al. used community health workers. Audet et al. (2016) used male champions within the community who were involved in visiting the HIV positive pregnant women and their male partners, encouraging them on PMTCT and advising the male partner on the need to support the women in taking up PMTCT services. August et al. (2016) used community health workers who were equipped with Home Based Life Saving skills in view of promoting male partner involvement through joint decision-making, birth preparedness and escorting wives for hospital delivery. Meanwhile Ediau et al., Bannink-Mbazzi et al., and Byamugisha et al. didn't use community health workers. Ediau et al. used trained health care workers from health facilities and organized community mobilization and sensitization talks, music, dance and dramas. During these community meetings, community members were educated on the relevance of early antenatal clinic attendance of couples and the role of male partners in supporting the uptake of hospital delivery services by women (Ediau et al. 2013). In the Bannink-Mbazzi et al. (2013) study, health education materials were distributed in the communities and community education was carried out through radio programmes while in the Byamugisha et al. study (2010), the authors focused only on the family with no public event organized in the community.

In three of the studies, HIV positive pregnant women were encouraged verbally through counselling to bring their partners for counselling to the clinic (Kalembo et al. 2013; Kashitala et al. 2015; Spangler et al. 2014). Kalembo et al. (2013) and Kashitala et al. (2015) gave no description of the verbal message given to the women or the personelle responsible to pass across the message while Spangler et al. (2014) actively encouraged the women through counselling to engage their male partners through HIV status disclosure.

Quality Assessment

The results of quality assessment are shown in Table 3. Half of all the included studies were of moderate quality while the other half were of high quality.

Two out of the eight studies selected a representative sample of patients and hence reduced selection bias (Kashitala et al. 2015; Spangler et al. 2014). Spangler et al. (2014) selected a random sample of pregnant women that tested HIV positive while Kashitala et al. (2015) carried out systematic random sampling to select 10 study sites from a list of 245 health facilities. The other studies were prone to significant selection bias. Audet et al. (2016) and August et al. (2016) recruited patients only from rural socioeconomic disadvantaged communities while Kalembo et al. (2013) and Ediau et al. (2013) recruited patients in single health facilities. The Byamugisha et al. (2010) study was conducted in a single referral hospital which meant only patients that required referral attention or could afford the cost of health care offered at the referral level were included. Bannink-Mbazzi et al. (2013) included only health facilities that were supported by an external funding agency.

Only Audet et al. (2016) and Ediau et al. (2013) adjusted for confounding. In terms of follow up, all the studies had long enough follow-up time to observe the outcome. Among the four studies that accounted for all the subjects followed up, only Kashitala et al. (2015) did not ensure that the patients lost to follow up were unlikely to introduce follow up bias.

Results of Meta-analysis

Figure 2 shows the forest plot of different categories of approach used and the effect they had on the utilization of hospital delivery services by pregnant women living with HIV. The effect sizes were reported as odds ratios (ORs). The overall pooled OR was 1.56 (95% CI 1.45–1.68). The odds ratios were: 1.51 (95% CI 1.38–1.65), 1.58 (95% CI 1.38–1.80), 3.47 (95% CI 2.16–5.58) for complex community interventions without community health workers (CHWs), complex community interventions with community health workers, and verbal encouragement respectively.

The overall I-square was 91.0% but after stratification into the three different approaches, the I-squared within the complex community intervention without CHWs group was 0.0%.

The funnel plot in Fig. 3 showed uneven distribution of points towards positive effects showing some evidence for publication bias.

Table 3 Quality assessment of included studies using the Newcastle Ottawa Scale

The Newcastle Ottawa scale for quality assessment of observational studies									
	Item	Authors							
		Audet et al. (2016)	August et al. (2016)	Bannink-Mbazzi et al. (2013)	Byamugisha et al. (2010)	Ediau et al. (2013)	Kalembo et al. (2013)	Kashitala et al. (2015)	Spangler et al. (2014)
A	Selection								
	Exposed truly representative of average	✗	✗	✗	✗	✗	✗	✓	✓
	Selection of non-exposed from the same community	✓	✓	✓	✓	✓	✓	✓	✓
	Exposure ascertained by secure record or interview	✓	✓	✓	✓	✓	✓	✓	✓
	Demonstration of outcome of interest not present at the start of the study	✓	✓	✓	✓	✓	✓	✓	✓
B	Comparability								
	Study controls for other variables	✓	✗	✗	✗	✗	✓	✗	✗
C	Outcome								
	Follow up long enough for outcome to occur	✓	✓	✓	✓	✓	✓	✓	✓
	Complete follow up of all subjects accounted fo	✓	✗	✗	✗	✗	✓	✓	✓
	Subject lost to follow up unlikely to introduce bias	✓	✗	✗	✗	✗	✗	✓	✓
	Score	7	4	4	4	4	6	7	7

Discussion

Main Findings

A meta-analysis of 08 odds ratios from 08 cohort studies showed a statistically significant increase in the uptake of hospital delivery with male partner involvement. The three approaches used were complex community intervention without CHWs, complex community intervention with CHWs and verbal encouragement. These interventions all increased the utilization of hospital delivery services by pregnant women living with HIV. Verbal encouragement had more impact than the complex community interventions. Complex community interventions with CHWs had more impact than those that didn't use CHWs. The overall heterogeneity was high but low for complex community interventions that didn't use CHWs. There was also publication bias as studies tend to report positive effect.

Interpretation

The findings from this systematic review and meta-analysis are similar to those of other reviews in the area of male involvement in maternal health. Yargawa and Leonardi-bee (2015) investigated the impact of male involvement on maternal health outcomes such as postpartum depression and the utilization of maternal health services. Yargawa and Leonardi-bee showed that male involvement was associated with increased utilization of maternal health services such as hospital delivery. Our study similar reported an increase in the uptake of hospital delivery but unlike the Yargawa and Leonardi-bee study, we focused mainly on HIV positive women with potential implications on the reduction of mother to child transmission of HIV. Furthermore, our study provided more information by clearly mentioning approaches that were used in male partner involvement such as complex community intervention and verbal invitation.

The findings from our study are quite different from the findings reported by Brusamento et al. (2012) who investigated the impact of male involvement approaches on the uptake of PMTCT services. The authors thoroughly searched the literature and assessed the quality of studies but with only one study included, there was no possibility for a meta-analysis. The review also provided evidence suggesting a negative impact invitation letters on the uptake of couple counselling and testing. Unlike the Brusamento et al. study, we have focused only on the uptake of hospital delivery and our findings are suggestive of a positive impact on the uptake of hospital delivery using other approaches in male involvement such as complex community interventions.

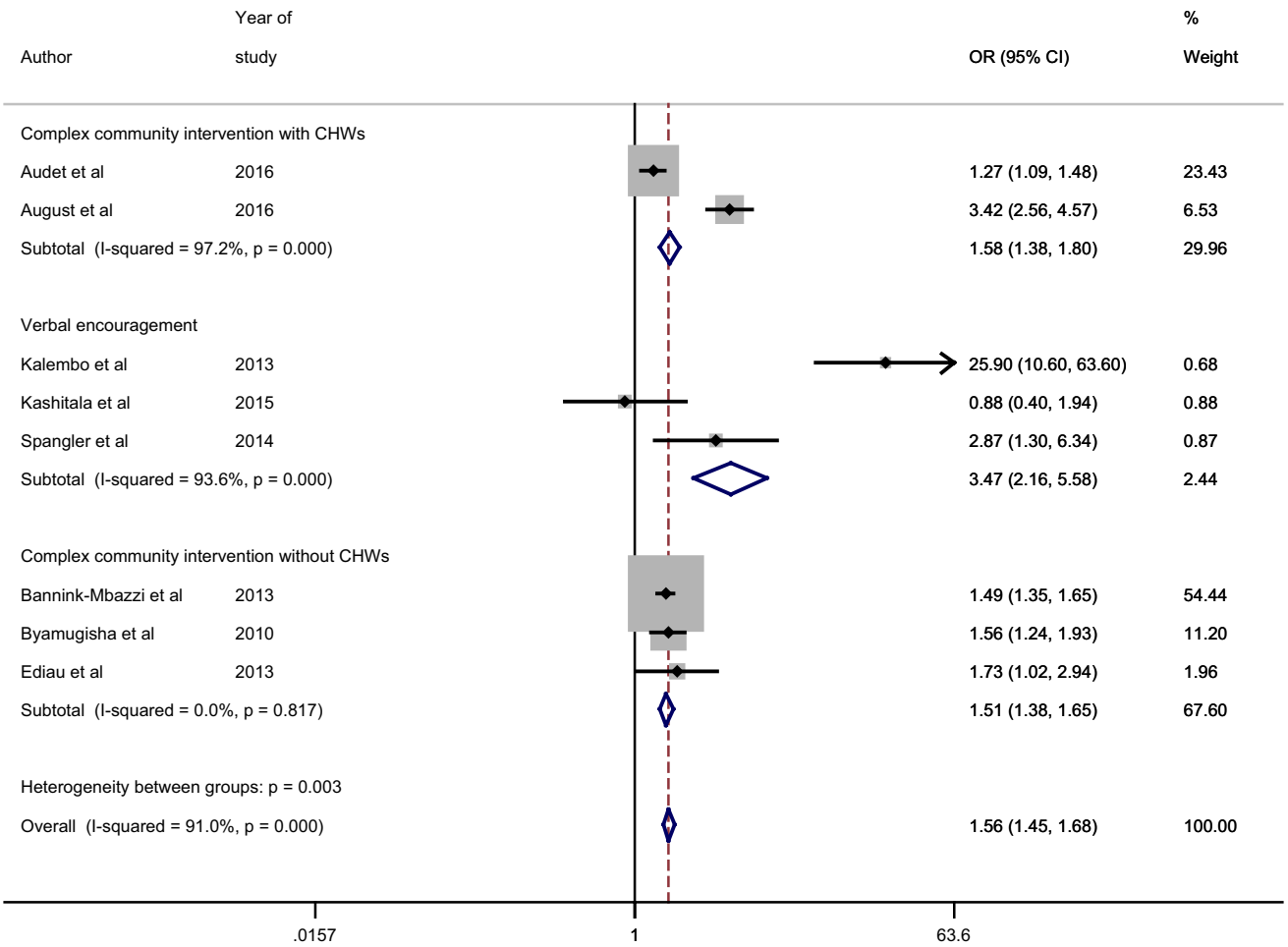

Fig. 2 Forest plot showing the impact of male partner involvement approaches

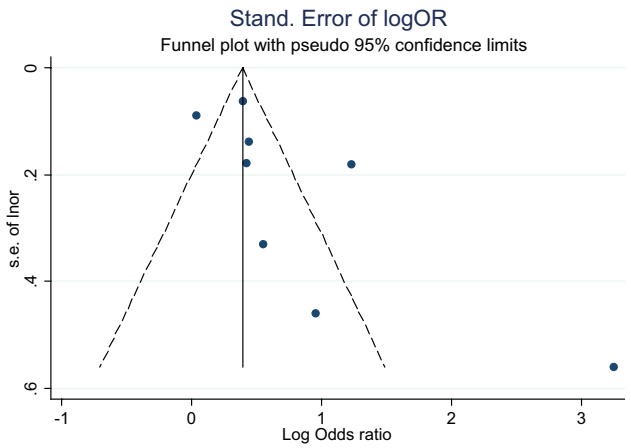

Fig. 3 Funnel plot showing publication bias for studies reporting impact on the uptake of hospital delivery

In our study, complex community interventions had a significant effect on the uptake of hospital delivery services. In general, complex community interventions could increase the utilization of hospital delivery services for several reasons: (1) By working with the community heads in recruiting male champions who served as role models within the communities, the investigators could register a higher response due to the high level of acceptability by the communities (Audet et al. 2016). This high acceptability likely yielded a higher impact on the uptake of hospital delivery by HIV positive women; (2) the organization of community mobilization and talks may have ensured a closer interaction with the communities which led to more trust with the health care workers and hence a higher uptake (Busza et al. 2012). The drama, music and visitation of male partners in various locations such as bars, football events and churches may have reduced selection bias and improved the coverage and response rate; (3) the coverage was also improved in certain instances

by integrating radio programmes with family support groups that ensured a closer follow-up of families in the community.

Furthermore, complex community interventions that used CHWs had more impact than those that didn't use CHWs. This finding could be possible for several reasons: (1) The use of male champions that were recruited by the heads of the communities meant they were easily acceptable by the members of the community, which could suggest a higher response rate. (2) The use of community health workers who were equipped with special life saving skills meant they could easily relate more with the basic antenatal care needs of the HIV positive women in the communities.

The use of verbal encouragement had a higher impact on the uptake of hospital delivery services. This finding was paradoxical to us because the use of verbal encouragement in involving male partners can be criticized for being less engaging for many reasons: (1) even though women were seen at different time points during the study, it seems there was no re-iteration of the verbal message to be passed to their male partners (Kalembo et al. 2013); (2) the authors did not actually confirm if the women informed their partners because it was clearly stated that the data were obtained from self-reports (Kashitala et al. 2015). However, from the findings of our meta-analysis, the studies that used verbal encouragement were weighted very low due to their small sample sizes. More studies with larger sample sizes that will use verbal encouragement will be needed in future to either confirm or refute this finding.

Strengths and Limitations

This systematic review and meta-analysis had several strengths and some limitations. The search was comprehensive because several databases and grey literature were searched and authors were contacted for any unpublished studies. The independent search and screening of articles by two reviewers reduced selection bias.

The overall heterogeneity was high. However, we carried out a stratification analysis that showed very low heterogeneity for studies that used complex community interventions without CHWs.

The studies included were conducted mostly in East Africa. With no study from West Africa that is more populated, there is a possibility of selection bias. However, it should be noted that the characteristics of the population in SSA are largely similar irrespective of the sub region of study.

No randomized controlled trial was included after inclusion and exclusion criteria were applied. Even though randomized controlled trials provide a higher level of evidence than cohort studies, there is some evidence to suggest that the latter provide a more reliable picture of the "real world" than the former (Besen and Gan 2014). Given that the implementation of hospital delivery occurs under "real world" conditions which are usually controlled in the course of a randomized controlled trial, the findings from our study using cohort studies may therefore present a better picture of "real world" implementation science than if only randomized trials were used.

Conclusion

Complex community interventions and verbal encouragement increase the utilization of hospital delivery services by pregnant women living with HIV in SSA. The overall heterogeneity was high but very low for studies that used complex community interventions without CHWs.

Recommendations for Future Research

No randomized trial has been carried out to investigate the impact of male partner involvement on the uptake of hospital delivery services. More well conducted studies (including randomized controlled trials) are needed in future to add to the quality of evidence. More studies with larger sample sizes that will use verbal encouragement will be needed in future.

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Author Contributions NFT and MM conceived the paper. NFT, MM and LNA developed the search strategy. NFT and MM independently searched the literature and screened the articles. NFT, and MM carried the meta-analysis and meta-regression. NFT made the first draft of the manuscript. NFT, MM and LNA reviewed several versions of the manuscript. All the authors read and approved the final manuscript.

Data Availability For more data, send email to takahnoah@yahoo.com. However, the sharing of data will be a consensus of all authors.

Compliance with Ethical Standards

Conflict of interest The authors declare that they have no conflict of interest.

Ethical Approval No ethical approval was needed since the included studies were published studies that had already obtained ethical approvals.

Informed Consent All authors consented to the publication.

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