Effect of an Educational Intervention on the Utilization of Maternal Healthcare Services for High-Risk Obstetric Clients, Systematic Review

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Abstract

This study aims to investigate how health systems can be strengthened through timely referral of obstetric patients. In many Low and Middle-Income Countries (LMICs), maternal and newborn mortality and morbidity outcomes continue to be major health issues. Most of the deaths occur in sub-Saharan Africa and South Asia where access to maternal and newborn health care is a challenge. Strengthening health systems aims at increasing access to vital services such as maternal and neonatal care to improve health outcomes. The broad objective of this systematic review was to determine the level of effectiveness of education interventions aimed at improving timely referral of obstetric patients to higher-level healthcare facilities, with the goal of strengthening health systems and improving maternal and new-born healthcare outcomes. This study adopts a systematic review of the meta-analysis approach. For articles, six electronic databases; namely, Science Direct, Scopus, EMBASE, PubMed, PLOS One, and Google Scholar were searched. The target population was publications on obstetric patients in low- and middle-income countries. Data were analysed using meta-analysis techniques. The results of the review indicated that education and training intervention had a statistically significant impact on five outcomes; namely, maternal mortality (p=0.05), service utilization (p=0.001), number of emergency referrals (p=0.00001), and referral time (0.05), though the margin was small in the latter. These outcomes were marked with significant improvement, following the implementation of the treatment of high risk obstetric patients. However, there was lack of meaningful impact of the intervention on neonatal mortality (p=0.80). The study concluded that timely referral can be enhanced by implementing education interventions such as training expectant women and healthcare providers.

Keywords: *Strengthening Health Systems, Pregnant women, Obstetric Patients, maternal and neonatal mortality*

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1.0 Introduction

Maternal and neonatal mortality are still a major challenge in the Low and Middle-Income Countries (LMICs). According to World Health Organization (WHO), in 2019, approximately 295,000 women died due to factors related to pregnancy and childbirth, while 2.4 million newborns died in the first month of life (World Health Organization [WHO], 2020). A great proportion of such deaths are reported in LMICs of sub-Saharan Africa and South Asia where health systems face numerous challenges in providing effective and accessible maternal and newborn health care. Kanyesigye et al. (2022) noted that approximately 94% of all maternal deaths occurred in LMICs. Similarly, neonatal and perinatal mortality rates are also higher in LMICs, with about 75% of all perinatal deaths occurring in sub-Saharan Africa and South Asia (Bharati et al., 2020). However, most of these deaths are preventable through provision of timely and quality maternal and newborn healthcare services. The leading causes of maternal mortality in these regions include infections, profuse bleeding, high blood pressure, unsafe abortion, and blockaded labour. Conversely, neonatal and perinatal mortalities are primarily caused by prematurity, complications during childbirth, and maternal infections.

McCarter et al. (2018) asserts that education and training interventions have been developed to strengthen health systems and improve maternal and newborn health care. Such interventions aim to increase women's knowledge of the danger signs of pregnancy and childbirth, as well as to encourage women to seek obstetric care when necessary. These interventions may include community-based education programs, mobile phone reminders, and community mobilization activities among others. These interventions improve maternal healthcare services; thereby, lowering maternal and newborn death rates and morbidity.

The aforementioned educational interventions can be helpful; however, their efficiency vary depending on the demographic being served, the intensity, duration, and substance of the intervention. Additionally, a number of contextual factors, like resource accessibility, community involvement, cultural norms sorrounding birthing, and the general caliber of the healthcare system, may have an impact on how beneficial these interventions are.

Locally, Zewde (2022) observes that one of the critical aspects of maternal and newborn health care is the timely referral of obstetric patients to higher-level health facilities when complications arise. Referral systems are essential for providing access to specialized care and reducing maternal and neonatal mortality and morbidity. However, referral systems in many LMICs face numerous challenges such as poor infrastructure (Maskey, 2015), inadequate staffing (Goodman et al., 2017), lack of adequate supplies and equipment (Mathew et al., 2021), and inadequate communication and coordination between health facilities (Chandrayan et al., 2018).

The existence of a well-functioning health system ensures smooth movement and timely referral of patients, thereby improving obstetric care outcomes, which is largely missing in most LMICs. These challenges collectively weaken referral systems and contribute to poor obstetric care outcomes in LMICs. Besides, they often result in delays or failures to refer obstetric patients, which eventually leads to poor maternal and neonatal outcomes in the region. In order to make prompt the referral of obstetric patients to

higher-level healthcare facilities, it is necessary to find efficient solutions.

This study seeks to enhance understanding of how to improve overall maternal and newborn health outcomes, as well as to strengthen health systems through identifying effective interventions to improve timely referral of obstetric patients. Secondly, the study synthesizes the evidence from existing studies on interventions, thereby providing valuable information to policymakers, healthcare providers, and researchers. The findings of the study provide evidence-based information that can guide the development and implementation of interventions for enhancing referral systems and reducing death and morbidity related to maternity and childbirth in LMICs.

Problem Statement

LMICs are characterized by unacceptably adverse maternal and new-born health care outcomes, such as maternal, perinatal and neonatal deaths, obstetric fistula, and neonatal asphyxia, among others. Nagavarapu et al. (2019) argued that one of the factors contributing to the adverse maternal and perinatal outcomes in LMICs is the lack of timely referral of obstetric patients. Reducing mortality and morbidity rates that are related to maternity and childbirth in LMICs is a health priority, and timely referral of obstetric patients is a critical component to achieving this goal. However, there are a number of obstacles that prevent prompt referrals in LMICs. These elements include, a lack of qualified healthcare professionals, lack of resources, and poor infrastructure. As a result of inadequate referral of obstetric patients, numerous women and new born babies perish in LMICs. Studies confirm that obstetric patient referral delays frequently result in poor healthcare outcomes for both mothers and their new-borns (Daniels & Abuosi, 2020). Despite the significance of promptly referring obstetric patients, research on this subject is scanty since the majority of studies have concentrated on particular components of the referral process rather than looking at the referral process as a whole. In some earlier studies, education interventions aiming at enhancing maternal and new-born health outcomes and prompt referral of obstetric patients were investigated (Bharati et al., 2020). However, there is a need to combine the data from current research because the evidence on the efficacy of these therapies is conflicting.

"Some of the educational interventions practiced to improve maternal and newborn health care include community-based education programs, mobile phone reminders and community mobilization activities"

Research Objectives

The aim of this review is to evaluate the effects of education interventions on multiple outcomes that increase the timely referral of obstetric patients to higher-level healthcare facilities so as to improve maternal and new-born healthcare outcomes, and strengthen health systems. The specific objective is to evaluate the efficiency of training and education initiatives meant to enhance timely referral of obstetric patients in LMICs.

2.0 Material and Methods

Study Design and Protocol

This study was a systematic review using metanalysis technique as the research strategy. The *Preferred Reporting Items for Systematic Reviews and Meta-Analyses* (PRISMA) criteria were followed in conducting the study. A systematic literature search was conducted on peer-reviewed papers on studies undertaken in LMICs retrieved from online journal databases. The study protocol was registered in PROSPERO.

The design of the search strategy was to identify articles that have been published in journals that evaluate interventions aimed at improving timely referral of obstetric patients and reporting obstetric care outcomes. The search strategy was implemented on six electronic databases, mainly PubMed, EMBASE, Science Direct, PLOS One, Scopus, and Google Scholar. The search strategy included keywords related to "obstetric care outcomes", "interventions" "perinatal mortality", "obstetric care outcome", "timeliness of obstetric care", "maternal mortality", "neonatal mortality", "service utilization", "referrals", "health system", and "strengthening". A PICOS framework was used in this review to search for pertinent studies. The studies obtained were then subjected to eligibility criteria summarized in the table below.

Table 1

Eligibility criteria

Inclusion Criteria	Exclusion Criteria
1. Randomized controlled trials (RCTs) or other forms of quasi-experimental study. 2. Participants include pregnant women and healthcare workers in LMICs. 3. Studies that evaluate interventions aimed at enhancing timely referral and obstetric care outcomes. 4. Studies published between January 2012 and January 2023. 5. Studies conducted in LMICs as classified by the World Bank. 6. Studies that report measures of timely referral and obstetric care outcomes.	1. Studies that do not include a comparison group and interventions. 2. Studies conducted in contexts such as refugee camps, war zones, and areas affected by mass casualties. 3. Studies focusing on isolated interventions to introduce first-aid practices. 4. Studies conducted in high-income and developed countries. 5. Qualitative papers and case studies.

Data extraction

After selecting suitable studies, all necessary data were extracted using a pre-tested standardized data extraction form which captured information such as primary author(s), study period, study duration (follow-up), country /region, study design, study setting, study participants, sample size, type of interventions studied, key findings, and study outcomes measured. The possible study outcome measured included maternal mortality, neonatal mortality, hospital fatality, provision of emergency obstetric care **(**EmOC), facility-based births, timeliness of care, service utilization, ANC attendance, PNC attendance, number of referrals, and diagnosis time. Numerical values that were collected for variables include frequencies, total numbers, mean, and probability values. The data

collected were then organized in an Excel Spreadsheet, standardized and then entered into RevMan.

Quality Assessment and Meta-Analysis

The quality of the included studies was assessed using the EPHPP tool, which is commonly used in public health research. It assesses the presence of selection bias, the type of study conducted, whether the information was withheld from participants through blinding, how data was collected, and the extent of participant withdrawals. Data was retrieved using an established structured method for collating information. The meta-analysis was conducted using RevMan 5.4 tool and the effect estimates were adjusted using an inverse variance. DerSimonian-Laird's method of estimated random effects model was adopted to assess variations between the studies. The findings were presented through written descriptions, tables, and forest plots, displaying effect measures and a 95% CI.

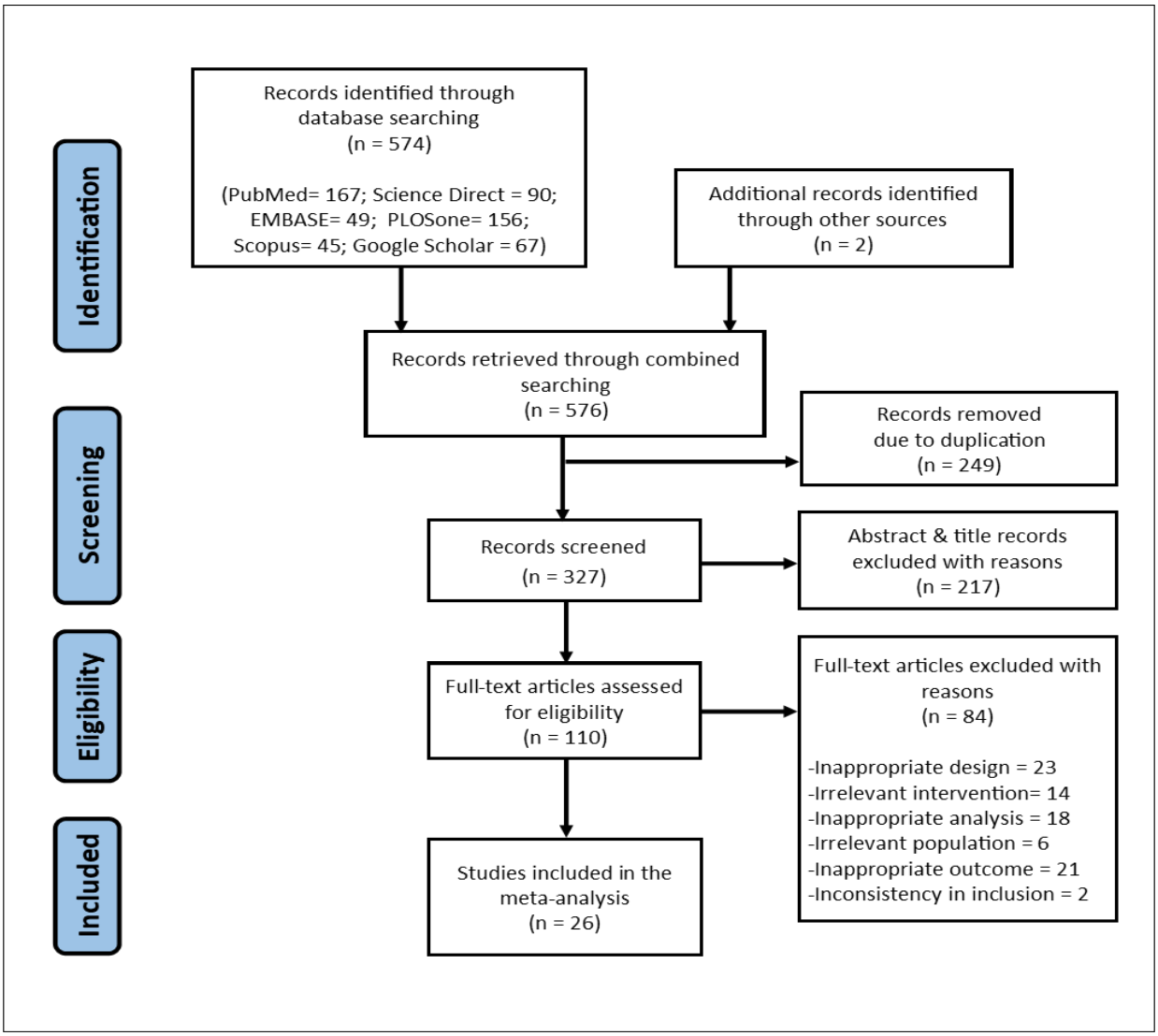
3.0 Results and Discussions

Literature Search Results

The search string was implemented in six databases resulting in a total of 576 published peer-reviewed articles. After conducting thorough scrutiny of all titles, 249 were identified to be duplicates and eliminated, which resulted in 327 journal articles. The titles and abstracts of the 327 articles were screened further and 217 articles were expunged from the list due to a lack of relevant abstracts and titles. The remaining 110 were then subjected to full-text screening to ascertain their eligibility against the established exclusion and inclusion criteria. During the full-text reading of each article, 84 were found to be inappropriate and they were eliminated which resulted in only 26 articles that were considered in the metanalysis. The PRISMA diagram below (figure 1) illustrates the results of the literature search strategy that was adopted.

Figure 1

PRISMA Flowchart of Literature Search Results



Characteristics of Included Studies

The included studies were conducted across 18 low-middle-income countries namely Burkina Faso (1), Ethiopia (2), Ghana (2), Guinea (1), Haiti (1), India (2), Kenya (2), Malawi (3), Mali (2), Rwanda (1), Senegal (2), Sierra Leone (1), South Africa (1), Tanzania (4), Uganda (6), Zambia (3), Zanzibar (1), and Zimbabwe (1) as presented in Appendix A. Of the 26 studies, 10

were RCTs, 7 were quasi-experimental studies, 6 were observational studies with pre- and post-intervention data, and 3 were prospective with pre and post-intervention data. The main characteristics of the included studies summarized included the study authors, country or region, study design, study duration, study year, article publication year, study setting, study participants, sample size, type of interventions, the scope of intervention, and outcomes as presented in Table 2 below.

Table 2

Characteristics of Included Studies

#	Authors	Country /region	Summarized Design	Study Year	Participants	Sample
1	Webber et al. (2022)	Tanzania	RCTs	2017-2019	pregnant women	12,359
2	Baumgartner et al. (2021)	Uganda	Quasi-experimental	2017-2018	Health facility workers	584
6	Kaboré et al. (2019)	Burkina Faso	RCTs	2014-2017	Health facility workers	4274
8	Tiruneh et al. (2018)	Ethiopia	Quasi-experimental	2013-2015	pregnant & perinatal women	12194
9	Maaloe et al. (2018)	Tanzania	Quasi-experimental	2014-2015	pregnant women	6777
10	Saaka et al. (2017)	Ghana	RCTs	2012-2015	Obstetric mothers	1003
11	Sayinzoga et al. (2017)	Rwanda	Prospective	2015-2016	pregnant & perinatal women	1,268
12	Semrau et al. (2017)	India	Observational	2014-2016	pregnant women	157,689
13	Patel et al. (2016)	Ghana	Observational	2013-2015	health workers	1,290
14	Kawooya et al. (2015)	Uganda	Observational	2012-2014	Obstetric mothers	5,561
15	Watt et al. (2015)	Kenya	Quasi-experimental	2010-2012	pregnant & perinatal women	934
16	Spitzer et al.(2019)	Kenya	Prospective	2012-2013	Obstetric mothers	3553

The impact of education and training in enhancing timely referral was also assessed. Such education and training are designed to improve the knowledge and skills of obstetric care providers, mothers and the community in identifying and managing obstetric emergencies and referring patients in a timely manner. This intervention was implemented using a combination of several tools and techniques; such as (a) training medical staff (doctors, midwives, nurses, birth attendants etc.) on various tools and protocols such as Acute Intermittent Porphyria (AIP), Saving Mothers, Giving Life (SMGL), Air Launched Anti-Radiation Missile (ALARM), Standard-Based Management and Recognition (SBM-R), Rescue and Preparedness in disasters (RAPID), maternity death reviews, Safe Motherhood programs (Dumont et al., 2013; Spitzer et al., 2014; Watt et al., 2015), (b) training medical staffs on BEmONC, emergency neonatal care, standard behaviour-change framework (Tiruneh et al., 2018), and (c) training expectant mothers on birth plans, danger signs during pregnancy, labour and the postpartum. Interventions were also delivered by (d) training birth attendants and other medical staff on standard birth practices, essential newborn care, and obstetric ultrasound scanning (Watt et al., 2015); (e) provision of an interactive workshop on evidence-based outreach visitations (Dumont et al., 2013), (f) training of community workers on behaviour change communication strategy, ANC basics, standard birth practices, and essential newborn care (Saaka et al., 2017), and (g) offering post-training follow-up (Tiruneh et al., 2018). See Appendix C.

The implemented education and training interventions were associated with essential improvements such as a decrease in diagnosis time, a significant increase in facility-based births and facility-based stillbirths (Colbourn et al., 2013). However, Lewycka et al. (2013) and Webber et al. (2022) found no meaningful change in facility-based births. Facility-based maternal fatality also decreased, but moderately (Patel et al., 2016; Spitzer et al., 2014). The intervention contributed a great extent to a decrease in maternal mortality and neonatal mortality (Semrau et al., 2017; Baumgartner et al., 2021; Webber et al., 2022). However, other studies reported a weak increase in perinatal mortality. Out-referral time also decreased; however Kawooya et al. (2015) report an insignificant change in this variable. Provision and utilization of facility maternal services such as ANC, PNC, and EmOC also increased.

See Appendix D.

Results of Meta-Analysis

The table below summarizes the key effects on each outcome of obstetric care that was measured.

Table 3

Overall Effect Education & Training Intervention

Outcome variable	Z statistic	P value
Maternal Mortality	1.95	0.05

Neonatal Mortality	0.26	0.80
Service Utilization	3.5	0.0005
Number of Referrals	22.19	0.00001
Referral Time	1.97	0.05

The forest plot (figure 2) shows a reduction in both maternal and neonatal mortality. However, the margin was small in the latter. Education and training intervention had a statistically significant impact on five outcomes; namely, maternal mortality (p=0.05), service utilization (p=0.001), number of emergency referrals (p=0.00001), and referral time (0.05). The forest plot shows no improvement in the utilization of hospital services and referral time. These outcomes were marked by significant improvement following the implementation of the intervention. However, there was no significant impact of the intervention on neonatal mortality (p=0.80). In essence, the intervention shows an ineffective impact on obstetric care outcomes due to mixed results. The funnel plot (Figure 3) is asymmetrical showing the presence of publication biases. Besides, most points tend to lie on one side of the weighted average of the mean difference. For each outcome variable, the computed I^2 >70% (except for the number of referrals), which suggests that there is substantial heterogeneity contributed by the small sample studies.

Table 4

Interventions from listed studies

	Intervention made	Study
1	Community based education progams on danger signs	DECIDE: a cluster-randomized controlled trial to reduce unnecessary caesarean deliveries in Burkina Faso
2.	Mobile phone reminders	Social work in East Africa: A mzungu perspective
3.	Community mobilization	*The Lancet* Oral Health Series: Implications for Oral and Dental Research

Figure 2

Forest Plot

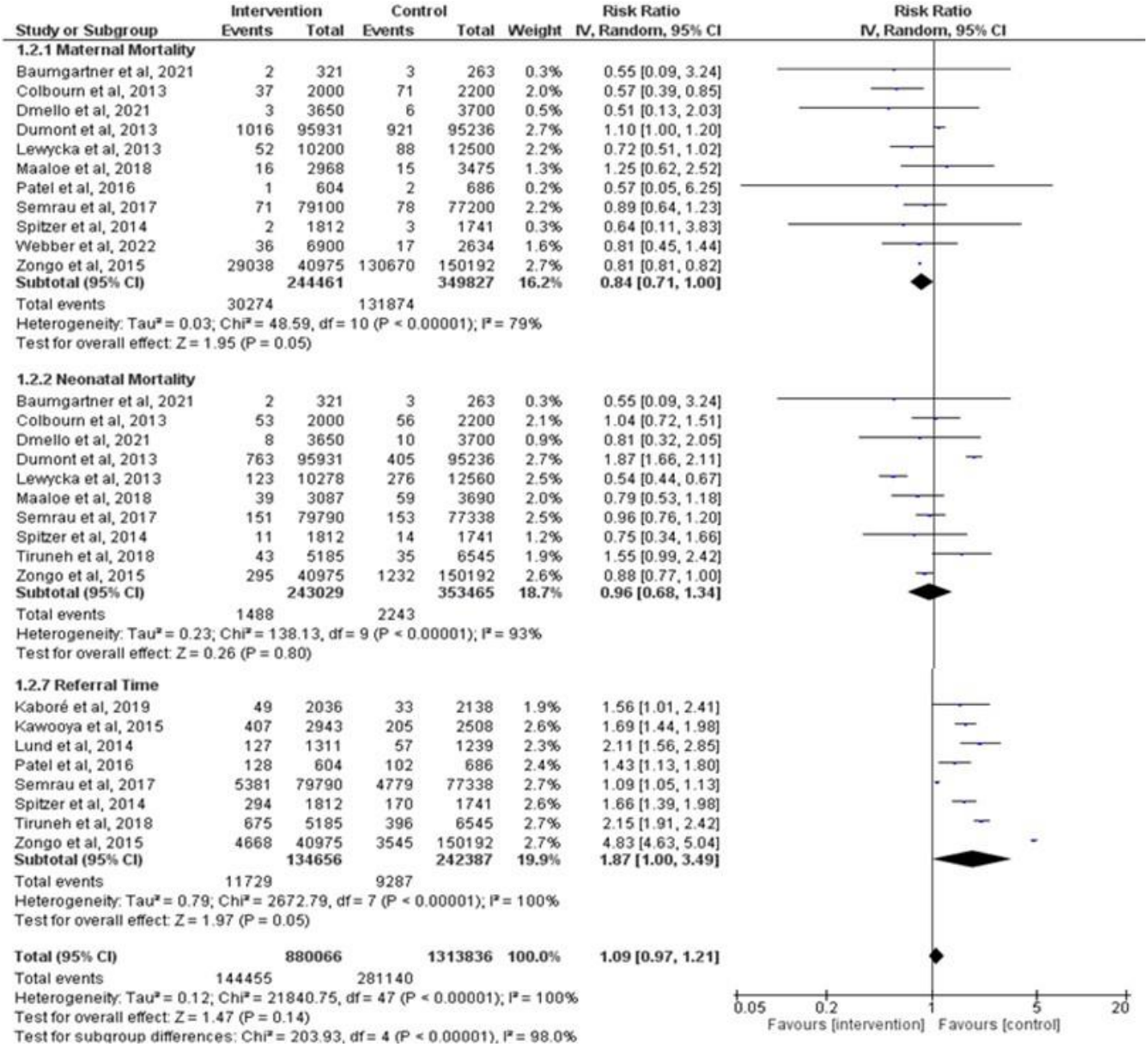
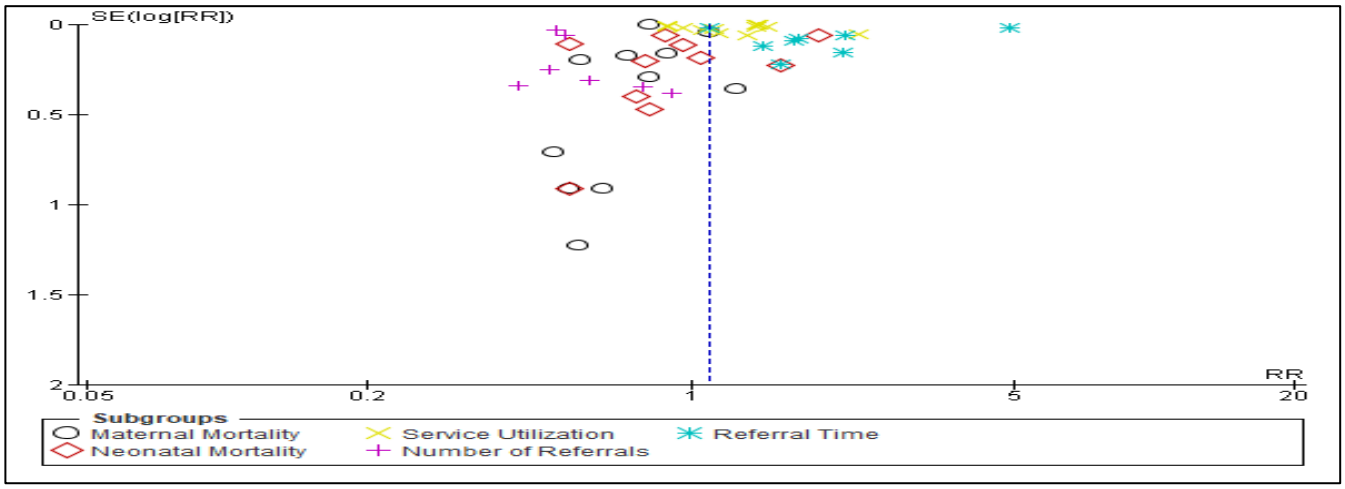


Figure 0

Funnel Plot



The interventions were implemented through various strategies such as training medical staff on healthcare protocols, maternity death reviews, EmONC provision, emergency neonatal care, evidence-based outreach visits, and essential newborn care. It also included free health education for women and CHWs on birth plans, and danger signs during pregnancy, labour and postpartum among others. The effect of instruction of CHWs and traditional birth assistants was limited but noteworthy. This implies that this crucial human asset should not be ignored in attempts to enhance prenatal care outcomes (Saaka et al., 2017; Webber et al., 2022). Community health workers and traditional birth attendants assist in the transportation of females with medical issues to hospitals, specifically in circumstances where the structured healthcare system is dysfunctional or lacking.

Education of medical professionals on urgent maternity assistance had a constructive impact on the accessibility and excellence of emergency obstetric care in Kenya. According to the research conducted by Spitzer et al. (2014), this intervention enhanced delivery and care abilities among midwives in Ghana (Saaka et al., 2017) and Tanzania (Webber et al., 2022). In particular, the BEmONC initiative was effective in improving institutional deliveries and met need for BEmONC services in Ethiopia (Tiruneh et al., 2018). On-site training of medical staff on maternal death reviews and emergency obstetric care was highly reliable when it comes to the overall reduction of maternal mortality among high-risk women in Mali and Senegal who need a cesarean section (Zongo et al., 2015). Maternal providers' education was also associated with enhanced understanding and self-assurance in performing patient evaluations among healthcare providers. Consequently, the excellence of healthcare provisions given to mothers and their infants was substantially increased. The program reportedly reduced hospital-based maternal and neonatal mortality in Malawi and India (Semrau et al., 2017). In Tanzania, the training of healthcare professionals on various aspects of clinical algorithms, audit and feedback; as well as

the implementation of SMS reminders resulted in a remarkable reduction in emergency caesarean deliveries, some of which were found to be unnecessary (Dmello et al., 2021). In essence, education and training interventions appeared to be effective in improving timely referrals and obstetric care outcomes in LMICs. A weakness of this intervention is that it may be difficult to sustain over time, particularly in settings with high turnover rates among healthcare providers.

4.0 Conclusion

The timely referral of obstetric patients is an essential component of maternal and neonatal health. In general, educational interventions were found to be highly effective in improving the timely referral of obstetric patients in LMICs. The study's findings suggest that a variety of education interventions have been implemented in different settings, with varying levels of success. One of the key findings of this study is that such interventions are often context-specific, thus their success and effectiveness are dependent on a variety of factors such as the availability of resources, the capacity of healthcare providers, and the cultural and social context among others. For instance, due to changes in the healthcare system, demographic characteristics, resource availability, cultural norms or orientations, among other things, education programs that were helpful in one setting may not be effective in another. Additionally, initiatives aiming at enhancing access to urgent obstetric care or expanding the pool of qualified birth attendants are frequently combined with initiatives in the area of education and training.

5. 0 Recommendations

The findings of this study highlight the need for a comprehensive education intervention approach to improving timely referral of obstetric patients in LMICs. This approach should take into account the specific needs and context of the healthcare system and should be tailored to address the underlying factors that contribute to delays in referral. Future studies should prioritize the identification of how education interventions can enhance prompt referral of high-risk obstetric patients. To improve obstetric care outcomes, healthcare providers and policymakers ought to implement a set of education interventions that tackle several hindrances to timely referral actively.

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