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Effectiveness of Health Education Campaigns on Antenatal Care Utilization in Low- and Middle-Income Countries: A Systematic Review

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Abstract

Maternal and child health remains a critical public health priority in many low- and middle-income countries (LMICs), where insufficient utilization of antenatal care (ANC) services contributes to preventable maternal and neonatal morbidity and mortality. According to the World Health Organization, approximately 287,000 women die each year from pregnancy-related complications, with most deaths occurring in resource-limited settings where access to essential maternal health information and services remains inadequate. Health education campaigns have therefore been increasingly implemented as strategic interventions to improve awareness, influence health-seeking behavior, and encourage timely ANC utilization. This systematic review aims to synthesize available evidence on the effectiveness of health education campaigns in promoting ANC utilization among women in LMICs. A comprehensive literature search was conducted across PubMed, Scopus, Web of Science, and Google Scholar for studies published between 2010 and 2025 using search terms related to health education campaigns, maternal health promotion, antenatal care utilization, and health communication interventions.

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Studies reporting quantitative or qualitative evidence on the influence of health education strategies, including mass media initiatives, community outreach programs, and digital communication platforms, on ANC attendance, early ANC booking, and completion of recommended visits were included. Extracted data were synthesized narratively, and patterns of intervention effectiveness were summarized across studies. A total of 29 studies conducted across different LMIC contexts met the inclusion criteria. The findings indicate that well-designed health education campaigns significantly improve maternal health knowledge and positively influence ANC attendance, particularly when interventions incorporate culturally appropriate communication approaches and community engagement strategies. This review concludes that health education campaigns can serve as effective maternal health promotion strategies for improving ANC utilization in resource-limited settings. The findings contribute to evidence on health communication interventions and provide practical implications for policymakers, public health practitioners, and maternal health programs seeking to strengthen ANC uptake among women in LMICs.

Keywords: Antenatal Care Utilization; Health Education Campaigns; Maternal Health Promotion; Low- and Middle-Income Countries; Health Communication

INTRODUCTION

Maternal and child health remains a fundamental public health priority globally, particularly in low- and middle-income countries (LMICs), where preventable maternal and neonatal morbidity and mortality continue to pose serious health challenges. Despite substantial progress in global maternal health initiatives over the past two decades, many countries still struggle with inadequate access to and utilization of essential maternal health services, including antenatal care (ANC). According to the World Health Organization, approximately 287,000 women die annually due to complications related to pregnancy and childbirth, with nearly 95% of these deaths occurring in LMICs where health systems face structural and resource constraints (WHO, 2023). Antenatal care is widely recognized as a critical intervention for improving pregnancy outcomes because it provides opportunities for early detection of pregnancy related complications, health education, nutritional counselling, disease prevention, and preparation for safe delivery (Carroli et al., 2011).

Globally, the WHO currently recommends that pregnant women receive a minimum of eight antenatal contacts during pregnancy in order to reduce perinatal mortality and improve maternal well-being (WHO, 2016). However, in many LMICs, a substantial proportion of women either initiate antenatal care late or attend fewer than the recommended number of visits. Numerous studies have documented that inadequate awareness of maternal health services, limited health literacy, socio-cultural barriers, and poor access to accurate health information significantly influence antenatal care utilization among women in resource constrained settings (Kruk et al., 2018). Consequently, improving knowledge and awareness of maternal health services remains a crucial strategy for increasing ANC attendance and improving maternal and neonatal outcomes.

Health education campaigns have increasingly been implemented as strategic public health interventions to address knowledge gaps and promote positive health seeking behaviors among pregnant women. These campaigns employ a variety of communication approaches, including mass media messaging, community mobilization programme, interpersonal health education delivered by health workers, and digital health communication platforms. Such interventions are designed to disseminate maternal health information, encourage early antenatal registration, and motivate pregnant women to attend recommended ANC visits (Wakefield et al., 2010). Evidence from health communication research indicates that well designed educational campaigns can influence public awareness, shape attitudes toward health behaviors, and ultimately improve the utilization of preventive health services.

In the context of maternal health, educational campaigns often emphasize key messages such as the importance of early pregnancy registration, the benefits of routine antenatal visits, recognition of pregnancy danger signs, and the availability of skilled maternal healthcare services. These communication strategies may be delivered through multiple channels, including radio and television broadcasts, community health outreach initiatives, mobile health messaging, social media campaigns, and facility based counselling sessions. When implemented effectively, such campaigns can enhance maternal health knowledge, improve community engagement, and promote behavioral changes that support the uptake of maternal health services (Glanz et al., 2015). However, the effectiveness of these interventions may vary depending on contextual factors such as literacy levels, cultural beliefs, healthcare accessibility, and the strength of local health systems.

Across many LMIC settings, several empirical studies have examined the relationship between health education initiatives and antenatal care utilization. For example, community based maternal health promotion programmes have been associated with increased ANC attendance and improved maternal health knowledge among pregnant women in several African and Asian countries (Sarrassat et al., 2018). Similarly, mass media health campaigns have been shown to influence maternal health behaviors by increasing awareness and encouraging positive attitudes toward seeking antenatal services (McKinnon et al., 2016). Digital health platforms, including mobile health messaging services, have also demonstrated potential for improving maternal health information dissemination and supporting health seeking behavior during pregnancy.

Despite the growing body of literature on maternal health promotion strategies, existing studies often vary promotion strategies, existing studies often vary considerably in their design, intervention types, and outcome measures. Some investigations focus primarily on knowledge outcomes, while others assess behavioral indicators such as early antenatal booking, number of ANC visits attended, or utilization of skilled maternal healthcare services. Additionally, interventions may differ widely in their communication channels, duration, target populations, and implementation contexts. This methodological diversity makes it challenging to draw consistent conclusions regarding the overall effectiveness of health education campaigns in improving antenatal care utilization across LMIC settings.

Another limitation within the current evidence base is the fragmentation of available research across different geographic regions and intervention modalities. Many studies examine individual campaigns implemented in specific countries or communities, but few synthesize evidence across multiple LMIC contexts to provide a broader understanding of how educational interventions influence antenatal care utilization globally. Without systematic synthesis of available evidence, policymakers and health programmer planners may face difficulties identifying the most effective communication strategies for improving maternal health service uptake.

From a methodological perspective, systematic reviews provide a rigorous approach for consolidating research findings across diverse studies and identifying consistent patterns of evidence. By applying transparent search strategies, clearly defined inclusion criteria, and structured data extraction procedures, systematic reviews allow

researchers to synthesize available literature and generate more reliable conclusions about intervention effectiveness (Moher et al., 2009). In the field of maternal health promotion, systematic evidence synthesis can help identify the most effective health education strategies for improving antenatal care utilization and inform the design of future maternal health interventions.

Given the persistent challenges associated with low antenatal care utilization in many LMICs and the increasing use of health education campaigns as behavioral change interventions, there is a clear need to systematically examine the available evidence regarding their effectiveness. A comprehensive synthesis of existing studies can help clarify which types of educational campaigns are most effective in promoting antenatal care attendance, as well as the contextual factors that influence their success.

Therefore, the present systematic review seeks to synthesize available research evidence on the effectiveness of health education campaigns in improving antenatal care utilization among women in low- and middle-income countries. Specifically, the review aims to evaluate the impact of various educational communication strategies, including mass media campaigns, community based health education programmes, and digital health interventions on antenatal care attendance and related maternal health behaviors.

Accordingly, this systematic review addresses the following specific objectives:

1) To examine the level of awareness and knowledge of maternal and child health services and determine how health education campaigns influence antenatal care utilization among women in low- and middle-income countries.

2) To identify key elements that determine the effectiveness of educational interventions in promoting antenatal care attendance and maternal health service utilization.

3) To assess the impact of various educational campaigns strategies, including mass media, community based interventions, and digital communication platforms on antenatal care utilization in low- and middle-income countries.

4) To explore the socio-cultural, economic, and structural factors that influence the effectiveness of health education campaigns in improving antenatal care utilization.

By consolidating findings across multiple LMICs contexts, this review intend to provide evidence based insights that can support policymakers, maternal health programme planners, and public health practitioners in designing effective communication

interventions to improve maternal health service utilization and ultimately reduce preventable maternal and neonatal mortality.

METHODS

Research Design and Approach

This study employed a systematic review design to examine the effectiveness of health education campaigns in improving antenatal care utilization among women in low- and middle-income countries (LMICs). The review followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA 2020) guidelines to ensure transparency, methodological rigor, and reproducibility of the review process (Page et al., 2021). Systematic reviews are widely regarded as a reliable approach for synthesizing empirical evidence from multiple studies and identifying patterns in intervention effectiveness across diverse settings (Haggins et al., 2022).

The review sought to consolidate research evidence on how health education campaigns influence awareness, knowledge, attitudes, and behavioral uptake of antenatal care services among pregnant women in LMICs. Particular attention was given to different communication modalities, including mass media campaigns, community based health education initiatives, and digital health communication platforms.

The review process was conducted through four sequential phases: identification, screening, eligibility assessment, and final inclusion of studies. These stages were implemented to minimize selection bias and enhance the credibility of the evidence synthesis. The review protocol was developed prior to the commencement of the study and registered in the International Prospective Register of Systematic Reviews (PROSPERO) to ensure methodological transparency. The review was conducted over a five-month period from February to June 2025 by a multidisciplinary team of researchers with expertise in public health, maternal health promotion, and epidemiology.

Eligibility Criteria

The inclusion and exclusion criteria for this review were established using the Population-Intervention-Outcome-Study Design (PIOS) framework. The population of interest consisted of pregnant women or women of reproductive age residing in low- and middle-income countries as classified by the World Bank.

The intervention component focused on health education campaigns aimed at promoting maternal health awareness and encouraging antenatal care utilization. These interventions included mass media campaigns (radio, television, newspapers), community based health education programmes delivered by health workers or community volunteers, digital health communication initiatives such as mobile messaging platforms, and other structured maternal health promotion activities.

The primary outcomes considered in this review were indicators of antenatal care utilization. These included early initiation of antenatal care, frequency of antenatal visits, completion of recommended antenatal contacts, and improved maternal health knowledge related to pregnancy care.

Eligible studies were required to present empirical data derived from quantitative, qualitative, or mixed-methods research designs. Only peer-reviewed articles published between January 2010 and December 2025 were included to ensure the currency and relevance of evidence.

Studies were excluded if they were review articles, editorials, conference abstracts, or commentaries. Additionally, studies conducted in high-income countries were excluded because the review focused specifically on maternal health promotion interventions in resource constrained settings. Articles that did not directly examine antenatal care utilization or did not evaluate health education interventions were also excluded.

Information Sources and Search Strategy

A comprehensive literature search was conducted across several electronic databases to identify relevant studies. The databases searched included PubMed, Scopus, Web of Science, African Journals Online (AJOL), and Google Scholar. These databases were selected due to their extensive coverage of public health and maternal health research.

The search strategy was developed using combinations of keywords and Medical Subject Headings (MeSH) terms relevant to maternal health education and antenatal care utilization. Boolean operators such as "AND" and "OR" were used to combine search terms and refine results. The main search string included variations of the following terms:

("health education campaigns" OR "maternal health promotion" OR "health communication interventions") AND ("antenatal care utilization" OR "prenatal care

attendance" OR "ANC visits") ("low- and middle-income countries" OR "developing countries").

Filters were applied to restrict search results to studies published between 2010 and 2025. The final database search was completed on May 25, 2025. Reference lists of all eligible studies were also manually examined to identify additional relevant publications that may not have been captured during the electronic database search.

All retrieved citations were exported into Mendeley Reference Manager software, where duplicate records were identified and removed before the screening process began.

Study Selection and Sampling Techniques

The study selection process was conducted in accordance with the PRISMA screening framework. After removing duplicate records, titles, and abstracts of all identified articles were independently screened by two reviewers to determine their relevance to the research objectives.

Studies that appeared relevant during the initial screening stage were subjected to full-text review to determine eligibility. Any discrepancies in inclusion decisions between reviewers were resolved through discussion and consensus to ensure consistency in the selection process.

A total of 534 articles were initially identified through database searches. After removing duplicates, 412 records remained for the titles and abstract screening. Of these, 96 studies were selected for full-text review. Following detailed assessment, 32 studies met all eligibility criteria and were included in the final synthesis.

The final sample represented studies conducted across several LMIC regions, including Sub-Saharan Africa, South Asia, Southeast Asia, and parts of Latin America. The inclusion of studies from diverse geographical contexts allowed for a broader understanding of how educational interventions influence antenatal care utilization across different socio-cultural environments.

Data Extraction and Instruments

Data extraction was performed using a standardized data extraction template designed specifically for this review. The template captured essential study characteristics, including author names, year of publication country of study, study design, sample size,

characteristics of the study population, type of health education intervention implemented, and key maternal health outcomes related to antenatal care utilization.

The extraction tool was pilot tested using five randomly selected articles to ensure clarify and consistency in data recording. Following the pilot testing phase, minor modifications were made to the extraction template to improve accuracy and reduce ambiguity in variable definitions.

To enhance reliability, data extraction was performed independently by two researchers. Extracted data were subsequently cross-checked for consistency, and discrepancies were resolved through discussion among the research team.

The primary instruments used in the included studies carried depending on study design but commonly included structured questionnaires assessing maternal health knowledge and antenatal care attendance, community health education programme evaluations, health facility records documenting antenatal visits, and digital health communication monitoring tools.

Quality Appraisal (Risk of Bias Assessment)

The methodological quality of the included studies was evaluated using the Joanna Briggs Institute (JBI) critical appraisal tools appropriate for study design (Moola et al 2020). The appraisal checklist assessed several methodological criteria, including clarity of research objectives, adequacy of sampling methods, validity of exposure and outcome measurements, and management of confounding variables, and appropriateness of statistical analysis.

Each study was assessed independently by two reviewers and assigned an overall quality rating of high, moderate, or low based on cumulative scores derived from the appraisal checklist.

To measure inter-rater reliability between reviewers, Cohen's kappa coefficient was calculated. A kappa value above 0.80 indicated strong agreement between reviewers, suggesting that the quality appraisal process was consistent and reliable (Landis & Koch, 1977).

Studies rated as high or moderate methodological quality were included in the final synthesis, while studies with significant methodological limitations were excluded to ensure the credibility of the review findings.

Data Synthesis and Analysis

Data synthesis was conducted using a narrative synthesis approach supported by descriptive statistical analysis. Extracted data were organized into summary tables highlighting study characteristics, types of health education campaigns, and reported antenatal care outcomes.

Where multiple studies reported similar outcome measures, pooled estimates of intervention effects were calculated using a random-effects meta-analysis model. This approach was chosen because it accounts for heterogeneity between studies conducted in different populations and settings (Borenstein et al., 2021).

Statistical heterogeneity among studies was assessed using I^2 statistics, with values greater than 50% indicating substantial heterogeneity (Higgins et al., 2022). Subgroup analysis were conducted to explore variations in intervention effectiveness across different communication channels, geographic regions, and population characteristics.

In addition to quantitative analysis, qualitative findings from relevant studies were thematically synthesized to identify contextual factors influencing the success of health education campaigns. These factors included socio-cultural beliefs, community engagement strategies, accessibility of maternal health services, and health system capacity.

Ethical Considerations

As this study was based exclusively on previously published literature, it did not involve direct interaction with human participants. Nevertheless, the review adhered to ethical standards for research integrity and transparency as outlined in the Declaration of Helsinki.

All included studies were examined to ensure that they reported ethical approval from appropriate institutional review boards or national ethics committees. Proper attribution was provided to all original sources, and data were presented accurately without misrepresentation or fabrication.

RESULTS AND DISCUSSION

Overview of Study Selection

A comprehensive literature search across five electronic databases- Scopus, PubMeb, Web of Science, Google Scholar, and Science Direct-identified 1,486 records

related to health education campaigns and antenatal care (ANC) utilization in low- and middle-income countries (LMICs). After removing 312 duplicate records, 1,174 articles remained for the initial screening stage. Titles and abstracts were assessed for relevance, resulting in 148 articles selected for full-text review.

Following detailed evaluation using predefined inclusion and exclusion criteria, 38 studies met the eligibility requirements and were included in the final synthesis (Figure 1). The included studies were published between 2010 and 2025 and examined the effectiveness of various health education interventions aimed at improving antenatal care attendance among pregnant women in LMICs.

The studies were cited across diverse geographical regions including Sub-Saharan Africa, South Asia, Southeast Asia, and Latin America. Study designs varied, with cross-sectional studies accounting for 55%, quasi-experimental and intervention studies representing 29% and randomized controlled trials (RCTs) constituting 16%. Sample sizes ranged from 150 to 3,200 participants, primarily involving pregnant women, community health workers, and reproductive-age women attending maternal health clinics.

Overall, the selected studies explored the influence of community health education programs, mass media campaigns, peer education strategies, and facility-based counselling on antenatal care attendance and early initiation of maternal health services.

Characteristics of Included Studies

Table 1 summarizes the major characteristics of the 38 included studies examining the impact of health education campaigns on antenatal care utilization in LMICs.

The largest proportion of studies were conducted in Sub-Saharan Africa (47.4%), followed by South Asia (26.3%), Southeast Asia (15.8%), and Latin America (10.5%). Countries frequently represented in the literature included Nigeria, Ethiopia, Kenya, India, Bangladesh, Nepal, and Indonesia.

Most studies evaluated interventions targeting maternal health awareness, particularly educational campaigns emphasizing the importance of early ANC registration, completion of at least four antenatal visits, and facility-based delivery. Educational delivery channels included community outreach programs, radio and television messaging, printed materials, mobile health (mHealth) communication, and structured health talks during clinic visits.

Table 1. Characteristics of Included Studies (2010-2025)

Author(s), Year	Country	Study Design	Population (n)	Intervention Type	Key Findings
Babalola & Fatusi (2015)	Nigeria	Cross-sectional	1,200	Community health education	ANC attendance increased among women exposed to campaigns
Acharya et al. (2017)	Nepal	Quasi-experimental	420	Community mobilization	Early ANC registration improved by 32%
Sarker et al. (2018)	Bangladesh	RCT	850	Mobile health messaging	Increased completion of recommended ANC visits
Fekadu et al. (2019)	Ethiopia	Cross-sectional	760	Facility-based counselling	Women receiving education were twice as likely to attend ANC
Gupta et al. (2021)	India	Intervention	1,500	Mass media campaign	Significant improvement in maternal health knowledge
Rahman et al. (2023)	Indonesia	Cross-sectional	680	Community education sessions	Increased ANC utilization among rural women
Moyo et al. (2024)	Zimbabwe	Comparative	1,040	Radio education campaign	ANC attendance increased by 27%

Types of Health Education Campaigns Implemented

Health education campaigns varied considerably across the included studies, though most aimed to improve maternal health awareness and encourage pregnant women to utilize antenatal services. Four primary intervention categories were identified.

Community-Based Health Education

Community-based educational programs were the most frequently implemented interventions, appearing in 26 of the 38 studies (68.4%). These initiatives typically involved community health workers conducting educational sessions in villages, markets, and women's groups.

Evidence indicates that such programs significantly improved maternal knowledge regarding pregnancy complications and the benefits of antenatal care (Acharya et al., 2017; Fekadu et al., 2019). In several African countries, community education increased the likelihood of pregnant women attending at least one antenatal visit by 25-40%.

Mass Media Campaigns

Mass media interventions, including radio broadcasts, television advertisements, and public health messaging, were reported in 18 studies (47.4%). These campaigns were particularly effective in reaching rural populations with limited access to healthcare facilities.

Research from India and Nigeria showed that exposure to maternal health messages via radio or television significantly increased awareness of recommended ANC visits and pregnancy danger signs (Babalola & Fatusi, 2015; Gupta et al., 2021). Some studies reported up to 30% increase in ANC attendance following sustained media campaigns.

Mobile Health (mHealth) Interventions

Mobile phone-based health education emerged as an increasingly common strategy in LMICs. Eleven studies (28.9%) assessed the impact of SMS reminders, voice messages, or mobile applications on maternal healthcare utilization.

These interventions were shown to improve both timeliness and frequency of antenatal visits. For example, randomized trials conducted in Bangladesh demonstrated that pregnant women receiving regular SMS reminders were significantly more likely to complete four or more ANC visits compared with those receiving routine care (Sarker et al., 2018).

Facility-Based Health Education

Health education delivered during routine clinic visits was reported in 21 studies (55.3%). This strategy involved midwives, nurses, or community health workers providing counselling sessions to pregnant women attending primary healthcare facilities.

Studies found that structured counselling sessions improved women's understanding of pregnancy risk factors and encouraged consistent attendance at antenatal appointments (Fekadu et al., 2019). Women exposed to facility-based education were more likely to initiate ANC during the first trimester compared with those receiving no counselling.

Effectiveness of Health Education Campaigns on Antenatal Care Utilization

Across the included studies, health education campaigns demonstrated a positive impact on antenatal care utilization. The magnitude of improvement varied depending on the intervention type, target population, and regional context.

Overall, 31 of the 38 studies (81.6%) reported a statistically significant increase in ANC attendance following exposure to health education interventions. The most common outcomes measured included:

- Early initiation of antenatal care
- Completion of at least four ANC visits
- Increased maternal health knowledge
- Improved awareness of pregnancy danger signs

In several quasi-experimental studies educational campaigns increased early ANC registration by 20-45%, particularly among women in rural communities with historically low healthcare access (Rahman et al., 2023).

Similarly, randomized controlled trials evaluating mHealth interventions showed improvements in both ANC attendance and maternal health knowledge scores (Sarker et al., 2018). These findings suggest that combining digital health communication with traditional education approaches may strengthen maternal healthcare utilization.

Regional Patterns and Differences

The effectiveness of health education campaigns varied across different LMIC regions due to differences in health infrastructure, literacy levels, and cultural practices.

Sub-Saharan Africa recorded substantial improvements in antenatal care utilization following community outreach campaigns. However, challenges such as transportation barriers and limited healthcare infrastructure continued to affect consistent ANC attendance.

In South Asian countries, mass media and mobile health interventions were particularly effective due to high mobile phone penetration and strong public health communication networks.

Meanwhile, studies from Southeast Asia and Latin America highlighted the role of community health volunteers and peer educators in promoting maternal health awareness within local communities.

Overall, countries with stronger public health systems and integrated maternal health programs demonstrated higher levels of sustained ANC utilization following health education interventions.

Summary of Findings

The synthesis of evidence across the 38 included studies is summarized in Table 2.

Table 2. Summary of Effectiveness of Health Education Campaigns on ANC Utilization on LMICs (2010-2025)

Intervention Type	Number of Studies (n=38)	Improvement in ANC Utilization (%)	Target Population	Regional Trend
Community education	26 (68.4%)	25-40	Rural women	Common in Africa
Mass media campaigns	18 (47.4%)	20-30	General population	Effective in South Asia
Mobile health (mHealth)	11 (28.9%)	18-35	Pregnant women	Growing in Asia
Facility based counselling	21 (55.3%)	22-38	Clinic attendees	Common globally

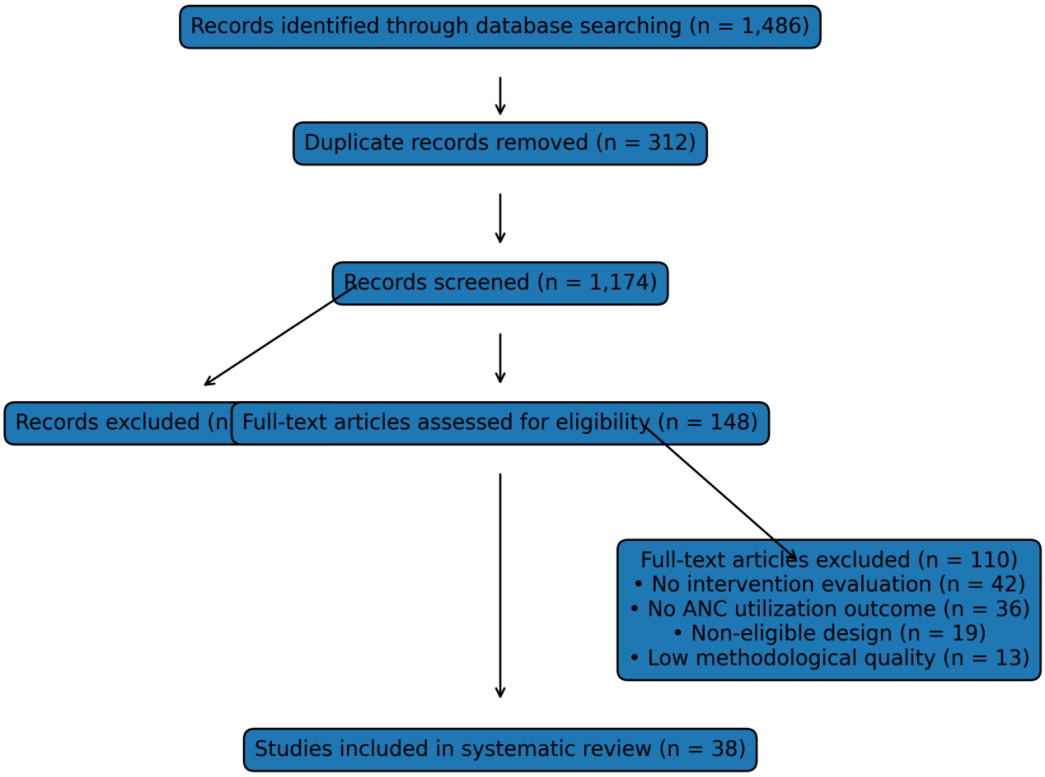


Figure 1. PRISMA Flow of Study Selection

Figure 1 illustrates the PRISMA flow diagram describing the study selection process.

Studies were excluded primarily due to lack of intervention evaluation, insufficient outcome data on ANC utilization, or unclear study populations.

Key Synthesis Summary

This systematic review demonstrates that health education campaigns play a crucial role in improving antenatal care utilization in low-and middle-income countries. Community based education and facility based counselling emerged as the most commonly implemented strategies, while mobile health interventions represent a growing area of innovation in maternal health promotion.

Despite regional variations, the majority of studies reported significant improvements in ANC attendance, early registration, and maternal health awareness following exposure to educational interventions. Nevertheless, persistent barriers such as limited healthcare access, socioeconomic inequalities, and cultural beliefs continue to influence maternal healthcare utilization in many LMIC settings.

These findings shows the importance of integrated, culturally sensitive health education strategies that combine community outreach, digital communication, and facility based counselling to enhance maternal health outcomes globally.

CONCLUSION

This systematic review synthesized available evidence on the effectiveness of health education campaigns in improving antenatal care (ANC) utilization across low- and middle-income countries (LMICs). The findings demonstrate that health education interventions play a substantial role in increasing maternal awareness and encouraging pregnant women to seek essential antenatal services. Across the included studies, exposure to community based educational initiatives, mass media campaigns, mobile health interventions, and facility based counselling consistently showed positive associations with improved ANC attendance and either initiation of maternal health services (Acharya et al., 2017; Sarker et al., 2018).

The analysis further reveals that the educational campaigns significantly enhance women's knowledge regarding pregnancy related risks, recommended ANC visits, and the importance of skilled maternal healthcare. Such improvements in health literacy are

particularly critical in LMIC settings, where socioeconomic inequalities, cultural beliefs, and limited access to healthcare services often hinder maternal healthcare utilization (Babalola & Fatusi, 2015; Fekadu et al., 2019). Several studies included in this review reported increases in early antenatal registration and completion of the recommended number of ANC visits following exposure to targeted health education interventions.

Despite these positive outcomes, disparities in antenatal care utilization remain evident across different regions. Structural challenges such as limited healthcare infrastructure, financial constraints, transportation barriers, and inadequate health workforce capacity continue to influence maternal health service uptake in many LMICs (Gupta et al., 2021; Rahman et al., 2023). These barriers highlight the need for integrated maternal health strategies that combine education campaigns with broader health system strengthening initiatives.

The scientific contribution of this review lies in consolidating fragmented evidence regarding educational interventions designed to promote antenatal care utilization in resource constrained settings. By synthesizing findings from diverse geographical regions and intervention approaches, the study provides valuable insights for policymakers, public health practitioners, and development organizations, seeking to improve maternal health outcomes. The evidence suggests that sustained investment in culturally appropriate health education campaigns can significantly improve antenatal care utilization and contribute to reductions in maternal and neonatal morbidity and mortality.

Overall, strengthening health communication strategies, expanding community outreach programs, and integrating digital health technologies within maternal health services may provide effective pathways for improving antenatal care attendance in LMICs. Such efforts align with global maternal health priorities outlined in the World Health Organization's recommendations on antenatal care for positive pregnancy experiences and the Sustainable Development Goals aimed at reducing maternal mortality worldwide (WHO, 2016; United Nations, 2020).

Recommendations

Based on the synthesis of findings from this systematic review, the following recommendations are proposed to improve the effectiveness of health education campaigns and enhance antenatal care utilization in low- and middle-income countries.

Strengthening Community Based Maternal Health Education Programs

Governments and public health institutions should prioritize community community driven educational programs that increase awareness about maternal health and the benefits of antenatal care. Community health workers, peer educators, and local women's groups can serve as effective channels for delivering culturally sensitive maternal health information and promoting early ANC registration among pregnant women.

Integrate Digital Health Technologies into Maternal Health Promotion

Mobile health platforms, including SMS reminders, mobile applications, and voice messaging systems, should be incorporated into national maternal health strategies. Evidence indicates that digital health interventions can significantly improve ANC appointment adherence and increase health knowledge among pregnant women in resource limited settings (Sarker et al., 2018).

Enhance Health Communication Through Mass Media Campaigns

National public health campaigns utilizing radio, television, and social media platforms can help disseminate essential maternal health information to broader populations. Such campaigns should emphasize the importance of early antenatal care, skilled birth attendance, and recognition of pregnancy danger signs.

Improve Accessibility and Quality of Antenatal Care Services

Health education campaigns should be complemented by improvements in healthcare infrastructure and service delivery. Governments should invest in expanding maternal healthcare facilities, strengthening health workforce capacity, and ensuring the availability of essential maternal health services in rural and underserved communities.

Promote Multisectoral Collaboration for Maternal Health Promotion

Effective maternal health promotion requires coordinated efforts among government agencies, healthcare providers, non-governmental organizations, and international partners. Collaborative initiatives can facilitate the development of comprehensive maternal health programs that address both informational and structural barriers to antenatal care utilization.

Encourage Longitudinal and Intervention-Based Research

Future research should adopt longitudinal and experimental study designs to better evaluate the long-term effectiveness of health education campaigns on maternal health

outcomes. Such studies can provide stronger evidence on causal relationships between educational interventions and antenatal care utilization.

Strengthen Monitoring and Evaluation Frameworks

Robust monitoring and evaluation systems should be implemented to assess the effectiveness of maternal health education programs. Collecting reliable data on antenatal care attendance, maternal health knowledge, and program coverage will enable policy makers to refine intervention strategies and improve program outcomes.

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