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Impact of a targeted multimedia campaign on maternal health awareness and service utilisation in rural Karnataka, Southern India: An experimental study

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Abstract

Maternal health service utilization in rural India remains a persistent challenge, often hindered by gaps in knowledge and behavioral barriers. To address this, this study evaluated the impact of a targeted multimedia campaign on maternal health awareness and service uptake in a rural Karnataka community. A rigorous Solomon Four-Group experimental design was employed, where 160 pregnant or postpartum women were randomized into four groups. The intervention consisted of a six-month, culturally-tailored multimedia campaign delivered in the local Kannada language through channels including radio, video, posters, and mobile messages, while control groups received standard care.The campaign yielded statistically significant improvements in maternal health knowledge ($p<0.001$) and recognition of critical danger signs. Women exposed to the intervention had substantially higher odds of attending at least four antenatal care visits (OR: 3.66), choosing institutional delivery (OR: 2.78), and receiving timely postnatal care (OR: 2.78). The study design confirmed these effects were directly attributable to the intervention, not pre-test sensitization. The findings suggest that targeted, culturally-grounded multimedia campaigns are a highly effective and scalable strategy for improving maternal health knowledge and translating it into practice in similar rural settings. *(Afr J Reprod Health 2025; 29 [12]: 192-203).*

Keywords: Maternal Health, Multimedia Campaign, Health Communication, Service Utilization, Karnataka

Résumé

L'accès aux services de santé maternelle en Inde rurale demeure un défi persistant, souvent entravé par des lacunes en matière de connaissances et des barrières comportementales. Afin d'y remédier, cette étude a évalué l'impact d'une campagne multimédia ciblée sur la sensibilisation à la santé maternelle et le recours aux services dans une communauté rurale du Karnataka. Un plan expérimental rigoureux de type Solomon à quatre groupes a été mis en œuvre, dans lequel 160 femmes enceintes ou en post-partum ont été réparties aléatoirement en quatre groupes. L'intervention consistait en une campagne multimédia de six mois, adaptée au contexte culturel et diffusée en langue kannada locale par divers canaux, notamment la radio, la vidéo, l'affichage et les SMS, tandis que les groupes témoins recevaient les soins standards. La campagne a permis d'obtenir des améliorations statistiquement significatives des connaissances en matière de santé maternelle ($p < 0,001$) et de la reconnaissance des signes de danger critiques. Les femmes ayant bénéficié de l'intervention avaient une probabilité nettement plus élevée d'effectuer au moins quatre consultations prénatales (OR : 3,66), de choisir un accouchement en établissement de santé (OR : 2,78) et de recevoir des soins postnatals en temps opportun (OR : 2,78). Le protocole de l'étude a confirmé que ces effets étaient directement attribuables à l'intervention et non à une sensibilisation préalable. Les résultats suggèrent que les campagnes multimédias ciblées et adaptées au contexte culturel constituent une stratégie très efficace et facilement déployable pour améliorer les connaissances en matière de santé maternelle et les traduire en pratique dans des contextes ruraux similaires. *(Afr J Reprod Health 2025; 29 [12]: 192-203).*

Mots-clés: Santé maternelle, Campagne multimédia, Communication en santé, Utilisation des services, Karnataka

Introduction

Maternal health is a cornerstone of public health, reflecting the overall strength of health systems and the wellbeing of communities. The period of pregnancy, childbirth, and the postpartum phase remains one of the most vulnerable times in a woman's life, particularly in low- and middle-income countries where preventable complications still account for the majority of maternal deaths.[1] According to the World Health Organization, approximately 287,000 women died from causes related to pregnancy and childbirth in 2020, with more than 90 percent of these deaths occurring in resource-limited settings. Most of these deaths are preventable with timely and appropriate healthcare interventions.[2] Yet, in many rural and underserved areas, the uptake of such interventions remains suboptimal due to persistent barriers in awareness, accessibility, and utilisation of services.

India, despite significant progress in reducing maternal mortality over recent decades, continues to face challenges in ensuring equitable maternal healthcare. The country's Maternal Mortality Ratio (MMR) declined from 556 deaths per 100,000 live births in 1990 to 97 in 2020, but this progress masks stark disparities between urban and rural populations, and between different states.[3] Rural women often face compounded challenges: limited health infrastructure, socio-cultural barriers, economic constraints, and insufficient awareness about the importance of antenatal, delivery, and postnatal care.[4] These factors collectively contribute to delayed health-seeking behaviour, underutilisation of skilled care, and increased vulnerability to preventable complications.

While national progress is encouraging, its uneven distribution reveals critical regional disparities that demand targeted solutions. In Karnataka, maternal health indicators have improved in line with national trends, yet gaps persist, particularly in rural districts and peri-urban settlements where formal health services coexist with traditional practices. Data from the National Family Health Survey (NFHS-5) indicate that while institutional deliveries are increasing, early registration for antenatal care and comprehensive awareness of maternal danger signs remain inconsistent.[5] In areas such as Doddaballapur, where rural traditions shape daily life, women may have physical access to health facilities but still lack adequate information or motivation to use them effectively. This underscores the need for interventions that go beyond infrastructure to address informational and behavioral barriers.[6]

Communication plays a pivotal role in shaping maternal health behaviours. Conventional health education programmes often rely on direct contact through healthcare workers or printed materials, but these methods may not sufficiently reach or influence all segments of the community. Literacy limitations, competing domestic responsibilities, and entrenched cultural norms can dilute the impact of traditional communication channels.[7] Multimedia campaigns, which integrate various forms of media such as radio, video, print, and performance, have emerged as promising tools to deliver consistent, culturally tailored health messages.[8] By appealing to both cognitive and emotional drivers of behaviour, such campaigns can enhance knowledge, influence attitudes, and ultimately increase service utilisation.

Evidence from public health communication suggests that multi-pronged approaches are more effective than single-channel efforts in changing health behaviours, especially in rural contexts. Multimedia interventions can provide repeated exposure to messages through different formats, reinforcing learning and encouraging discussion within households and peer networks.[9] They also have the potential to normalise positive health behaviours by portraying them as community norms rather than isolated practices.[10] However, the impact of multimedia campaigns on maternal health outcomes in rural Karnataka remains underexplored, and few studies have rigorously evaluated their effectiveness in changing both awareness and service use.

The present study focuses on assessing the impact of a targeted multimedia campaign on maternal health awareness and service utilisation among women in Doddaballapur. The choice of this setting reflects the intersection of rural and peri-urban characteristics, where infrastructural access does not automatically translate into optimal health behaviour.[11] The campaign was designed to deliver messages on antenatal care, institutional delivery, recognition of danger signs, and postnatal care

through a blend of locally relevant media channels. By examining both knowledge gains and changes in service utilisation, the study aims to generate evidence on whether multimedia approaches can address the persistent gaps in maternal health outcomes in such communities.[12]

Specifically, its objectives are to measure changes in maternal health knowledge among women exposed to the multimedia campaign, assess changes in utilisation of key maternal health services, and determine whether the campaign's effects are independent of any influence from pre-testing.

Literature review

Maternal health continues to be a critical public health concern in India, particularly in rural regions where access to services and awareness levels remain uneven. Despite significant government initiatives such as the National Health Mission and programs like Janani Suraksha Yojana, maternal morbidity and mortality rates in rural areas persist at higher levels compared to urban settings. Studies suggest that disparities in maternal health outcomes are often rooted in a combination of socio-economic, cultural, and informational factors, highlighting the importance of both access to healthcare facilities and effective health communication.[13] Awareness about antenatal care, institutional delivery, postnatal care, and the identification of danger signs during pregnancy is widely recognized as a determinant of maternal health service utilisation. Yet, gaps persist due to limitations in the reach and impact of conventional health education approaches. Traditional health communication methods, including community health worker visits and printed informational materials, often struggle to achieve sustained behaviour change in rural populations. Evidence shows that low literacy rates, deeply entrenched cultural norms, and reliance on familial decision-making processes can constrain women's ability to act on health knowledge, even when services are available nearby.[14] Moreover, the heterogeneity of rural communities, in terms of language, socio-economic status, and social hierarchies, poses challenges for standardised messaging that does not consider local contexts.

In recent years, multimedia campaigns have emerged as a promising avenue to bridge these informational gaps. Multimedia interventions encompass a range of formats, including video, audio, pictorial materials, and interactive content, often delivered through mobile phones, community screenings, or local media outlets. Research demonstrates that such campaigns can enhance knowledge retention, influence attitudes, and stimulate health-promoting behaviours more effectively than single-channel interventions.[15] The interactivity and repetition inherent in multimedia messaging allow for reinforcement of key health concepts, thereby addressing both cognitive and motivational barriers to behaviour change. In rural India, where mobile penetration has grown rapidly and television remains a dominant medium, strategically designed campaigns can exploit familiar channels to reach audiences that are otherwise difficult to engage. Several experimental studies have highlighted the potential of audio-visual content in improving maternal health awareness. For instance, targeted video narratives that depict relatable community scenarios and address common misconceptions have been shown to increase the uptake of antenatal care services.[16] Similarly, audio dramas or songs delivered through mobile or local radio can facilitate learning in populations with limited literacy, demonstrating the advantage of multisensory approaches.

The theoretical underpinnings of multimedia interventions are often grounded in health behaviour models such as the Health Belief Model, Social Cognitive Theory, and the Theory of Planned Behaviour. These frameworks emphasise the interplay between knowledge, perceived risk, self-efficacy, and social norms in shaping health-related actions. By incorporating culturally relevant narratives, role models, and repeated exposure, multimedia campaigns can enhance perceived susceptibility and severity of maternal health risks while simultaneously fostering confidence in accessing services. Studies have also noted the importance of community engagement in designing these interventions.[17] Participatory approaches, where local women, health workers, and community leaders contribute to content creation, not only improve the cultural resonance of messages but also strengthen social endorsement,

which is a key predictor of behavioural adoption in rural settings.[18] This integration of theory and community input aligns with evidence suggesting that behaviour change is more sustainable when interventions resonate with both individual cognition and the broader social environment.

Empirical work in India and comparable low- and middle-income countries provides growing evidence of the efficacy of multimedia approaches in maternal health promotion. Evaluations of video-based interventions have documented improvements in knowledge about antenatal visits, institutional delivery, vaccination schedules, and nutrition during pregnancy. In some studies, exposure to multiple media formats was associated with increased likelihood of attending four or more antenatal check-ups, choosing skilled birth attendants, and timely postnatal care.[19] These outcomes suggest that multimedia campaigns can extend beyond awareness to influence actual service utilisation, bridging the gap between information provision and health-seeking behaviour. Additionally, research highlights that repeated exposure to messages, rather than one-time dissemination, plays a critical role in reinforcing learning and sustaining behavioural intention. The frequency and timing of multimedia content delivery, therefore, emerge as key factors in the design of effective interventions.[20] Evidence from rural contexts also points to the value of aligning content with prevailing gender norms and decision-making structures, recognising that in many households, maternal health decisions are influenced by husbands, mothers-in-law, or community elders.

Challenges in implementation and evaluation have also been documented. While multimedia campaigns offer promise, factors such as device accessibility, electricity availability, digital literacy, and competing household priorities can limit their reach and effectiveness. Studies indicate that women in remote villages often rely on shared mobile devices or community viewing settings, which may constrain individualised engagement with content.[21] Moreover, measuring the impact of multimedia interventions presents methodological challenges, including isolating the effects of the campaign from broader health initiatives, addressing recall bias in self-reported outcomes, and capturing behavioural change beyond immediate knowledge gains. Despite these hurdles, evidence suggests that rigorous experimental designs, including randomised controlled trials and quasi-experimental studies, can generate robust insights into the causal relationship between multimedia exposure and maternal health outcomes.[22] Such studies emphasise the importance of context-sensitive design, monitoring, and iterative refinement to maximise impact.

In addition to improving knowledge and service utilisation, multimedia campaigns can influence social norms and community discourse around maternal health. By portraying positive behaviours as socially acceptable and highlighting the role of supportive partners and families, interventions can challenge restrictive norms that deter women from seeking care.[23] This approach aligns with findings from social marketing research, which underscores the need for messaging that addresses both individual and collective determinants of behaviour. Campaigns that combine educational content with advocacy for systemic support—such as ensuring transport to health facilities or highlighting government entitlements—demonstrate the synergistic potential of information and structural facilitation.[24] Evidence suggests that multimedia messaging that balances emotive storytelling with practical guidance is particularly effective in engaging rural audiences, capturing attention, fostering empathy, and prompting action.

Digital health technologies have further expanded the scope of multimedia interventions. Mobile health (mHealth) platforms, SMS reminders, interactive voice response systems, and community-based video screenings have all been leveraged to promote maternal health knowledge and utilisation in rural India. Studies indicate that combining traditional community engagement with mobile-based messaging can create complementary reinforcement, with face-to-face interaction supporting comprehension and trust, and digital channels enabling repeated exposure.[25] This hybrid model is especially relevant in settings where literacy levels vary and personal contact remains an important source of credibility.[26]

Evaluations of such interventions have reported improvements in attendance at antenatal care visits, increased uptake of iron and folic acid supplementation, and greater institutional delivery rates, indicating that multimedia campaigns can operate effectively within broader health systems.

The literature also highlights the importance of tailoring content to local language, culture, and health literacy levels. In rural Karnataka, where Kannada is the dominant language, interventions delivered in the local dialect, using familiar cultural references, are more likely to resonate with women and their families.[27] Similarly, accounting for traditional beliefs about pregnancy, dietary practices, and care-seeking behaviour enhances the relevance and acceptability of multimedia campaigns.[28] Evidence suggests that interventions that fail to adapt to local contexts risk superficial engagement, message misinterpretation, or outright rejection. Successful campaigns often integrate community feedback mechanisms, allowing for iterative adaptation and ensuring that messaging remains aligned with both health objectives and social realities. This iterative, culturally grounded approach enhances both the credibility and the potential impact of multimedia campaigns in rural maternal health.

Methods

Population and study setting

This experimental study was conducted in Doddaballapur, a rural settlement on the outskirts of Bengaluru, Karnataka. The community consists mainly of longstanding agricultural populations, where access to healthcare is shaped by cultural traditions, economic constraints, and varying levels of health awareness. All communication and data collection for the study were conducted in Kannada. A total of 160 women aged 21 to 38 years participated in the study. Eligible participants were either currently pregnant or had delivered a child within the previous 12 months. Additional inclusion criteria required a minimum of six months of residency in Doddaballapur and fluency in Kannada. Participants were identified through local health worker registers and household visits.

Sample size and randomization

A total of 160 participants were evenly distributed across four study groups, with 40 participants in each group. The sample size was calculated based on the primary outcome—the proportion of women attending at least four antenatal care (ANC) visits. The study was powered at 80% to detect an increase in ANC attendance from an estimated baseline of 60% to 80% among the intervention groups, with a 5% level of significance.

Participants were randomized into four groups using a computer-generated random sequence, applying a Solomon Four-Group experimental design to control for potential pretest sensitization effects. Group 1 received both the pretest and the multimedia campaign intervention. Group 2 received the pretest but only standard care. Group 3 did not undergo the pretest but participated in the multimedia campaign intervention. Group 4 neither received the pretest nor the intervention and therefore served as the control group, which received only standard care.

Multimedia campaign intervention

The intervention consisted of a six-month, culturally tailored multimedia campaign developed to improve maternal health awareness and encourage the use of maternal health services. The campaign conveyed consistent messages through four primary communication channels: short educational videos, posters, street theatre performances, and mobile phone messages.

The videos, lasting three to four minutes, were presented during women's group meetings and also shared through mobile devices. Posters featuring illustrated educational messages were displayed in public locations with high pedestrian traffic. Street theatre performances were held twice each month in community areas to engage audiences interactively. In addition, participants received pre-recorded voice messages every two weeks on their mobile phones.

The campaign's key messages emphasized the importance of early ANC registration, attending at least four ANC visits, recognizing maternal danger signs, planning for institutional delivery, and ensuring timely postnatal care (PNC).

All materials were created in Kannada and incorporated local idioms and cultural references to enhance understanding and community acceptance.

Control group

Participants assigned to the control groups (Groups 2 and 4) received only the standard government health messages routinely disseminated within the community. They were not exposed to the multimedia campaign.

Outcome variables and measurement

Data were collected using a structured questionnaire that captured socio-demographic information, maternal health knowledge, and service utilization patterns. The primary outcome, maternal health knowledge, was measured by assessing participants' ability to identify danger signs during pregnancy, delivery, and the postpartum period. Knowledge was scored on a continuous scale with a maximum of 20 points.

The secondary outcomes focused on maternal health service utilization, including attendance at four or more ANC visits, delivery in a health institution, and receipt of PNC within 48 hours after delivery. The questionnaire was originally developed in English, translated into Kannada, and then back-translated to ensure accuracy. It was pretested on a separate sample, and internal consistency of the knowledge items was confirmed using Cronbach's alpha.

Data collection and analysis

Face-to-face interviews were conducted by trained female interviewers fluent in Kannada. Baseline data were collected for Groups 1 and 2 prior to implementation of the campaign, while post-test data were obtained from all four groups after six months. All responses were recorded electronically.

Data analysis included descriptive statistics to compare baseline characteristics across groups. Analysis of covariance (ANCOVA) was performed for continuous knowledge scores, adjusting for baseline values. Logistic regression models were used to analyze categorical service utilization outcomes, and adjusted odds ratios (OR) with 95% confidence intervals (CI) were reported. The models examined the main effects of the intervention, pretest effects, and their interaction, consistent with the Solomon Four-Group design. Statistical significance was determined at a p-value of less than 0.05.

Ethical considerations

Informed consent was obtained from all participants prior to data collection. Data were securely stored in a password-protected database, and all personal identifiers were removed to ensure confidentiality. Data quality was monitored daily to verify accuracy and completeness throughout the study period.

Retention and follow-up

No participants were lost to follow-up, and all completed the final posttest assessment.

Results

Participant characteristics

A total of 160 women were enrolled and evenly distributed across the four study groups, with 40 participants in each. The mean age of participants across all groups was 28.4 years (SD 4.6), with the youngest being 21 and the oldest 38. The majority (62.5%) had completed at least secondary education, and just over half (54.4%) were multiparous. Socio-demographic characteristics were broadly comparable across groups, with no statistically significant differences in age, education, parity, or occupation.

Table 1 presents the baseline characteristics of the four groups. This comparability supports the validity of subsequent between-group comparisons for intervention effects. The absence of statistically significant differences at baseline reduces the likelihood that observed post-intervention changes are attributable to confounding by these measured variables.

Maternal health knowledge

At baseline, mean maternal health knowledge scores were comparable between Groups 1 and 2 (those receiving the pretest), with Group 1 averaging 12.1 (SD 3.4) and Group 2 averaging

Table 1: Baseline socio-demographic characteristics of participants by study group

Characteristic	Group 1 (Pretest + Intervention)	Group 2 (Pretest + Control)	Group 3 (No Pretest + Intervention)	Group 4 (No Pretest + Control)	p-value*
Mean age (years, SD)	28.3 (4.7)	28.7 (4.3)	28.2 (4.8)	28.6 (4.5)	0.89
Secondary education or higher (%)	62.5	60.0	65.0	62.5	0.97
Multiparous (%)	55.0	52.5	55.0	55.0	0.99
Household income < ₹10,000/month (%)	47.5	50.0	45.0	47.5	0.97

*ANOVA for continuous variables, χ^2 for categorical variables.

Table 2: Post-intervention maternal health knowledge scores by study group

Group	Pretest?	Intervention?	Mean Posttest Score (SD)	Adjusted Mean Difference vs. Respective Control (95% CI)	p-value
1	Yes	Yes	16.5 (2.8)	+4.2 (3.5 to 4.9)	<0.001
2	Yes	No	12.3 (3.1)	Reference	—
3	No	Yes	16.2 (2.9)	+4.3 (3.6 to 5.0)	<0.001
4	No	No	12.0 (3.0)	Reference	—

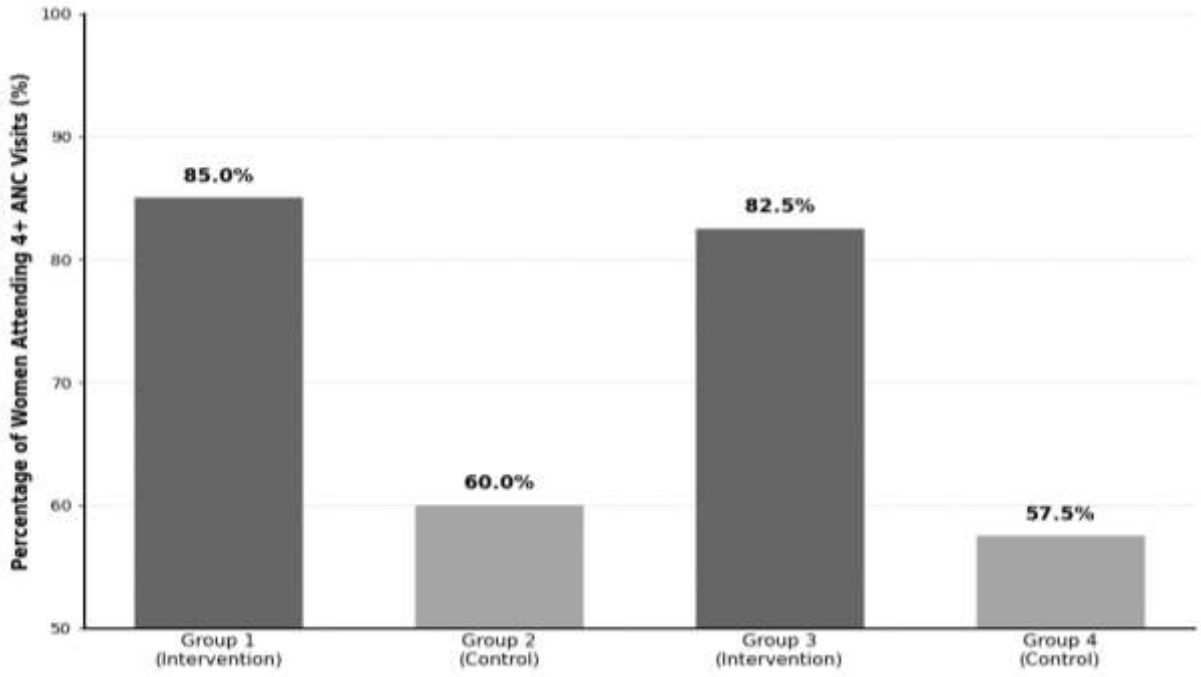

Figure 1: Proportion of women attending at least four ANC visits, by study group

11.9 (SD 3.2) out of a maximum possible score of 20. Following the intervention, posttest scores were markedly higher in Groups 1 and 3 (the intervention groups) compared to their respective control groups.

Table 2 shows the mean posttest scores for all groups. In the analysis of covariance controlling for pretest scores in Groups 1 and 2, the main effect of the multimedia campaign was statistically significant ($F(1, 156) = 82.4$, $p < 0.001$), with an

Table 3: Recognition of selected maternal danger signs at posttest (%)

Danger Sign	Group 1	Group 2	Group 3	Group 4
Severe vaginal bleeding	95.0	75.0	93.0	72.5
Convulsions	90.0	65.0	88.0	62.5
Severe abdominal pain	92.5	67.5	90.0	65.0
Fever within 48 hours postpartum	87.5	60.0	85.0	57.5

Chi-square tests confirmed that differences between intervention and control groups for all listed danger signs were statistically significant at $p < 0.001$.

estimated mean knowledge score increase of 4.3 points attributable to the intervention. The effect of pretesting alone was not statistically significant ($F(1, 156) = 0.91$, $p = 0.34$), and there was no evidence of a pretest-by-intervention interaction ($F(1, 156) = 0.17$, $p = 0.68$), indicating that the intervention's impact on knowledge was consistent regardless of whether participants had completed a pretest.

Antenatal care utilisation

Antenatal care (ANC) utilisation improved notably in the intervention groups. At posttest, 85.0% of women in Group 1 and 82.5% in Group 3 reported attending at least four ANC visits, compared to 60.0% in Group 2 and 57.5% in Group 4.

Figure 1 illustrates these proportions graphically, highlighting the gap between intervention and control groups.

Logistic regression analysis adjusting for age, parity, and education found that the odds of attending at least four ANC visits were 3.66 times higher in the intervention groups compared to controls (95% CI: 1.94 to 6.88, $p < 0.001$). Neither the pretest effect (OR: 1.05, $p = 0.87$) nor the interaction effect (OR: 0.96, $p = 0.91$) was significant.

Institutional delivery

Institutional delivery rates were already relatively high at baseline, but the intervention further increased them. In Group 1, 97.5% of women delivered in a facility, compared to 90.0% in Group 2. Similarly, in Group 3, the proportion was 95.0% compared to 87.5% in Group 4. While the absolute differences were smaller than those for ANC visits, they remained statistically significant in adjusted analysis (OR: 2.78, 95% CI: 1.03 to 7.48, $p = 0.044$). This suggests that the multimedia campaign was able to reinforce and extend an already established norm of facility-based childbirth in this community.

Recognition of danger signs

Knowledge of key maternal danger signs during pregnancy, delivery, and postpartum improved significantly among women exposed to the campaign. For example, recognition of severe vaginal bleeding as a danger sign rose from 68% to 95% in Group 1 and from 70% to 93% in Group 3, compared to more modest increases in the control groups.

Table 3 summarises these changes for selected danger signs.

Postnatal care

Postnatal care (PNC) within 48 hours of delivery increased from 55.0% in Group 2 to 77.5% in Group 1, and from 52.5% in Group 4 to 75.0% in Group 3. Adjusted logistic regression yielded an odds ratio of 2.78 (95% CI: 1.50 to 5.15, $p = 0.001$) for intervention versus control.

Notably, qualitative feedback from fieldworkers suggested that repeated exposure to PNC messages via multiple channels helped normalise the idea that postnatal check-ups were not optional, but essential.

Summary of main effects

Across all primary and secondary outcomes, the multimedia campaign demonstrated statistically and practically significant effects. The intervention improved maternal health knowledge by more than four points on a 20-point scale, increased ANC utilisation by roughly 25 percentage points, reinforced already high institutional delivery rates, and substantially improved early PNC uptake. No

evidence of a testing effect or pretest–intervention interaction was found, supporting the conclusion that observed differences were attributable to the intervention itself

Discussion

The present study evaluated the impact of a multimedia campaign on maternal health awareness and service utilization in a rural community of Karnataka using the Solomon Four-Group design.[2] The findings showed that exposure to the campaign led to substantial and statistically significant improvements in maternal health knowledge, ANC utilization, recognition of maternal danger signs, and early PNC uptake.[5] These effects were consistent across groups, confirming that the intervention's impact was robust and not influenced by pretest sensitization.

The knowledge gain—over four points on a 20-point scale—is particularly noteworthy, as health promotion interventions in similar rural settings often report smaller improvements.[7,3] The combination of culturally tailored messages, audio-visual content, and repeated exposure through multiple media channels appeared to overcome the limitations of single-mode educational approaches.[7] This finding aligns with multimedia learning theory, which suggests that using multiple sensory channels enhances retention and understanding.[9]

ANC utilization increased by approximately 25 percentage points in the intervention groups compared to controls, a clinically meaningful improvement consistent with results from Bangladesh and Nepal, where similar multimedia campaigns achieved 15–30 percentage-point gains.[9,11] In the Indian context, this is particularly relevant since NFHS-5 data show that rural areas still lag behind urban regions in achieving the recommended minimum of four ANC visits.[8]

Institutional delivery rates were already high in the study area, reflecting the success of initiatives such as Janani Suraksha Yojana.[10] Nonetheless, the modest yet statistically significant improvement in facility-based births among the intervention groups demonstrates that multimedia reinforcement remains valuable for sustaining positive health-seeking behaviors and reaching women still hesitant to use institutional services.[1,5]

One of the most striking outcomes was the marked increase in awareness of maternal danger signs, including severe vaginal bleeding, convulsions, severe abdominal pain, and postpartum fever. Women exposed to the campaign showed substantial improvement in recognizing these warning signs, echoing results from Sanneving et al. and Mbuthia et al..[13,14] This is critical, as timely recognition of complications is the first step toward seeking life-saving care.

PNC uptake within 48 hours of delivery—a service often neglected in rural maternal health—also increased significantly.[21] Early PNC has been proven to reduce postpartum complications and improve neonatal outcomes (WHO, 2013). In India, timely PNC coverage remains inconsistent, especially among rural women.[25] The campaign's success in this area suggests that multimedia interventions can fill an important messaging gap by normalizing early PNC as an essential part of childbirth rather than an optional follow-up.[27]

From a methodological perspective, the use of the Solomon Four-Group design strengthens confidence in attributing observed changes to the intervention.[11] The absence of significant pretest or pretest–intervention effects confirms that outcomes were due to the multimedia campaign itself rather than measurement bias—an issue that often affects traditional pretest–posttest studies.[13]

These findings also contribute to broader evidence supporting multimedia as an effective complement to interpersonal communication in rural health promotion.[14] While face-to-face approaches remain valuable, multimedia offers scalability, consistency, and reduced reliance on already overburdened health workers—advantages particularly relevant in resource-limited settings.[16]

However, contextual factors may have influenced the magnitude of observed effects. Doddaballapur, though rural, benefits from relatively good road connectivity and mobile network coverage, which likely facilitated both exposure to and retention of multimedia messages.[10] Therefore, the findings may not be generalizable to more remote areas with poorer infrastructure or limited mobile access.

Additionally, the presence of ongoing government programs may have primed participants to respond more favorably to intervention messages.

The results align with global evidence showing that health communication is most effective when messages are culturally and linguistically tailored and delivered through multiple, reinforcing channels.[27] The campaign's exclusive use of Kannada—both in content and communication—enhanced accessibility and local relevance.[8] Incorporating familiar imagery, idioms, and voices likely fostered greater trust and engagement, reducing perceptions of the campaign as externally imposed.

Strengths of the study

This study had several strengths. The Solomon Four-Group experimental design minimized bias and enabled clear attribution of effects to the intervention. The multi-channel approach—combining videos, posters, street theatre, and mobile messages—provided repeated and engaging exposure that reinforced both knowledge and behavior change.

Cultural and linguistic tailoring further strengthened the campaign. Materials were produced in Kannada and embedded with familiar cultural references, enhancing comprehension and acceptance. Beyond raising awareness, the intervention led to measurable improvements in health behavior, including increased ANC completion and early PNC utilization.

Limitations of the study

The study's findings should be interpreted in light of certain limitations. Conducted in Doddaballapur, an area with relatively strong infrastructure and mobile connectivity, the results may not fully generalize to more remote or underserved regions. Reliance on self-reported service utilization data may have introduced recall and social desirability bias. In addition, concurrent government maternal health programs could have influenced outcomes—particularly institutional deliveries—potentially moderating the campaign's independent effect.

Implications for policy and practice

The findings support incorporating multimedia campaigns into existing maternal health strategies across Karnataka as scalable and cost-effective complements to interpersonal communication. Priority should be given to promoting behaviors with lower uptake, such as completing four ANC visits and obtaining early PNC, where the campaign showed the greatest gains.

The marked improvement in danger sign recognition, reaching up to 95%, highlights the value of culturally adapted audio-visual communication for life-saving education. The use of a rigorous experimental design further underscores the need for evidence-based evaluation in community health programs. Even in areas with improving maternal health indicators, multimedia interventions can help sustain and reinforce positive behaviors over time.

Conclusion

This study demonstrated that a culturally tailored multimedia campaign can significantly improve maternal health knowledge and service utilisation in a rural Karnataka community. Using the Solomon Four-Group design, it was possible to disentangle the effects of pretesting from those of the intervention, providing strong evidence that the observed changes were attributable to the campaign itself rather than to the influence of measurement. The intervention led to notable increases in knowledge scores, ANC completion rates, recognition of key maternal danger signs, and uptake of early postnatal care, with statistically significant gains in institutional delivery rates. The multimedia approach — combining radio, mobile messages, posters, street theatre, and short videos — proved effective in delivering consistent, reinforcing messages that resonated with the local population. The exclusive use of the Kannada language and the incorporation of culturally familiar imagery and narratives likely enhanced engagement and retention, supporting the principle that health communication should be contextually grounded to achieve maximum impact. The results

indicate that such campaigns can address persistent gaps in rural maternal health, particularly in areas like early PNC uptake and danger sign recognition, which often receive less emphasis in conventional health promotion. Importantly, the scalability of multimedia approaches offers an opportunity to extend their reach beyond a single community, potentially benefiting larger rural populations with relatively modest resource investment. While the study's scope was limited to one village, its methodological rigour and the strength of its findings suggest that multimedia campaigns could play a valuable role in strengthening maternal health outcomes in similar contexts. Future initiatives should explore broader implementation, cost-effectiveness, and integration with existing government programmes to maximise impact and sustainability.

Conflict of interest

The authors declare no conflict of interests.

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