Journal of Health, Population and Nutrition

RESEARCH

Open Access

Effectiveness of a community health worker-led education intervention on knowledge, attitude, and antenatal care attendance among pregnant women in Eastern Uganda

Seungwon Lee[1,2], Samuel Kasibante[2,3], Adam Eminai[2], Solomon Wani[4], Didan Jacob Opii[5], Lisa D. Levine[6] and Andrew Marvin Kanyike[2,7,8*]

Abstract

Background Uganda experiences high maternal mortality ratios, with suboptimal utilization of maternal health services like antenatal care (ANC), especially in rural areas. Community Health Workers (CHWs), known as Village Health Teams (VHTs), have shown the potential to enhance maternal and child health (MCH) outcomes in Uganda by educating pregnant women in the community. However, their training models need to be refined to boost their performance.

Objective We evaluated the effectiveness of a contextually tailored educational intervention delivered by VHTs on the knowledge, attitudes, and antenatal care attendance of pregnant women in Eastern Uganda.

Methods We performed a quasi-experimental study using a pre-post-intervention evaluation conducted over six months in Eastern Uganda. We included pregnant women in their first trimester who consented to participate and excluded those in later trimesters. We performed multistage sampling with villages randomly selected and participants enrolled by trained VHTs. The VHTs were trained using a Maternal Newborn Child Health curriculum developed by a multidisciplinary team of healthcare professionals. The VHTs delivered educational sessions to the participants during home visits throughout their pregnancy. Data was collected on pregnant women's knowledge, attitudes, and antenatal care attendance before and after the intervention. A score of ≥ 75% was considered sufficient knowledge. The Chi-square test was used to test the difference in the proportional change in knowledge and attitude of pregnant women. A paired two-sample t-test assessed changes in ANC attendance pre- and post-intervention. A $p < 0.05$ was considered statistically significant.

Results 228 participants were included, with a mean age of 27 ± 5.90 years and gravidity of 2.92 ± 1.47. There was a 60.7% increase in the proportion of participants with sufficient MCH knowledge after the intervention (19.6–80.3%, $p < 0.001$). Attitudes toward healthy MCH behaviors also improved. The proportion agreeing that attending eight or more ANC visits is crucial increased by 10.6% (88.1–98.7%, $p < 0.001$). Recognition of health facilities as the best place

*Correspondence:
Andrew Marvin Kanyike
andrewmarvinkanyike@gmail.com

Full list of author information is available at the end of the article

for ANC increased by 9.7% (89.9–99.6%, $p < 0.001$). The average number of ANC visits significantly increased from 1.22 to 6.38 ($p < 0.001$).

Conclusion Contextually tailored education delivered by trained VHTs significantly improved maternal health knowledge, attitudes, and ANC attendance among pregnant women in rural Uganda.

Keywords Community health workers, Maternal and child health, Village health team, Education curriculum, And antenatal care

Background

The Sustainable Development Goals aim to decrease the worldwide maternal mortality ratio (MMR) to less than 70 per 100,000 live births. Despite Uganda's significant improvement in reducing MMR from 336 in 2016 to 189 per 100,000 live births in 2022, it still has one of the highest MMRs in the world [1]. The case is worse for Eastern Uganda, which records very high mortality rates of 390 deaths per 100,000 live births despite numerous interventions to reduce it [2]. The impact of maternal death extends beyond the loss of life with long-lasting effects, particularly on the deceased mother's young children. Studies have shown that maternal death often leads to more significant nutrition deficits and higher school dropout rates for children due to increased household labor and family fragmentation [3].

Uganda's Ministry of Health has implemented several measures to reduce maternal and child mortality rates, including providing care guidelines for mothers during pregnancy, promoting skilled birth attendance, educating mothers during hospital visits, and encouraging antenatal care attendance [4]. Although the uptake of maternity services has improved over the past decade, it is not optimal [5]. According to the 2016 Uganda Demographic and Health Survey report, about 35% of mothers are still not attended to by skilled health personnel during delivery, and they do not receive postnatal care within two days of childbirth [6]. Furthermore, the first antenatal care (ANC) attendance rate was 95%. However, only 60% of women make at least four of the recommended eight ANC contacts, with only 29% having their first visit during the first trimester. A meta-analysis of 12 studies found that newborns of women who attended at least one ANC visit with a skilled provider had a 39% lower risk of neonatal death compared to those with no ANC (pooled risk ratio ~ 0.61, 95% confidence interval 0.43–0.86) [7].

Communities should be engaged at the heart of efforts to improve maternal and child health (MCH) outcomes [8]. Community Health Workers (CHWs) provide essential MCH care at the household and community levels, reduce healthcare inequalities, and offer education and curative services. They also liaise between the community, skilled workers, and facility-based services [9, 10]. In Uganda, the Ministry of Health established CHWs called Village Health Teams (VHTs) in 2001 as the first point of contact between the community and formal healthcare providers. Since their inception, VHTs have significantly contributed to maternal and child health outcomes and helped reduce the incidence of malaria, HIV, and tuberculosis [11]. VHTs visit homes to educate and sensitize community members, but lack of training and systemic management hinders their effectiveness, especially on MCH topics [12]. Follow-up with pregnant and postnatal women is done by most active VHTs in Uganda, but the impact of MCH education at the village level remains underexplored.

A few previous studies have implemented interventions that demonstrated the utility of VHTs in improving MCH outcomes in Uganda [13, 14]. However, there is a notable need to improve the training models of the VHTs for better performance [15]. Thus, this study utilized a consultatively developed and contextually tailored curriculum enhanced with visual components for training VHTs. We examined the effectiveness of the VHT-led MCH education program using the curriculum designed to assess the knowledge, attitudes, and ANC attendance practices of pregnant women in Bugembe town council, Eastern Uganda. We hypothesized that the MCH education pilot program would effectively enhance knowledge levels, increase attitudes toward healthy MCH behavior, and improve ANC attendance among pregnant women.

Methods

Study design

This was a single-group quasi-experimental study with a pre-post intervention evaluation method utilizing quantitative techniques. It followed a six-month intervention conducted from August 2022 to January 2023.

Study setting

The study was conducted in Bugembe, Jinja district in Uganda. Bugembe is one of the 5 Parishes in Mafubira Sub County in Jinja District. Bugembe Parish has a town Council called Bugembe Town Council, located along the Jinja-Iganga highway, about 5 km from Jinja town and 77 km northeast of Uganda's capital city, Kampala. Bugembe Parish was conveniently selected because it is highly populated and easily accessible along Jinja-Tororo road. Bugembe Parish Consists of 7 villages with an estimated population of 45,600 people. The most prevalent

economic activity in Bugembe is trading in various small-scale businesses, such as grocery stores. Bugembe Health Center IV mainly serves it.

Study population

We included pregnant women in the first three months of pregnancy (first trimester) who were permanent residents of Bugembe Town Council, willing to stay within the study area until at least one week after birth and consented to participate. We excluded mothers in the third trimester and those unwilling to consent to participate in the study.

Sample size determination

The sample size was determined using the Kish-Leslie formula: $Z^2p(1-p)/\ d^2$. The prevalence of knowledge of MCH was estimated at 0.19 from a study that reported the prevalence of knowledge of 3 or more key obstetric danger signs during three periods (pregnancy, delivery, and postpartum) among 19% of women in rural Uganda [16]. Taking the standard deviation at 95% Confidence Interval (1.960) and the precision of the estimate of 5%, the calculated sample size was 236.489. We then used the modified Kish and Leslie equation to calculate the available sample size: N/1+(N-1)/K, where K is the estimated overall study population. In 2020, Uganda's crude birth rate was 36.67 births per thousand population [17]. Bugembe had a population of 45,600 in 2020 [18]. The number of pregnant women would be approximately 3. 36.67 / 1000 × 45,600 = 1672.15. Therefore, K is 1672. The calculated sample size was 207. To cater for non-respondents, 10% of the sample size was added. The final sample size was 207 + 21 = 228 participants.

Sampling criteria

Multistage sampling was employed. At the parish level, Bugembe has 15 villages, of which five villages were randomly selected using the fish bowel technique. Within the selected villages, pregnant women were identified and enrolled by the Village Health Teams. Equal proportions of participants from the total sample were enrolled from each village.

Study intervention

Each village in Bugembe has three designated VHTs. All 15 VHTs of the five selected villages were included in the study. Their communities select the VHTs through a process facilitated by local councils. The selection criteria emphasize that VHTs should be exemplary, trustworthy, and respected within their communities. They should also be able to fluently read and write in their local language, facilitating effective communication and participation in training programs [19].

The VHTs were enrolled and trained through a four-day workshop, three days focusing on using a Maternal Newborn Child Health (MNCH) curriculum developed by a multidisciplinary team of health professionals, as described below. The study data collection tool and procedures were discussed on the last day. The trained VHTs identified and enrolled eligible participants from their villages following the study sampling procedures described above. They administered a semi-structured questionnaire pre-intervention, followed up with these participants to teach them about MCH services using information from the curriculum for six months, and then administered the same questionnaire immediately post-intervention.

Development of the training curriculum

The MNCH Curriculum was developed by Communities for Childbirth International (CCI) in collaboration with a diverse team of healthcare professionals, including midwives, nurses, obstetricians, and public health experts, alongside input from education and social work specialists. Developed over six months before the intervention, this curriculum includes essential MNCH topics, such as antenatal care, birth preparedness, and danger signs, informed by research into prevalent knowledge gaps among pregnant and postnatal women in sub-Saharan Africa. It also draws upon accredited international guidelines, notably those established by the World Health Organization (WHO), ensuring alignment with the latest recommendations, such as updated recommendations on antenatal care frequency. The curriculum was enriched with visual components to enhance knowledge acquisition and retention, as shown from the selected curriculum pages in Fig. 1.

Data collection tool

The data collection tool was developed by reviewing relevant literature from different studies. The formulated questionnaire was pretested and validated in our local context for validity and reliability. It consisted of 52 questions aggregated into five sections. Section one had seven questions describing the different sociodemographic characteristics of participants, such as age, education level, occupation, and monthly income. Section two collected data on obstetric history with five close-ended questions. Section three had 15 questions assessing participants' knowledge of MCH aspects. There were 11 multiple choice questions with one most correct answer. Four questions were open-ended to allow participants to spontaneously mention key information (e.g., danger signs in pregnancy, childbirth, postpartum, and for newborns). The interviewer used pre-validated checklists of correct responses to tick off any mentioned items, assigning a score of "1" for each correct response. The

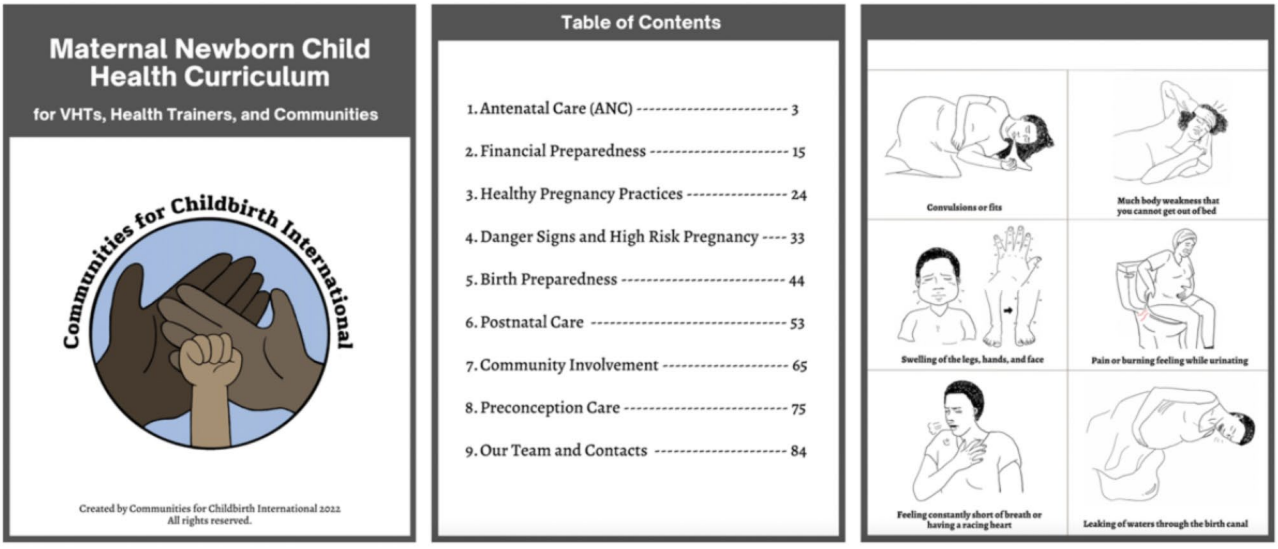

Fig. 1 Sample pages of CCI's MNCH curriculum

data generated were analyzed quantitatively. Section four focused on maternal attitude towards MCH aspects with nine multiple choice questions answered on a 5-point Likert scale from strongly agree to strongly disagree. The last section assessed participants' ANC attendance, determining the number of times they had attended ANC.

Data analysis

All completed questionnaires were double-entered using a designed Kobo Toolbox form (https://www.kobotoolbox.org/) to ensure consistency. Data was then exported into Microsoft Excel 365 for cleaning and coding. The cleaned data was exported to Stata (StataCorp) version 15 for analysis. The pre-and post-ANC training intervention analysis strategy was adopted. Continuous variables were summarized using means and standard deviations for normally distributed data. Pre- and post-ANC training intervention categorical variables were summarized using frequencies and proportions. Knowledge was derived as a score depending on how many common ANC questions participants answered correctly. Participants who scored 75% and above were categorized as having sufficient knowledge of ANC, and those who scored below 75% were categorized as having insufficient knowledge. The Chi-square test was done to test the difference in the proportional change in knowledge and attitude of pregnant women's pre- and post-intervention samples. A paired two-sample t-test was done to assess changes in the number of ANC attendances pre- and post-intervention. A $p < 0.05$ was considered statistically significant.

Results

Sociodemographic characteristics of participants

A total of 228 mothers were recruited into the study, with the same group participating in both pre-intervention and post-intervention surveys. The average age of the respondents was 27.28 (± 5.90) years; the youngest was 15 years, and the oldest was 47 years. Most of the participants were married 192 (84.21%), were Basoga by tribe 159 (69.74%), and had a monthly household income less than 100,000 (USD 27) Ugandan shillings 165 (72.37%). The majority of participants had completed secondary education 110 (48.25%), followed by primary education 68 (29.82%), with a smaller proportion reporting to have completed tertiary/university education 26 (11.40%). The occupations of participants were uniformly distributed as 87 (38.16%) were engaged in informal employment, 81 (35.53%) were in formal employment, and 57 (25.0%) were unemployed – Table 1.

Reproductive characteristics of participants

All respondents (100%) reported to have ever been pregnant, with the average number of pregnancies reported as 2.92 (± 1.47). The minimum number of pregnancies reported was 1, while the maximum was 9. Similarly, the average number of previous births reported by the participants was 1.84 (± 1.46), with observations ranging from 0 to 8 births. Of these total births, the average number of hospital deliveries was 1.78 (± 1.35), with observations ranging from 0 to 6. The prevalence of unplanned pregnancies among participants was 23.68%.

Table 1 Sociodemographic characteristics of participants ($N = 228$)

Variable	Frequency	Percentage
Age Mean (± SD)	27.28 (± 5.90)	
Education level		
None	24	10.53
Primary	68	29.82
Secondary	110	48.25
Tertiary/university/diploma	26	11.40
Marital status		
Single	20	8.77
Married or co-habiting	192	84.21
Divorced or separated	14	6.14
Widowed	2	0.88
Occupation		
Formal employment	81	35.53
Informal employment	87	38.16
Unemployed	57	25.0
Others	3	1.32
Religion		
Muslim	87	38.16
Catholic	53	23.25
Anglican	82	35.96
Others	6	2.63
Tribe		
Basoga	159	69.74
Baganda	24	10.53
Banyankole	7	3.07
Other tribes ($n < 5$)	38	16.67
Household income (Ugx)		
Less than 100,000	165	72.37
100,000–500,000	56	24.56
500,000–1,000,000	7	3.07
Above 1,000,000	0	0.00

Table 2 Changes in knowledge of maternal and child health care among mothers after the intervention

Variable	Pre-intervention	Post-intervention	χ2	*p*-Value
Knowledge Level				
Insufficient knowledge	182(82.0%)	40 (18.0%)	176	0.001*
Sufficient knowledge	46(19.6%)	188(80.3%)		
Aware of danger signs during pregnancy				
Aware	198(86.4%)	216 (94.7%)	8.5	0.004*
Not aware	30 (13.1%)	12 (5.3%)		
Aware of danger signs during childbirth				
Aware	159(69.7%)	208(91.2%)	40	0.001*
Now aware	43(18.8%)	20(8.8%)		
Others specify	26 (11.4)	0 (0%)		
Aware of danger signs after childbirth				
Aware	172(75.4%)	208(91.2%)	25	0.001*
Now aware	42 (18.4%)	20 (8.7%)		
Others specify	14(6.1%)	0 (0%)		
Danger signs that should make the mother take the child to a health facility				
Aware	180(79.6%)	211(92.5%)	15.8	0.001*
Not aware	46(20.3%)	17(7.4%)		

*Significant at $p < 0.05$

Effect of the intervention on knowledge, attitude, and ANC attendance of participants

The proportion of pregnant women with sufficient knowledge significantly increased following the intervention, rising from 19.6% at baseline to 80.3% post-intervention ($p = 0.001$). Furthermore, the women were significantly more aware of danger signs during pregnancy ($p = 0.004$), during childbirth ($p = 0.001$), and after childbirth ($p = 0.001$). They were also more aware of danger signs that should make a mother take a newborn child to the health facility ($p = 0.001$) – Table 2.

The participants' attitudes towards MCH improved after the intervention compared to before. A significant proportion of mothers agreed that attending ANC is good for a healthy pregnancy and child ($p = 0.025$). A significant change was also observed for those who agree that attending eight or more ANC visits is important ($p = 0.001$), that the best place for ANC attendance is a health facility ($p = 0.001$), willing to attend more than 8 ANC contacts for the next pregnancy ($p = 0.001$). There was also a significant reduction in participants who regarded herbs during pregnancy as safe after the training ($p = 0.001$). There was also a significant reduction in participants indicating that sometimes it is better to wait for the pain or danger signs to resolve instead of going to the hospital immediately ($p = 0.001$) – Table 3.

Regarding prenatal care practices, the average ANC attendance after the intervention significantly improved compared to the participants' previous pregnancy before the intervention (6.38 ± 2.04 versus 1.22 ± 1.49, $p < 0.001$).

Discussion

This study designed a contextually tailored MCH curriculum through multiple stakeholder engagements to be delivered by VHTs.

The study showed a significant improvement in pregnant mothers' knowledge of maternal and child health aspects. More participants were aware of danger signs during pregnancy and delivery and those of a newborn baby compared to before the intervention. This indicates that the VHTs effectively delivered the educational intervention during home visits. This finding is reinforced by several other studies from LMICs, which have found that CHWs are the primary source of MCH at the community level [20, 21]. Similar findings have also been reported in previous studies. An empowerment program for CHWs in Indonesia effectively improved pregnant women's knowledge of pregnancy health and attitude toward the

Table 3 Changes in attitudes of maternal and child health care among mothers after the intervention

Variable	Pre-intervention	Post-intervention	χ2	*p*-Value
Attending ANC is good for a healthy pregnancy and birth.				
Agree	216(94.7%)	226 (99.1)	7.9	0.025*
Disagree	7(3.0%)	1(0.4%)		
Neutral	5(2.2%)	1(0.4%)		
Attending eight or more antenatal care contacts is essential.				
Agree	201 (88.1%)	225 (98.7%)	20.5	0.001*
Disagree	17 (7.4%)	2 (0.9)		
Neutral	1 (0.4%)	1(0.4%)		
The best place for ANC attendance is a health facility.				
Agree	205(89.9%)	227(99.6%)	21.6	0.001*
Disagree	16 (7.0%)	0(0%)		
Neutral	7(3.0%)	1(0.4%)		
Willingness to attend more than 8 ANC contacts on the next pregnancy.				
Willing	195(85.5%)	225(98.7)	27.6	0.001*
Unwilling	11 (5.0)	0(0%)		
Neutral	22 (10.0%)	3(1.3%)		
Giving birth at a health facility is better than giving birth at home.				
Agree	203(89.0%)	227(99.6%)	23.5	0.001*
Disagree	19(8.3%)	1 (0.44%)		
Neutral	6(2.6%)	0(0%)		
Willing to deliver in a health facility for the current or next delivery.				
Willing	206(90.3%)	225(98.7%)	15.6	0.001*
Not willing	15 (7.0%)	2(0.8%)		
Neutral	7 (3.0%)	1(0.4%)		
It is safe to use herbs.				
Agree	91(39.9%)	22(9.6%)	91.8	0.001*
Disagree	110(48.2%)	204(89.4%)		
Neutral	27(11.8)	2(0.9%)		
Sleeping under a mosquito net while pregnant is important.				
Agree	215(94.3%)	227 (99.6%)	10.7	0.005*
Disagree	9(3.9%)	1 (0.4%)		
Neutral	4(1.7%)	0(0%)		
Sometimes, waiting for the danger signs to resolve is better than going to the hospital immediately.				
Agree	86 (37.7%)	17(7.4%)	75	0.001*
Disagree	131(57.4%)	211 (92.5%)		
Neutral	11(4.8%)	0(0%)		

*Significant at $p < 0.05$

utilization of maternal health services [22]. Additionally, a randomized controlled trial of a CHW program in Nigeria also improved the health knowledge of pregnant women. The program was even more effective in the study arm, which included the provision of safe birth kits [23]. In Kenya, a community health volunteer-led health education program improved pregnant women's knowledge and attitude toward using iron and folic acid supplementation [24]. Health education for pregnant women can lead to positive maternal and child outcomes. Scaling up contextually designed education programs to suit the local environment delivered by VHTs can potentially improve MCH in Uganda and other LMICs [25].

This study also revealed that participants' attitudes toward adopting healthy MCH practices improved significantly after the intervention. This finding aligns with a study conducted in Kenya, where CHWs improved pregnant women's attitudes toward utilizing maternal health components such as iron and folic acid supplementation [24]. The attitudes of pregnant women are influenced by the information they receive, which impacts their practices. Therefore, it is crucial to improve these aspects to promote better practices that would enhance their pregnancy outcomes.

Furthermore, after the intervention, participants had significantly more average ANC contacts than before the intervention. Although the average increase to 6 ANC contacts observed after the intervention is below the recommended eight by the World Health Organization guidelines, the noted improvement benefits the participants. The observed changes could be attributed to the improved knowledge and attitude exhibited by participants following the education by VHTs. This finding builds on evidence from an earlier study in the same Eastern region of Uganda that particularly showed improved attendance at least four ANC contacts using a VHT intervention [13]. Furthermore, an intervention utilizing the VHTs to track women who missed ANC appointments through home visits and community dialogues significantly increased ANC attendance and skilled birth attendance in Northern Uganda [14]. These findings show that CHWs have the potential to influence the adoption of antenatal care practices, which can help in early identification of complications, reducing their severity, and potentially decreasing the risk of maternal and infant mortality [26].

As CHWs are vital in improving MCH outcomes, they must be trained to be competent in health education to provide quality care through effective communication, management, and promotion [27, 28]. A previous study conducted in Uganda found that while training provided knowledge to VHTs, it was not enough to maintain it, as it significantly decreased one year after training [15]. The study recommended strengthening training modules to address this issue. This current study has improved the training process by developing a comprehensive curriculum through a consultative process enriched with visual components to enhance knowledge acquisition and retention. Although VHTs' knowledge retention assessment will be reported in another paper, we believe this curriculum can be adapted to similar settings. Pregnant women's knowledge was assessed immediately after the intervention; thus, sustained knowledge retention wasn't ascertained. Future studies can utilize this curriculum

to expand similar interventions and consider assessing long-term knowledge retention.

Strengths and limitations

This study employed a comprehensive, contextually tailored training program for VHTs, enriched with visual aids to enhance knowledge acquisition and retention. This curriculum, developed through a consultative process with diverse stakeholders, offers a model that can be adapted to similar community-based maternal health settings. However, the study has several limitations. First, the absence of a control group restricts the ability to attribute observed improvements solely to the intervention, as other unmeasured factors may have influenced the outcomes. Second, the study was conducted in a single district, which may limit the generalizability of findings to other settings with different socio-demographic or health system characteristics. Third, participant responses were self-reported and, thus, subject to recall and social desirability bias. Fourth, the intervention's effect was assessed only in the short term; long-term retention of knowledge and behavior change was not evaluated. Further studies could consider a longitudinal design to evaluate long-term outcomes. Additionally, selection bias may have arisen due to reliance on VHTs for participant recruitment. Finally, the participants' close interaction with VHTs and their awareness of being part of a study may have contributed to a Hawthorne effect, potentially influencing them to modify their behavior due to the increased attention received.

Conclusion

This study demonstrates that VHTs have the potential to improve maternal health outcomes through targeted, community-based educational interventions. The findings highlight that contextually tailored training programs can significantly improve maternal and child health knowledge and practices. These results support the expansion of similar CHW-led interventions across different regions as a viable strategy for improving antenatal care attendance and maternal health outcomes. Future research should consider incorporating a control group to strengthen causal inference and explore the scalability of such interventions across diverse geographic and cultural settings. Furthermore, implementation research is needed to assess the acceptability, feasibility, and scalability of the VHT model. As lay health workers, VHTs may face challenges, such as maintaining confidentiality and the potential for unintended alarm, which should be explored to ensure safe and effective program delivery.

Abbreviations

ANC	Antenatal Care
CCI	Communities for Childbirth International
CHW	Community Health Worker
LMIC	Low–and Middle–Income Country
MCH	Maternal Child Health
MMR	Maternal Mortality Ratio
MNCH	Maternal Newborn Child Health
SSA	Sub–Saharan Africa
VHT	Village Health Team
WHO	World Health Organization

Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s41043-025-00876-5.

Supplementary Material 1: Additional file 1: While writing this study, we followed a checklist for Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines

Acknowledgements

We thank the VHTs who participated in this research study and Musana Sophie, the Communities for ChildBirth International administrator who coordinated the VHTs.

Author contributions

All authors made substantial contributions to the manuscript. SL, AMK, and SW conceptualized the study. SL, AMK, SW, and LDL designed the study protocol. DJO, AE, and SW participated in the data collection. SK and AMK analyzed the data. AMK, SL, AE, and LDL drafted the original manuscript. All authors reviewed and approved the final manuscript.

Funding

This study was not supported by any external funding.

Data availability

No datasets were generated or analysed during the current study.

Declarations

Ethics approval and consent to participate

Ethical approval was obtained from the Mbale Regional Referral Hospital Research and Ethics Committee (MRRH-REC), approval number MRRH-2022-199. Before collecting data, written informed consent was obtained from all participants. Participation in the study was voluntary, and participants were informed of their right to withdraw at any time.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

Author details

[1]Department of Neuroscience, University of Pennsylvania, Philadelphia, PA, USA
[2]Communities for Childbirth International, Jinja, Uganda
[3]Department of Community Health, Jinja Regional Referral Hospital, Jinja, Uganda
[4]Department of Community and Public Health, Faculty of Health sciences, Busitema University, Mbale, Uganda
[5]Department of Pharmacology, Mbarara University of Science and Technology, Mbarara, Uganda
[6]Pregnancy and Perinatal Research Center, Department of Obstetrics and Gynecology, University of Pennsylvania Perelman School of Medicine, Philadelphia, PA, USA
[7]Department of Internal Medicine, Mengo Hospital, Kampala, Uganda
[8]HIV, Infectious Disease and Global Health Implementation Research Institute, Washington University in St. Louis, St. Louis, USA

Received: 10 June 2024 / Accepted: 10 April 2025
Published online: 03 July 2025

References

1. Ministry of Health. National Annual Maternal and Perinatal Death Surveillance and Response (MPDSR) Report FY 2022/2023. 2023;(September):1–89.
2. Batambuze U. Factors influencing maternal death among mothers who seek maternal health services at Iganga District-Eastern Uganda. 2018.
3. Miller S, Belizán JM. The true cost of maternal death: individual tragedy impacts family, community and nations. Reproductive Health. 2015;12(1):56.
4. Quam L, Achrekar A, Clay R. Saving mothers, giving life: a systems approach to reducing maternal and perinatal deaths in Uganda and Zambia. Global Health Sci Pract. 2019;7:S1–5.
5. Musaba MW, Ndeezi G, Barageine JK, Weeks AD, Wandabwa JN, Mukunya D, et al. Incidence and determinants of perinatal mortality among women with obstructed labour in Eastern Uganda: a prospective cohort study. Maternal Health Neonatology Perinatol. 2021;7(1):13.
6. Uganda Bureau of Statistics. Uganda Demographic and Health Survey 2016 Key Indicators Report. 2017 [cited 2022 Jul 14]. Available from: https://www.ubos.org/wp-content/uploads/publications/03_2018Uganda_DHS_2016_KIR.pdf
7. Tekelab T, Chojenta C, Smith R, Loxton D. The impact of antenatal care on neonatal mortality in sub-Saharan Africa: a systematic review and meta-analysis. PLoS ONE. 2019;14(9):e0222566.
8. Rosato M, Laverack G, Grabman LH, Tripathy P, Nair N, Mwansambo C, et al. Community participation: lessons for maternal, newborn, and child health. Lancet. 2008;372(9642):962–71.
9. Lewin S, Munabi-Babigumira S, Glenton C, Daniels K, Bosch-Capblanch X, van Wyk BE, et al. Lay health workers in primary and community health care for maternal and child health and the management of infectious diseases. Cochrane Database of Systematic Reviews; 2010.
10. Gilmore B, McAuliffe E. Effectiveness of community health workers delivering preventive interventions for maternal and child health in low- and middle-income countries: a systematic review. BMC Public Health. 2013;13(1):847.
11. Kalyango JN, Rutebemberwa E, Alfven T, Ssali S, Peterson S, Karamagi C. Performance of community health workers under integrated community case management of childhood illnesses in Eastern Uganda. Malar J. 2012;11(1):282.
12. Kimbugwe G, Mshilla M, Oluka D, Nalikka O, Kyangwa J, Zalwango S, et al. Challenges faced by village health teams (VHTs) in Amuru, Gulu and Pader districts in Northern Uganda. Open J Prev Med. 2014;04(09):740–50.
13. Wafula ST, Nalugya A, Kananura RM, Mugambe RK, Kyangwa M, Isunju JB et al. Effect of community-level intervention on antenatal care attendance: a quasi-experimental study among postpartum women in Eastern Uganda. Global Health Action. 2022;15(1).
14. Ediau M, Wanyenze RK, Machingaidze S, Otim G, Olwedo A, Iriso R, et al. Trends in antenatal care attendance and health facility delivery following community and health facility systems strengthening interventions in Northern Uganda. BMC Pregnancy Childbirth. 2013;13(1):189.
15. Namazzi G, Okuga M, Tetui M, Muhumuza Kananura R, Kakaire A, Namutamba S, et al. Working with community health workers to improve maternal and newborn health outcomes: implementation and scale-up lessons from Eastern Uganda. Global Health Action. 2017;10(sup4):1345495.
16. Kabakyenga JK, Östergren PO, Turyakira E, Pettersson KO. Knowledge of obstetric danger signs and birth preparedness practices among women in rural Uganda. Reproductive Health. 2011;8(1):33.
17. Knoema. Uganda Crude birth rate, 1950–2021.. 2021 [cited 2025 Mar 21]. Available from: https://knoema.com/atlas/Uganda/Birth-rate
18. City Population. Bugembe (Town Council, Uganda) - Population Statistics, Charts, Map and Location. 2020 [cited 2025 Mar 21]. Available from: https://www.citypopulation.de/en/uganda/eastern/admin/jinja/SC1441__bugembe/
19. Ministry of Health. Village health team strategy and operational guidelines.. 2010 [cited 2022 Sep 30]. Available from: http://library.health.go.ug/sites/default/files/resources/VHT-strategy-and-operational-guidelines.pdf
20. Lassi ZS, Haider BA, Bhutta ZA. Community-based intervention packages for reducing maternal and neonatal morbidity and mortality and improving neonatal outcomes. In: Bhutta ZA, editor. Cochrane database of systematic reviews. Chichester, UK: John Wiley & Sons, Ltd; 2010.
21. Bhutta ZA, Soofi S, Cousens S, Mohammad S, Memon ZA, Ali I, et al. Improvement of perinatal and newborn care in rural Pakistan through community-based strategies: a cluster-randomised effectiveness trial. Lancet. 2011;377(9763):403–12.
22. Dewi A, Supriyatiningsih S, Sundari S, Sugiyo D, Dewi DTK. Community health worker empowerment through collaborative models with community midwifery. Int J Public Health Sci (IJPHS). 2023;12(2):510.
23. Björkman Nyqvist M, Leight J, Sharma V. Community health educators and maternal health: experimental evidence from Northern Nigeria. J Dev Stud. 2023;59(1):73–93.
24. Kamau M, Mirie W, Kimani S, Mugoya I. Effect of community based health education on knowledge and attitude towards iron and folic acid supplementation among pregnant women in Kiambu County, Kenya: a quasi experimental study. Ghose B, editor. PLOS ONE. 2019;14(11):e0224361.
25. Herval ÁM, Oliveira DPD, Gomes VE, Vargas AMD. Health education strategies targeting maternal and child health. Medicine. 2019;98(26):e16174.
26. Kirkwood BR, Manu A, ten Asbroek AH, Soremekun S, Weobong B, Gyan T, et al. Effect of the Newhints home-visits intervention on neonatal mortality rate and care practices in Ghana: a cluster randomised controlled trial. Lancet. 2013;381(9884):2184–92.
27. World health organization. Strengthening the capacity of community health workers to deliver care for sexual, reproductive, maternal, newborn, child and adolescent health. 2015.
28. Tilahun D, Hanlon C, Araya M, Davey B, Hoekstra RA, Fekadu A. Training needs and perspectives of community health workers in relation to integrating child mental health care into primary health care in a rural setting in sub-Saharan Africa: a mixed methods study. Int J Mental Health Syst. 2017;11(1):15.

Publisher's note