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Effect of healthcare worker vs. non-health worker delivered health education on modern contraceptive uptake among women in Malawi: a quasi-experimental study

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Abstract

Background Most women receive health education from healthcare workers. However, the same information can be delivered by non-health workers such as religious and traditional leaders, and peers, among others. The effectiveness of non-health worker-delivered health education on the uptake of hormonal contraceptives, however, remains uncertain. We compared the effectiveness of health worker and non-health worker-delivered health education on the uptake of modern contraceptives among women of reproductive age in two large districts in Malawi.

Methods We designed a quasi-experimental study in two Malawian districts (Mangochi and Chikwawa). The intervention was health education delivered by either a health worker, such as a nurse (intervention group), while the comparator was health education delivered by a non-health worker, like a religious or traditional leader, peer, or the media, among others (comparison group). The main outcome was the uptake of modern contraceptives. To remove systematic differences between the two groups and achieve comparability on observed covariates, we used inverse probability of treatment weighting to emulate a randomized trial. After achieving covariate comparability, we performed a binary logistic regression to estimate the effect of health worker-delivered health education on contraceptive uptake, adjusting for the inverse probability of treatment weights. We reported the odds ratios (OR) and 95% confidence intervals (CI).

Results We studied 414 participants aged 15–49 years (median age 29 years, interquartile range 23–36). There were 316 participants in the intervention group, and 143 (45.3%) of them used modern contraceptives. The comparison group had 98 participants, and 41 (41.8%) of them used modern contraceptives ($p=0.552$). Participants in the intervention group tended to have an increased modern contraceptive uptake compared to those in the comparison group, although the difference was statistically insignificant (OR 1.45, 95% CI 0.74–2.89).

Conclusions Modern contraceptive uptake did not differ between health worker and non-health worker-delivered health education approaches in the two Malawian districts. Non-health worker-delivered health education could

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be an additional tool for reaching several women of reproductive age with modern contraceptive information. This would contribute to increasing the contraceptive prevalence rate and reducing maternal and neonatal morbidity and mortality in these districts and similar settings.

Clinical trial number Not applicable.

Keywords Community health workers, Health education, Modern contraceptive uptake, Propensity-score weighting, Quasi-experimental

Background

Contraceptives improve the well-being of families and communities by preventing high-risk pregnancies and abortions, including unplanned and unwanted pregnancies. Contraceptives equally have the potential to reduce poverty and hunger as women engage more in economic activities [1, 2]. The use of modern contraceptives has been shown to reduce maternal mortality by one-third and child mortality by 20% [3–5]. Consequently, there are strong international commitments aiming at improving the use of modern contraceptives among women, including within the Sustainable Development Goals (SDGs). In particular, SDG 3.7.1 tracks contraceptive use with efforts on reducing maternity mortality and empowering women [6]. Contraceptive use is generally high in high-income countries compared to low-income countries, with studies showing low contraceptive use in sub-Saharan Africa estimated at 28.5% in 2015 [7, 8]. The 2019–2020 Multiple Indicator Cluster Survey estimated that about 65% of married women use modern contraceptives, and among sexually active unmarried women, modern contraceptive use was around 44% [9].

Within and between regions in sub-Saharan Africa, there are variations in modern contraceptive use. For example, rural women and those in lower socioeconomic status as well as lower educational levels are less likely to use modern contraceptives compared to their counterparts in urban areas and higher socioeconomic status [10]. The low uptake of modern contraceptives among women of reproductive age in low-income countries may partly be explained by limited access to contraceptive services or information and concerns about the side effects [11–13]. Studies also show that modern contraceptive use is influenced by factors such as age, the partner's educational level, number of children (parity), religion, ethnicity, and employment status, among others [8, 14–16]. Past studies in Malawi have shown that fears and misconceptions about contraceptive use, such as infertility, as well as lack of awareness and spousal disapproval, significantly limit modern contraceptive uptake [17–19].

Increased knowledge about contraceptives, implementation of targeted interventions, and increased access to contraceptives in rural areas, among others, have been shown to increase the uptake of modern contraceptives [20].

Understanding who provides the most effective health education can significantly improve modern contraceptive uptake, but there is limited evidence. Health workers are the most reliable source of contraception information compared with other sources such as the media, family members, and religious groups. Women who receive contraceptive information from health workers are more likely to use modern contraceptives compared to those receiving the same information from other sources [11, 21–25]. Community health workers (CHWs) are another source of contraceptive information, and when integrated into the primary healthcare system, they are uniquely positioned to provide culturally relevant and accessible health education on contraceptives. Engaging community health workers can contribute to meeting the demand for modern contraceptives, addressing health inequities, and improving access to health services [26].

In Malawi, community health workers play a significant role in improving access to reproductive health services and promoting contraceptive use. Community health workers take contraceptive services closer to communities, especially in rural or underserved areas where healthcare facilities are scarce [27]. By providing education, counseling, and sometimes distributing contraceptives, community health workers reduce the barriers to contraceptive access [21, 22, 25]. Training community health workers in couple counseling has been shown to increase contraceptive uptake in urban settings in Malawi [28], and has proved effective in distributing contraceptives such as condoms, oral contraceptives, and injectables. A 2019 study showed that in areas with active community health worker involvement, contraceptive use consistently increased while fertility rates declined [22].

Other sources of contraceptive information include traditional and religious leaders, peers, and the media. Overall, women receive health education about contraceptives from healthcare workers, community health workers, and non-health workers such as religious and traditional leaders and peers, among others. However, the effectiveness of non-health worker-delivered health education on the uptake of modern hormonal contraceptives remains uncertain. We, therefore, compared the effectiveness of health worker-delivered and non-health worker-delivered health education on the uptake

of modern contraceptives among women of reproductive age (15–49 years) in two districts in Malawi. Evidence from this study contributes to providing information about the most effective approaches to improving modern contraceptive uptake in settings with low uptake in sub-Saharan Africa.

Methods and materials

Data source and setting

The data analyzed in this study are from a cross-sectional study conducted by Amref Malawi in October 2023 in Mangochi and Chikwawa districts in Malawi. The 2015-16 demographic health survey in Malawi (2017) showed that Mangochi District had a contraceptive prevalence rate of approximately 31%, significantly below the national average of 58%. In contrast, Chikwawa District had a contraceptive prevalence rate of 58.7%, suggesting a relatively higher contraceptive uptake [29]. The primary study collected data on women's perspectives on their health status and behavior, including water, sanitation, and hygiene, and that of their families. Additionally, the study explored changes and effects of development interventions in the lives of community members over the years that Amref Malawi implemented in the two districts. The data were collected for 10 days in October 2023 using a structured questionnaire (Supplementary File 1) programmed on the Kobo Toolbox electronic data collection tool administered by trained research assistants.

The sample size in the primary study was 418 participants. The study was conducted in Mangochi and Chikwawa districts in Southern Malawi, two sites that have actively implemented Amref Malawi's projects for over 10 years. The study sites provide valuable data on the effect of Amref's work around sexual, reproductive, maternal, newborn, adolescent, and child health, including water, sanitation, and hygiene interventions.

Mangochi is a fast-growing rural district with a population of 1,148,611 (approximately 603,111 females), while Chikwawa is a predominantly rural district with an estimated population of 564,684, of whom 287,794 are women [30]. The primary study used a multi-stage sampling approach to select women of reproductive age that ranged from 15 to 49 years. The two districts had a total of 11 zones: 5 from Mangochi and 6 from Chikwawa. All the health zones were purposively selected for the study. A health zone usually has several health facilities based on the population density and the geographical boundaries. The number of villages served by a health zone fluctuates. However, each village is approximated to have around 100 to 500 households. The first phase of the sampling was a random sample of two health facilities within each health zone (overall, 22 health facilities). This was followed by a random sampling of three villages in the sampled health facilities, and then the selection of households within each selected village. In Mangochi, nine households from each village were randomly selected to participate in the study. Conversely, in Chikwawa, four households from each village were randomly selected. The selection was done using the list of household records that were kept by community health workers.

We used Microsoft Excel to generate random numbers for selecting health facilities, followed by villages, and then households. This sampling strategy resulted in a total of 418 women: 274 from Mangochi and 144 from Chikwawa.

Ethical considerations

The primary study received ethical approval from the Malawi National Social Sciences and Humanities Committee (reference number P.05/20/480) and was carried out in line with the principles of the Declaration of Helsinki. For this analysis, ethical approval was waived by the ethics committee as the analysis of the already collected data posed no potential risks to the participants, and there was no direct contact with them. We ensured the privacy and confidentiality of participants by anonymizing the data. Data were analyzed and presented in aggregate form, hence posed no risk to the participants. In the primary study, participants provided written informed consent before data collection.

Study design and population

We used a quasi-experimental study design as there was no randomization of the intervention. A randomized trial is considered the gold standard for evaluating cause-effect relationships. However, in this study, randomization was impractical because the source of modern contraceptive health education was determined by how the program was designed and implemented. This phenomenon is referred to as program selection, where individuals are exposed to interventions based on programmatic decisions rather than random assignment. Given these considerations, a quasi-experimental study design was the most suitable approach. The lack of randomization introduces selection bias and confounding. Therefore, inverse probability of treatment weighting was used to remove systematic differences between the two groups and achieve comparability on observed covariates, allowing the emulation of a randomized trial. We included data for women of reproductive age, 15 to 49 years.

Study variables

Intervention

The intervention was exposure to health education from either a community health worker, healthcare providers

such as nurses, or non-healthcare providers such as traditional leaders (chiefs), religious leaders, youth leaders, peers, teachers, or through the media (radio, television, magazines, and social media handles like Facebook or X). Youth leaders delivered health education every week through Youth Centers. Traditional and religious leaders were used on a need basis. In Malawi, community health workers undergo 12 weeks of standardized training that covers both health promotion and contraceptive services. They receive the same level of training on contraception as professional healthcare providers. As part of their role, they provide various contraceptive methods, including Depo-Provera and oral contraceptive pills. Non-health workers underwent a one-day orientation on modern contraceptives, lasting approximately 4–6 h. Both health workers and non-health workers delivered basic contraceptive education, including information on the types of contraceptives available to women of reproductive age, where to access them, and the benefits of contraception.

To determine whether women received health education and identify the source of that information, they were asked to indicate whether the education was provided by a health worker or a non-health worker. The data collection process captured a comprehensive list of sources from which individuals could have received information about contraceptives. Based on this information, individuals were categorized as having received contraceptive information from either a health worker or a non-health worker. Women who reported receiving information from a community health worker or healthcare provider were considered as having received health education from a health worker, while those who reported the other sources were considered as having received it from a non-health worker. These responses were respectively coded as 1 and 0.

The intervention group consisted of women who received health education from health workers, while the comparison group comprised women who received health education from non-health workers.

Outcome variable

The primary outcome was modern contraceptive use measured as a dichotomous variable (yes vs. no). Women were asked to report if they started using modern contraceptives after receiving contraceptive information. Affirmative responses were coded as 1; otherwise, 0.

Covariates and their selection

We selected covariates based on the conditional independence assumption—variables that were associated with the outcome and those that differed systematically between the intervention and comparison groups. The covariates included age, religion, employment, educational level, parity, the partner's educational level, and marital status. We categorized age as 15–24 and 25–49 years to denote adolescent girls and young women, and mature women, respectively. Level of education was categorized as none or no formal education, primary, or post-primary (tertiary, vocational, and secondary school). Marital status was measured as married or single (not married). Parity was measured as the total number of live births a woman had at the time of the data collection and was categorized as <5 vs. ≥ 5. Antenatal care (ANC) attendance was measured as the number of ANC visits the woman had had at the most recent pregnancy and then categorized as <4 visits vs. ≥ 4. Religion was categorized as Christian and others (Muslim and traditional religion). Employment status was measured as unemployed and employed.

Statistical analysis

Baseline characteristics of women were reported using frequencies and percentages for categorical variables, while continuous variables were summarized using mean and standard deviation. These characteristics were summarized by exposure to health education status to examine potential imbalance or confounding bias. Associations between covariates and the treatment variable were assessed using Pearson's chi-square tests. Inverse probability treatment weighting was utilized to remove selection bias and confounding and to create a comparable group based on observed covariates. First, the propensity scores were computed as the probability of being exposed to the intervention given baseline characteristics, by regressing the intervention as a function of the covariates. Second, inverse probability treatment weights were computed as the inverse of the propensity score (1/propensity score) for the intervention group and (1/ [1-propensity score]) for the comparison group, creating a pseudo-population in which the covariates were equally distributed across the two groups. As such, individuals in the intervention group with a lower probability of exposure and those in the comparison group with a higher probability of exposure received larger weights, and therefore their relative influence on the comparison was increased. We checked covariate balance using an absolute standardized mean difference (SMD) and considered an SMD of less than 10% or 0.1 as indicative of balanced covariate. We then performed a binary logistic regression analysis to estimate the effect of the intervention on the outcome, adjusting for the inverse probability treatment weights. We reported the odds ratio (OR) and the 95% confidence interval (CI).

For a robustness check of the causal estimate, we computed the unadjusted association between the intervention and the outcome using a binary logistic regression analysis. We performed sensitivity analyses to assess the robustness of the causal effect to unmeasured

Table 1 Participant characteristics distributed by intervention and comparison groups

	Comparison (*n* = 98)	Intervention (*n* = 316)	Total (*n* = 414)	*P*-value
Residence				0.029
Urban	12 (12.2%)	18 (5.7%)	30 (7.2%)	
Rural	86 (87.8%)	298 (94.3%)	384 (92.8%)	
Religion				0.077
Christian	50 (51.0%)	193 (61.1%)	243 (58.7%)	
Others	48 (49.0%)	123 (38.9%)	171 (41.3%)	
Marital Status				0.408
Married	73 (74.5%)	248 (78.5%)	321 (77.5%)	
Not married	25 (25.5%)	68 (21.5%)	93 (22.5%)	
Respondent education				0.343
None	4 (4.1%)	25 (7.9%)	29 (7.0%)	
Primary	75 (76.5%)	241 (76.3%)	316 (76.3%)	
Post-primary	19 (19.4%)	50 (15.8%)	69 (16.7%)	
Parity				0.659
< 5	69 (70.4)	215 (68.0)	284 (68.6)	
≥ 5	29 (29.6)	101 (32.0)	130 (31.4)	
Employment status				< 0.001
Employed	26 (26.5%)	152 (48.1%)	178 (43.0%)	
Unemployed	72 (73.5%)	164 (51.9%)	236 (57.0%)	
Partner's educational level				0.025
Not reported	17 (17.3%)	27 (8.5%)	44 (10.6%)	
None	10 (10.2%)	18 (5.7%)	28 (6.8%)	
Primary	45 (45.9%)	169 (53.5%)	214 (51.7%)	
Post-primary	26 (26.5%)	102 (32.3%)	128 (30.9%)	
ANC visits				0.016
< 4	50 (51%)	118(37.3%	168 (40.6%)	
≥ 4	48 (49%)	198(62.7%)	246 (59.4%)	
Age in years				0.010
15–24	44 (44.9%)	97 (30.7%)	141 (34.1%)	
25–49	54 (55.1%)	219 (69.3%)	273 (65.9%)	

confounders or hidden bias—bias that was not identified or removed by the analytic approach—using Wilcoxon's signed rank test.

A very large change in the lower/upper odds bounds was needed before a change in statistical significance was interpreted as suggestive of robust findings. The statistical analyses were carried out using the R Programming Language and Statistical Software (R Version 4.4.1).

Results

Participant characteristics

Of 418 records, 414 were included in the analysis. We excluded 4 records because the women had reached menopause and did not need contraception. The median age of all the participants was 29 years (Interquartile range [IQR] 23–36). We found that 316 (76.3%) women had received health education from healthcare workers, while 98 (23.7%) had received health education from non-healthcare workers. Table 1 presents the participant characteristics grouped by the intervention and comparison groups. The participants mainly comprised Christians (58.7%), unemployed individuals (57%), and married individuals (77.5%). Nearly 84% had never been to secondary school, and about three-quarters had attended at least four ANC visits.

Covariate balance before and after the inverse probability of treatment weighting

We present covariate balance before and after the inverse probability of treatment weighting in Table 2. The results showed systematic differences between the intervention and comparison groups concerning parity, employment status, partner's level of education, age, and religion (SMD > 0.1). After inverse probability of treatment weighting, all the covariates became balanced across the intervention and comparison groups since each had an absolute SMD < 0.1, thus successfully emulating a randomized trial.

Table 2 Covariate balance before and after an inverse probability of treatment weighting

Covariates	Before inverse probability of treatment weighting			After inverse probability of treatment weighting		
	Comparison (*n* = 98)	Intervention (*n* = 316)	SMD	Comparison (*n* = 98)	Intervention (*n* = 316)	SMD
	Mean (SD)	Mean (SD)		Mean (SD)	Mean (SD)	
Parity	3.11 (2.31)	3.53 (2.15)	0.187	3.54 (2.19)	3.43 (2.18)	0.048
Employment	1.73 (0.44)	1.52 (0.50)	0.456	1.55 (0.50)	1.57 (0.50)	0.042
Partner Education	3.01 (1.13)	3.31 (0.92)	0.289	3.28 (0.98)	3.24 (0.98)	0.037
Marital Status	1.26 (0.44)	1.22 (0.41)	0.094	1.25 (0.43)	1.22 (0.42)	0.052
Age	1.55 (0.5)	1.69 (0.46)	0.295	1.67 (0.47)	1.66 (0.47)	0.031
Respondent education	2.72 (0.53)	2.68 (0.61)	0.071	2.73 (0.58)	2.69 (0.59)	0.052
Religion	1.49 (0.50)	1.39 (0.49)	0.203	1.41 (0.49)	1.41 (0.49)	0.015

Note: SD: Standard deviation; SMD: Standardized mean difference; SMD < 0.1 suggests balanced covariate

Table 3 Effect of healthcare worker vs. non-healthcare worker-delivered health education on modern contraceptive uptake

Modern contraceptive uptake	Intervention group ($n=316$)	Comparison group ($n=98$)	Propensity-score unweighted analysis	Propensity-score weighted analysis
			OR (95% CI)	OR (95% CI)
No	173 (54.7)	57 (58.2)	1	1
Yes	143 (45.3)	41 (41.8)	1.15 (0.73–1.83)	1.45 (0.74–2.89)

Effect of health worker vs. non-health worker-delivered health education on contraceptive uptake

Table 3 shows that modern contraceptive uptake was at 45% among women in the intervention group compared to 41.8% among those in the comparison group ($p=0.552$). Table 3 further presents the unadjusted and adjusted analyses results of the effect of health worker-delivered vs. non-health worker-delivered health education on contraceptive uptake.

In the unadjusted (propensity-score unweighted) analysis, modern contraceptive uptake increased by 15% in the intervention group compared to the comparison group (propensity-score unweighted OR 1.15, 95% CI 0.73–1.83). In the propensity-score weighted analysis, modern contraceptive use was 45% higher in the intervention group than the comparison group (propensity-score weighted OR 1.45, 95% CI 0.74–2.89), but the improvement was statistically insignificant. The Rosenbaum sensitivity analysis showed that the estimated causal effect was robust to hidden bias up to a gamma (Γ) value of 3.0, at which the upper bound p-value remained statistically significant ($p=0.036$). Beyond $\Gamma=3.25$, the association lost statistical significance, suggesting that only a relatively large unmeasured confounder, increasing the odds of treatment assignment by more than threefold, could explain away the observed effect (Supplementary File 2).

Discussion

This paper examined the effect of health worker-delivered health education compared to non-health worker-delivered health education on modern contraceptive uptake among women of reproductive age in two districts (Mangochi and Chikwawa) in Malawi using observational data. The findings showed no difference in contraceptive uptake between health worker and non-health worker-delivered health education, with the latter group showing a tendency to better contraceptive uptake. In other words, the findings suggest that non-health worker-delivered health education has a similar effect to that delivered by health workers in increasing modern contraceptive use among women of reproductive age in this setting. Non-health worker-delivered health education, therefore, could serve as an additional tool to promptly reach several women of reproductive age with contraceptive information. This would help to increase the coverage and use of modern contraceptives among women of reproductive age.

An Indian study that investigated the effect of health education delivered through community health workers found that women exposed to health education were 40% more likely to use modern contraceptives, although the effect was statistically insignificant [31]. This finding is similar to our findings. Kumar et al. in 2020 found that health worker outreach for contraceptive services significantly increased the intention to use contraceptives among women, although the effect of such an approach remained suboptimal [23].

In contrast, other studies that have reported on the effect of health education showed it impacts contraceptive use, regardless of whether it was delivered by health workers or not. For instance, in 2023, meta-analytic findings among women of reproductive age in Ethiopia demonstrated that interactive communication and diverse health education delivery methods significantly improve knowledge, attitude, and utilization of contraceptives [32]. A 2015 meta-analysis of data from low and middle-income countries also showed that community health worker-delivered health education is effective in improving contraceptive use [25]. Similar effectiveness was also reported in Kenya, where lay health workers delivered health talks that improved contraceptive use [33, 34]. Furthermore, a randomized trial conducted in 2008 showed that contraceptive counseling and educational leaflets, which do not need to be handed out by health workers, led to a significant increase in contraceptive uptake [35]. This is consistent with our argument around non-health worker-delivered health education serving as an additional tool for disseminating contraceptive information. A randomized trial in Nigeria showed that targeted health education delivered by health workers was effective in increasing contraceptive awareness and uptake [36].

Strengths and limitations

Our study has several strengths and some limitations to consider. The strengths include being one of the first few studies to employ causal inference methods to compare the effectiveness of health worker vs. non-health worker-delivered health education on contraceptive uptake among women of reproductive age in our setting. The design and analytic approach utilized enabled the emulation of a randomized trial by removing selection biases between the two non-randomized groups [37]. The limitations include the analysis of secondary data that had several unmeasured confounders. However, sensitivity analysis showed that the findings are robust to unmeasured confounders.

The outcome variable, modern contraceptive uptake, was assessed through self-report; hence, the possibility of social-desirability bias cannot be excluded. Although we accounted for all known sources of contraceptive information, there remains a possibility of information exchange between the two groups (health worker-delivered vs. non-health worker–delivered health education). This may have introduced contamination; however, we lack the data to assess the extent of this effect. We also combined both healthcare providers and community health workers as the intervention group. Therefore, we could not report the cause-effect estimate for either healthcare providers or community health workers alone. These limitations should be considered as one interprets the results.

Conclusions and recommendations

This study showed no difference in modern contraceptive uptake between health worker and non-health worker-delivered health education approaches in the two Malawian districts (Mangochi and Chikwawa). Therefore, our study demonstrates that non-health worker-delivered health education could serve as an additional tool for reaching several women of reproductive age with modern contraceptive information. This would contribute to increasing the contraceptive prevalence rate and reducing maternal and neonatal morbidity and mortality in these settings. We recommend the standardization of health education messages delivered by non-health workers to ensure the information is accurate and similar to that delivered by health workers. Future studies should replicate this analysis with a sufficiently larger sample size.

Abbreviations

ANC	Antenatal care
CHW	Community Health Worker
SMD	Standardized Mean Difference

Supplementary Information

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Supplementary Material 1

Supplementary Material 2

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Author contributions

TS, TM, IG, and GM conceptualized the study. TS and RV conducted data collection, TS, RV, GK conducted data analysis and TS, JI, TM, GM, IG, GK, SK, AK, RV, DM and MJG contributed to interpretation of data, read and approved the final manuscript.

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Data availability

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate

The study received ethical approval from the Malawi National Social Sciences and Humanities Committee (reference number P.05/20/480) and was carried out in line with the principles of the Declaration of Helsinki. Study participants also provided written informed consent prior to engagement in the study.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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