Impact of community health workers training and cash-incentives on tuberculosis knowledge and attitudes among community members in Akwa Ibom State, Nigeria

Christie Akwaowo,[1,2] Olugbemi Motilewa,[2] Aniema Udoh,[3] Idongesit Umoh,[3] Victory Ekpin,[1] Theresa Nde,[1,4] Emem Inem,[1] Etop Antia,[5] Victor Umoh[3]

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ABSTRACT

Background: Tuberculosis (TB) remains a public health crisis as it is the second leading cause of death from an infectious agent worldwide. Nigeria accounts for 4.5% of the global TB burden and has the 6th highest TB burden. This study evaluates the effect of community health worker (CHW) training and cash incentives on TB knowledge and attitudes among community members in rural Akwa Ibom State, Nigeria. **Methods:** A pre- and post-intervention study design was employed using an interviewer-administered structured questionnaire. The intervention involved training CHWs and providing them with cash incentives to enhance TB education outreaches and active case finding. Data was summarized using frequencies and percentages, and comparisons were made between pre- and post-intervention data using the chi-square test. Effect sizes were measured using odds ratios. Data analysis was conducted using SPSS version 28, at a 5% significance level. A total of 745 and 723 respondents participated in the pre-intervention and post-intervention surveys respectively. **Results:** Post-intervention, significant improvements in TB knowledge were observed: The proportion of respondents with good overall TB knowledge increased from 67.8% pre-intervention to 83.7% post-intervention (OR: 1.474; $p<0.0001$). There was also a significant improvement in TB health-seeking behaviours, with more respondents willing to visit a health facility if they thought they had TB (90.3% vs. 80.4%) and to advise others to do the same (81.5% vs. 16.4%). The CHW training and cash incentive program significantly improved overall TB knowledge and health-seeking behaviours among rural community members in Akwa Ibom State. **Conclusion:** These findings reiterate the importance of CHWs in TB control efforts in high-burden settings. Continuous evaluation and adaptation of such programs are recommended to sustain and further enhance their impact.

Keywords: Tuberculosis, Knowledge, Attitude, Community Health Workers, Training, Cash Incentives

Key Messages

- Health worker (CHW) training and cash incentives significantly enhanced tuberculosis (TB) knowledge and positively influenced attitudes toward TB in rural communities, demonstrating their potential for improving TB awareness and care-seeking behaviours.
- This study highlights the importance of leveraging context-specific strategies, such as CHW programs and locally trusted information channels, to enhance TB control efforts in rural settings.

INTRODUCTION

Tuberculosis (TB) remains a significant global health challenge, despite ongoing efforts to eradicate the disease. TB was declared a public health emergency by the World Health Organization (WHO) in 1993 and is currently the second leading cause of death from a single infectious agent worldwide. In 2022, there were 10.6 million cases of TB and 1.3 million deaths.[1] This airborne disease primarily affects the lungs but can also impact other parts of the body.[1]

Institute of Health Research and Development,[1] University of Uyo Teaching Hospital, Akwa Ibom, Nigeria.
Department of Community Medicine,[2] University of Uyo Teaching Hospital, Akwa Ibom, Nigeria.
Department of Internal Medicine,[3] University of Uyo Teaching Hospital, Akwa Ibom, Nigeria.
Department of Community Medicine,[4] University of Port Harcourt, Rivers State, Nigeria.
State Tuberculosis & Leprosy and Buruli Control Program,[5] Akwa Ibom State Ministry of Health, Uyo, Akwa Ibom State

***Corresponding Author:**
Victory Ekpin.
Institute of Health Research and Development, University of Uyo Teaching Hospital, Akwa Ibom, Nigeria
Email: victoryekpin98@gmail.com

TB poses a substantial threat to global health, particularly in low- and middle-income countries where access to healthcare and educational resources is limited.[1,2] The WHO African region contributed 23% of TB cases and 33% of TB deaths in 2022.[1] Beyond its direct health effects, TB has significant socioeconomic and mental health impacts on patients and their families including impoverishment, fear, social isolation, and stigma.[3–5] Nigeria is one of the countries most affected by TB, accounting for 4.5% of the global TB burden and ranking sixth among the 30 high TB-burden countries identified by the WHO.[6] Additionally, Nigeria accounts for 8% of the 4.3 million missed TB cases globally.[6] The prevalence of TB in Nigeria is exacerbated by factors such as poverty, overcrowding, malnutrition, and HIV co-infection.[7,8] Despite the availability of effective treatment, TB control in Nigeria faces numerous challenges, including inadequate healthcare infrastructure, social stigma, and limited public awareness about the disease.[9]

Akwa Ibom State, with its high HIV burden, also has a high TB burden.[10] Rural areas in particular face significant barriers to TB control, including limited access to healthcare services, low levels of education, and insufficient knowledge about TB, all of which contribute to the continued spread of the disease. Knowledge of TB and health-seeking behaviours are critical factors influencing case detection and management of the disease.[11,12] For example, in Anambra State, Nigeria, good TB knowledge improved the health-seeking behaviour of traders by almost four times.[13]

The WHO's End TB Strategy, launched as part of the United Nations Sustainable Development Goals, aims to reduce TB incidence by 90% by 2035. Achieving this ambitious goal requires prompt diagnosis, effective treatment, prevention of new infections, and prevention of progression to active disease.[1]

In many countries, the integration of Community Health Workers (CHWs) into TB detection and management has led to better outcomes. Studies have shown that enhanced training of community health workers led to better treatment and prevention outcomes. For instance, in Mozambique, a training program increased the TB case notification rate by 14.6% in the intervention group, compared to a 16.5% decrease in the control group.[14] Similarly, a training initiative in Enugu, Nigeria, doubled the number of TB presumptive cases and diagnoses three months after a health workers' training.[15] Additionally, cash incentives for health workers have been shown to boost their commitment, innovation, and accountability in HIV and TB control programs.[16–18] However, there is limited evidence regarding the impact of such incentives on improving TB knowledge and attitudes among target communities in low- and middle-income countries.

This study aims to assess the effect of training and cash incentives given to CHWs on TB knowledge and attitudes among community members in Akwa Ibom State, Nigeria. By evaluating the effectiveness of these interventions, this research seeks to inform the development of strategies that enhance TB control efforts through improved passive case-finding by improving knowledge and attitudes towards TB. The findings could provide valuable insights for public health practitioners and policymakers working to reduce the TB burden in high-risk, rural populations.

METHODS

Study setting

The study was nested within a cluster randomised controlled trial (cRCT) assessing the effect of training and cash incentives on TB case notification.[19] It was conducted in the intervention arms of the cRCT in Akwa Ibom state, Southern Nigeria. Akwa Ibom State has an estimated population of approximately 5.48 million people, comprising 31 Local Government Areas (LGAs) and three senatorial districts.[20]

Study design

A pre- and post-study design was used.

Study Population and Sampling Technique

The study population comprised rural residents of Akwa Ibom State. The parent cluster-RCT was conducted in six high-TB-burden LGAs, purposively selected from a sampling frame of 13 LGAs with the assistance of the State Tuberculosis and Leprosy Control Officer. The 13 LGAs were those without an active TB intervention at the start of the cRCT. Each LGA served as a cluster for this study, and they included Esit Eket and Uyo (Arm A which received both cash incentive and training), Ibiono Ibom and Ibesikpo (Arm B which received only training), and Nsit Ibom and Uruan (Arm C-Control). The present study focused on the intervention arms (A and B).

In each participating LGA, three primary health centres (PHCs) offering DOTS (Directly Observed Treatment, Short-course) services were selected by simple random sampling. Twelve PHCs and their catchment communities were included. Using the PHC as the starting point, one of every three houses was selected. All consenting adults (>18 years) in each household were interviewed. The sampling process was repeated post-intervention in the same communities.

Sample Size Determination

The sample size was determined using Raosoft sample size calculator for cross-sectional studies (http://www.raosoft.com/samplesize.html).
Assuming a population of over 20,000 across the four LGAs, a 95% confidence level, a 5% margin of error, and a 50% conservative estimate for TB knowledge, the required sample size was 377 per survey. Adjusting for a 10% attrition rate, the target sample size was approximately 415 participants.

Interventions

The interventions were carried out between April 2019 and March 2020 and included:

Training of CHWs
A total of 158 CHWs already working in the intervention clusters participated in a one-day, face-to-face training workshop facilitated by researchers in collaboration with the State Tuberculosis and Leprosy Control Program office.

Before the workshop, the research team and the Akwa Ibom State TB, Leprosy, and Buruli Ulcer Control Program (AKSTLBCP) State Coordinator conducted a "training of trainers' session with workshop facilitators. The facilitators were trained on the course content to ensure a shared understanding of the workshop's aims and to familiarize them with the workshop materials.

Training manuals were developed specifically for the research and distributed to participants. The contents of the training were based on the module developed for "*active TB case finding for CHWs through house-to-house search, for community-based organizations (CBOs) and CHWs*" by the National Tuberculosis and Leprosy Control Program (NTBLCP). Facilitators used both the training manuals and PowerPoint presentations developed from the manuals. They also used participatory learning methods such as role plays and peer learning to deliver the course contents. The sessions included training on basic symptoms, misconceptions diagnosis and treatment of TB, identification of presumptive TB cases, sputum collection and transportation and linking TB patients to care and treatment.

CHWs were instructed to conduct community education and awareness campaigns, identify presumptive TB cases in communities, collect sputum, and transport the sputum to the PHCs from where they were transported to designated laboratories. At the end of the training, each participant was given a container for transporting sputum, 4 sputa cups, a presumptive case referral booklet and information, education and communication (IEC) materials to be used in educating clients.

Cash incentives

The intervention Arm A (85) received cash incentives of 200 naira (USD0.78) for every presumptive case referred to the PHC for screening.

Supervisory support

Quarterly supervisory visits were conducted to monitor CHWs' activities and provide logistical and financial support for outreach activities.

Study instruments and data collection

An interviewer-administered structured questionnaire was used in this study. The questionnaire was specifically developed for this research and validated through pretesting and analysis with 30 respondents residing in the state. It collected information on the socio-demographic characteristics of respondents, knowledge, attitudes and care-seeking behaviour of respondents with regards to TB.

The fieldworkers underwent a one-day training with the data collection instruments for standardization of the interview protocol.

Outcome variables

The knowledge scale consisted of 10 questions and demonstrated good reliability with a Cronbach's alpha of 0.704. Scores greater than 5 were considered indicative of good knowledge. The attitude of respondents was assessed using 5 questions.

Data management and analysis

Data were entered into Microsoft Excel and analyzed using IBM SPSS Statistics, Version 28.0. Categorical data were summarized as frequencies and percentages, while continuous data were presented as means and standard deviations. Pearson's chi-square test was applied for categorical variables, and Student's t-test was used for continuous variables. A p-value <0.05 was considered statistically significant.

Ethical Considerations

Ethical approval was obtained from the University of Uyo Institutional Health Review Ethical Committee (UUTH/AD/S/96/VOL.XXI/253). Written informed consent was obtained from all respondents before participation. Confidentiality was maintained by anonymizing data and restricting access to research personnel only.

RESULTS

A total of 745 respondents participated in this survey before the intervention and 723 after the intervention. Pre-intervention, the participants were majorly female (51.0%), aged 31-40 years (33.0%) and had a secondary level of education (53.6%). Post-intervention, females made up 50.1% of the participants. The majority were 31-40 years old (36.4%) and had a secondary level of education (53.4%). There was strong evidence of a difference in the age and level of education distribution between the pre-intervention and post-intervention populations (Table 1).

Table 1: Socio-demographic characteristics of pre- and post-intervention respondents

Socio-demographic characteristics	Pre-Intervention	Post-Intervention	Test statistic
Age (years)			
</=30	187 (25.1)	233 (32.2)	44.298
31-40	246 (33.0)	263 (36.4)	p<0.0001
41-50	200 (26.8)	95 (13.1)	
>50	112 (15.0)	132 (18.3)	
Gender			
Male	365 (49.0)	361 (49.9)	0.129
Female	380 (51.0)	362 (50.1)	p=0.719
Level of education			
Primary	272 (36.5)	261 (36.1)	14.121
Secondary	399 (53.6)	386 (53.4)	p=0.003
Technical college	31 (4.2)	11 (1.5)	
University/Polytechnic	43 (5.8)	65 (9.0)	
Total	**745**	**723**	

Respondents' sources of information on Tuberculosis

As shown in Figure 1, the most common source of information on tuberculosis was the radio (50.5%), followed by family and friends (44.1%).

Knowledge of Tuberculosis

Pre-intervention, knowledge scores ranged from 0 to 10, with a median score of 6 [interquartile range (IQR): 4–7]. Post-intervention, scores ranged from 1 to 10, with a median score of 7 [IQR: 5–8]. The median difference of 1.0 was statistically significant ($p < 0.001$).

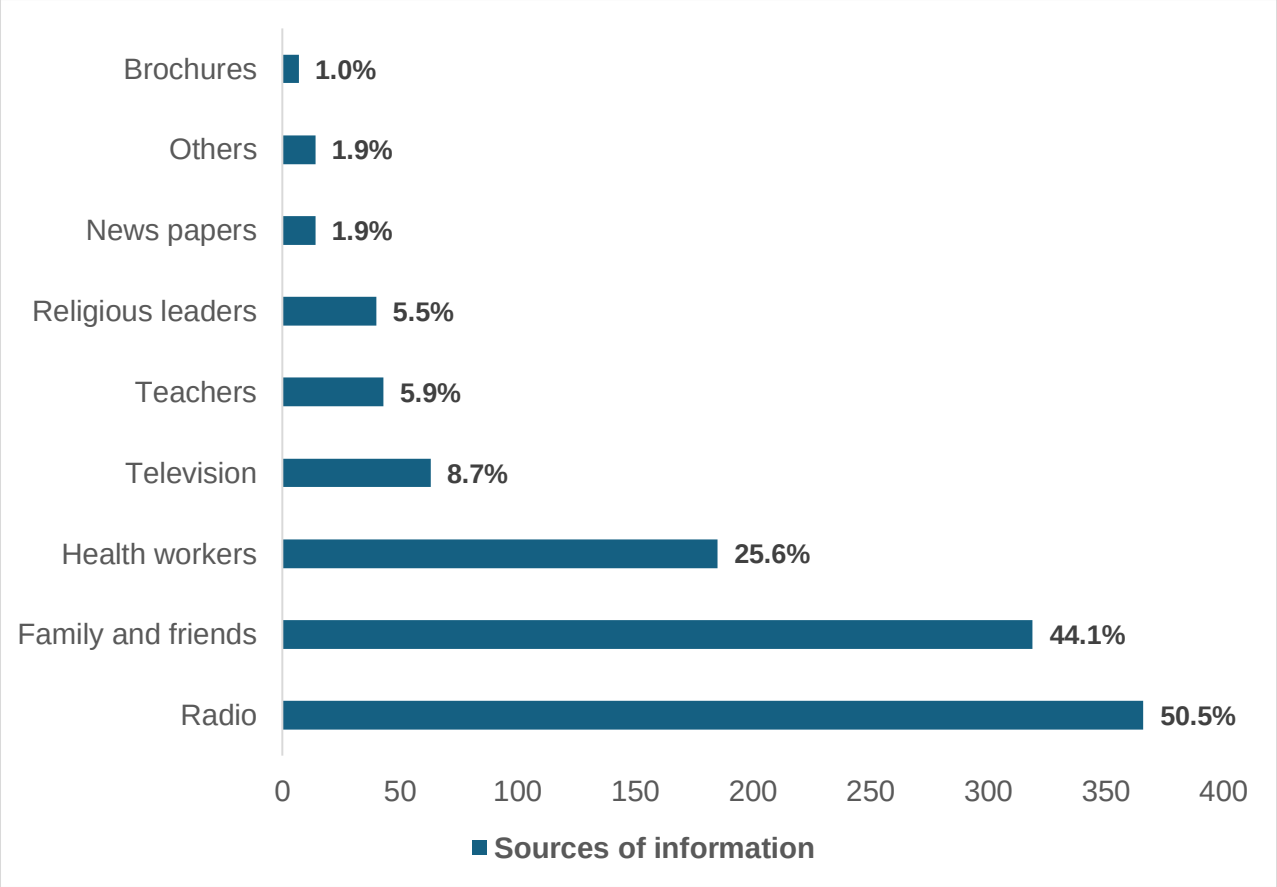

Figure 1: Sources of information on Tuberculosis pre-intervention

The proportion of participants with good knowledge increased significantly post-intervention. As shown in figure 2, pre-intervention, 505 participants (67.8%) demonstrated good knowledge, compared to 605 participants (83.7%) post-intervention. This increase was statistically significant (OR: 1.474; p < 0.0001).

Figure 2: TB knowledge pre-and post-intervention

Comparing the answers to each question pre- and post-intervention, the odds of correct responses increased for most questions. These increases were statistically significant. For instance, the knowledge of what TB is increased from 63.5% to 72.8% (OR: 1.225; p<0.0001) and understanding of TB causation rose from 31.3% to 52.6% (OR: 1.575; p< 0.0001). However, the proportion of respondents with correct knowledge of TB prevention decreased from 58.4% to 35.8% (OR: 0.639; p < 0.0001), and correct knowledge of who can be infected with TB slightly decreased from 93.2% to 89.5% (OR: 0.776; p = 0.012).

Table 2: Responses to knowledge questions pre- and post- intervention

Variables	Pre-intervention n=745	Post-intervention n=723	Odds ratio (95% CI)	Test statistic; p value
What is TB?				
Correct	473 (63.5)	526 (72.8)	1.225 (1.107 –	χ^2 = 14.479
Wrong	272 (36.5)	197 (27.2)	1.355)	P<0.0001
What causes TB?				
Correct	233 (31.3)	380 (52.6)	1.575 (1.404 –	χ^2 = 68.342
Wrong	512 (68.7)	343 (47.4)	1.768)	P<0.0001
What is the most common part of the body affected by TB?				
Correct	289 (38.8)	401 (55.5)	1.399 (1.259 –	χ^2 = 40.939
Wrong	456 (61.2)	322 (44.5)	1.556)	P<0.0001
Is TB hereditary?				
Correct	182 (24.4)	330 (45.6)	1.657 (1.458 –	χ^2 = 72.698
Wrong	563 (75.6)	393 (54.4)	1.883)	P<0.0001
How can a person get TB?				
Correct	486 (65.2)	576 (79.7)	1.394 (1.264 –	χ^2 = 38.203
Wrong	259 (34.8)	147 (20.3)	1.538)	P<0.0001
How can a person avoid getting TB?				
Correct				
Wrong	435 (58.4)	259 (35.8)	0.639 (0.576 –	χ^2 = 74.962
	310 (41.6)	464 (64.2)	0.709)	P<0.0001
Who can be infected with TB?				
Correct	694 (93.2)	647 (89.5)	0.776 (0.624 –	χ^2 = 6.240
Wrong	51 (6.8)	76 (10.5)	0.965)	P=0.012
Can someone have TB more than once in a lifetime?				
Correct	227 (30.5)	340 (47.0)	1.436 (1.280 –	χ^2 = 42.428
Wrong	518 (69.5)	383 (53.0)	1.612)	P<0.0001
Can TB be cured?				
Correct	579 (77.7)	639 (88.5)	1.402 (1.262 –	χ^2 = 30.269
Wrong	166 (22.3)	83 (11.5)	1.559)	P<0.0001
How can TB be cured?				
Correct	518 (69.5)	642 (88.9)	1.656 (1.510 –	χ^2 = 83.303
Wrong	227 (30.5)	80 (11.1)	1.816)	P<0.0001

TB: Tuberculosis; CI: Confidence interval

Attitudes towards TB and care-seeking behaviours among respondents

Less than half of the respondents thought they could contact TB both pre-intervention (40.8%) and post-intervention (43.6%), However, this difference was statistically significant (p<0.0001). Prior to the education outreach, 43.5% of participants expressed surprise at the prospect of contracting TB, which increased significantly to 61.2% post-intervention (p<0.0001)

Health-seeking attitudes also improved following the intervention. A significantly higher proportion of respondents indicated that they would visit a health facility if they had TB during the post-intervention survey (90.3%) compared to the pre-intervention survey (80.4%). Similarly, 81.5% of participants stated they would advise someone in their community with TB to seek care at a health facility post-intervention, a substantial increase from 16.4% pre-intervention. All differences were statistically significant, as shown in Table 3.

Table 3: Attitude towards TB and care-seeking behaviours among respondents

Variables	Pre-intervention n=745	Post-intervention n=723	Test statistic; p-value
Can you contact TB?			
Yes	304 (40.8)	315 (43.6)	χ^2 = 24.499
No	441 (59.2)	408 (54.6)	P<0.0001*
What would your reaction be if you contacted TB?		n=706	
Fear	205 (27.5)	89 (12.3)	
Surprise	324 (43.5)	442 (61.2)	χ^2 = 114.311
Shame	11 (1.5)	40 (5.5)	P<0.0001*
Embarrassment	49 (6.6)	41 (5.7)	
Sadness/Hopelessness	152 (20.4)	87 (12.0)	
Others	4 (0.5)	7 (1.0)	
What would your action be if you suspected that you have TB?			
Go to drug store	31 (4.2)	18 (2.5)	Fisher's exact
Pray/fast	51 (6.8)	18 (2.5)	P=0.003*
Go to health facility	599 (80.4)	653 (90.3)	
Self-medicate/traditional herbs	64 (8.6)	19 (2.6)	
Others	0 (0.0)	15 (2.1)	
What would be your reaction if someone in your community had TB?			
Fear	103 (13.8)	36 (5.0)	
Surprise	385 (51.7)	204 (28.2)	Fisher's exact
Sympathy	202 (27.1)	454 (62.8)	P<0.0001*
Embarrassment	55 (7.4)	8 (1.1)	
Sadness or hopelessness	0 (0.0)	8 (1.1)	
Others	0 (0.0)	13 (1.8)	
What advice would you give the person?			
Go to the drugstore	130 (17.4)	9 (1.2)	
Go for spiritual healing	131 (17.6)	19 (2.6)	χ^2 = 695.059
Go to a traditional healer	121 (16.2)	19 (2.6)	P<0.0001*
To take some medicines or herbs you recommend	123 (16.5)	80 (11.1)	
To go to the health facility	122 (16.4)	589 (81.5)	
Others	118 (15.8)	7 (1.0)	

** Statistically significant; TB: Tuberculosis*

DISCUSSION

This study evaluated a CHW training and cash incentives intervention, using community members' knowledge and attitudes about tuberculosis (TB) as proxies for its effectiveness. The findings demonstrated significant improvements in TB knowledge post-intervention and notable shifts in attitudes toward the disease.

Before the intervention, the most common source of information on TB was the radio, followed by family and friends. This finding aligns with other studies reporting that in rural communities, radio and interpersonal communication are primary sources of health information.[21,22] In rural Akwa Ibom, radios are widely available, and communal listening to radio programs is common. Additionally, information often spreads through word-of-mouth communication among family and friends.[23] These channels can be leveraged to disseminate health information effectively.

Overall, participants' knowledge of TB significantly improved after the intervention, compared to the pre-intervention scores, showing that CHW training and cash incentives can potentially improve community knowledge of TB. This improvement could be attributed to the increased number of TB community outreaches hosted by the CHWs in the communities and their greater engagement with community members during the intervention period. The parent study confirmed a significant increase in community outreaches during the intervention year compared to the previous year.[19] CHW interventions have been proven to improve TB active case detection, linkages to care and improved treatment outcomes.[24] The present study shows the potential of CHW programs to also improve passive case detection and care-seeking by improving TB awareness within communities.

Despite the overall improvements, there was a notable decline in the proportion of respondents with correct knowledge of TB prevention. This suggests that while the intervention effectively addressed certain aspects of TB knowledge, CHWs may have been less effective or clear in communicating preventive measures. This emphasizes the importance of refining health education content to ensure comprehensive understanding. Health education is a well-known strategy for improving health outcomes at the community level,[25] and targeted educational programs can promote health and well-being through better preventative and health-seeking behaviours.

Only 40.8% of the respondents thought that they could contact TB pre-intervention, and this slightly increased to 43.6% post-intervention. This shows that despite improved knowledge of TB, the perception of personal susceptibility to TB was still low in the communities. This is supported by a higher proportion of participants reporting that they would be surprised if they contacted TB. Since perceived susceptibility influences preventative and health-seeking behaviors,[26] future programs should emphasize this aspect of TB awareness. Notably, the intervention led to an improvement in TB health-seeking behaviour, measured by proxy using the intention to visit a health facility. A significantly higher proportion of participants indicated that they would seek care at a hospital or refer someone from their community to a hospital if TB was suspected.

The success of this intervention can be attributed to the effective training of CHWs, coupled with cash incentives and supportive supervision, which likely enhanced their motivation and performance. Similar studies have demonstrated that well-trained and motivated CHWs are effective in improve TB outcomes.[27] Cash incentives, in particular, have been shown to improve CHW retention and effectiveness in various settings.[28] However, they should be used with caution, as large incentives can potentially divert effort from non-incentivized tasks.[29] Contrary to our findings, Dam et al., while assessing TB REACH projects in over 30 African countries found that non-monetary incentives for CHWs were more effective in improving TB outcomes.[27] The same study also reported that training of CHWs through hands-on or practical applications in a community setting was associated with more outcomes than classroom-based training - the method used in the present study. These disparities may be due to contextual differences in the study locations and highlight the importance of contextualizing implementation methods and assessing the best strategies for specific settings to achieve maximum impact.

This study had several limitations. First, the potential for self-reporting bias, where participants might have provided socially desirable responses rather than truthful ones, particularly with assessing attitudes. bias may have influenced participants to provide socially desirable rather than truthful responses, especially regarding attitudes. Second, TB knowledge and attitudes in the control group of the parent study were not assessed, making it difficult to determine whether the observed changes were unique to the intervention group or reflected broader population trends during the study period. Lastly, the sustainability of the intervention's positive effects is uncertain without ongoing educational efforts and continued CHW support.

CONCLUSION

The CHW training and cash incentive program significantly improved TB knowledge and attitudes among community members in rural Akwa Ibom State. These findings highlight the potential of such interventions in enhancing TB control efforts. Continuous evaluation and adaptation of these programs are recommended to sustain and amplify their impact.

CONFLICT OF INTEREST

The authors declare no conflict of interest

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