

RESEARCH ARTICLE

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The effect of a health education programme on Tuberculosis infection prevention and control practices among HIV-positive patients at three tertiary hospitals in Ogun state, southwest Nigeria

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Abstract

Objective: This research evaluated the impact of a peer-support health education programme on tuberculosis infection prevention and control practices among HIV-positive patients receiving anti-retroviral therapy (ART) in a tertiary hospital.

Methods: A quasi-experimental design was used for this study. Forty respondents were randomly selected between January and April 2023. Two tertiary health institutions in Ogun State, Nigeria with Direct Observation Treatment Shortcut programme were purposively selected. Systematic sampling was used to select the participants from the selected facilities and they were grouped into one experimental group (EG) and one control group (CG). The intervention was implemented for six weeks and data were collected at baseline, immediate post-intervention and at 12th-week follow-up.

Results: At the 12th-week follow-up, the peer-supported health education intervention had a significant effect ($t_{78}=14.21$, effect size =3.09, $p < 0.05$) on the Intervention Group with a mean score (\bar{X}) of 6.85 ± 0.86 compared to the Control Group (CG) with a mean score (\bar{X}) of 3.95 ± 0.96 . Furthermore, among the Intervention Group, there is a significant difference ($t_{39}=19.0$, effect size =3.06, $p < 0.05$) in the effect of the peer-supported health education intervention program on TB infection prevention practices of participants at baseline ($\bar{X} = 3.98 \pm 0.73$) and also at 12th weeks follow-up ($\bar{X} = 6.90 \pm 0.71$).

Conclusion: There was a significant association between the intervention and improvement in TB infection prevention and control practices. More focus should be placed on peer-supported health education TB prevention interventions among HIV patients. Also, the National Tuberculosis Control Programme should adopt peer-supported health education interventions to improve prevention practices.

Keywords: Antiretroviral, Health education, HIV, Preventive practices, Peer-supported education, Tuberculosis

Plain English Summary

Tuberculosis (TB) is the most common opportunistic infection among HIV-infected persons. The problem of TB globally is worsened by HIV/AIDS, as people with HIV have a much higher risk of developing active TB. Some studies, in Nigeria have shown that prevention practices against TB were poor among HIV

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patients receiving Anti-retroviral Therapy (ART) in hospitals. Prevention of any disease requires an adequate understanding of the associated behaviours or practices, similarly, modifying health behaviours or practices requires adequate knowledge of the underlying factors. The prevention practices of TB have been shown to reduce the risk of progression from latent tuberculosis infection to active disease. Public health education intervention is an effective preventive strategy against tuberculosis infection, improvement of people's knowledge of tuberculosis infection risk factors led to a decrease in the prevalence rate of the infection.

Studies have shown that peer-supported health education intervention may serve as a tool to improve these prevention practices. This fact was also established in our study where HIV patients who had peer-support education intervention exercise improved their TB prevention practices after 4 weeks and 12 weeks as compared to their counterparts who had no peer-support education on TB prevention. It is therefore recommended that there is a need to integrate peer-supported health education programs for tuberculosis prevention among HIV patients receiving ART in health facilities.

Introduction

Tuberculosis is a global threat and Nigeria is among the highest TB, TB/HIV and DR-TB countries globally, along with India, China, Pakistan, Bangladesh, Philippines, Indonesia, and South Africa (1). Nigeria ranks 7th among the 30 high TB burden countries globally and first in Africa, accounting for 4% of the estimated incidence cases globally (2). Human Immunodeficiency Virus (HIV) infection stands out as the most significant risk factor for tuberculosis, particularly in Nigeria where the burden of HIV has a high prevalence (3).

In 2019, approximately ten million people were affected by tuberculosis (TB), the global incidence was 133 cases per 100,000 population, the morbidity rate was 27%, and the mortality rate was 39,933 people (4). By the end of that year, approximately three million of the estimated ten million cases were unreported or undiagnosed (5). Study results indicate that there is no interaction between intermittent preventive therapy (IPT) and antiretroviral therapy (ART) regarding mortality. Another conclusion of this study is that IPT should be used for patients on ART regardless of their CD4 cell count (6). This research is related to preventive health behaviour relating to tuberculosis prevention, the basic need was to choose it to guide the design. Previously, studies on tuberculosis infection in HIV-infected patients in Nigeria mainly focused on disease incidence (7, 8, 9). However, the effectiveness of peer-support educational interventions on tuberculosis prevention practices in patients on ART remains unexplored. Therefore, this study examined the impact of a peer health education intervention in preventing tuberculosis infection among patients receiving ART at a tertiary care hospital in Ogun State.

Materials and Methods

Design and study population

A quasi-experimental study was used. HIV patients between ages 20- and 59 years, receiving HIV treatment facilities in Ogun state, Nigeria namely (Babcock University Teaching Hospital, Ilishan-Remo, Ogun state and Federal Medical Centre, Idi-Aba, Abeokuta, Ogun state). Forty participants each were recruited for the experimental and control groups. A prevalence-based sample size formula was used.

Study area and study location

Ogun State is in southwestern Nigeria and it was created in February 1976 from the former Western State. The state has a total landmass of 16,409.26sqkm. Ogun State had a total population of 3,751,140 residents as of 2006. Ogun State is predominantly Yoruba, with the Yoruba language serving as the lingua franca of the state. There are three tertiary hospitals in the State which are Babcock University Teaching Hospital (BUTH, The Federal Medical Centre (FMC) Abeokuta and Olabisi Onabanjo University Teaching Hospital (OOUTH). Two of the three tertiary hospitals were used for this study (Babcock University Teaching Hospital, Ilishan Remo, Ogun State and Federal Medical Centre, Idi-Aba, Abeokuta, Ogun state). BUTH is a 140-bed private tertiary hospital that is run by the Seventh-day Adventist Church. The teaching hospital has about fifteen departments which include the Department of Community Medicine. The department offers several services including the Directly Observed Treatment Short-course (DOTS) clinic for TB and the virology clinic for HIV/AIDS. The DOTS clinic runs every Friday when adequate care is provided for patients with different forms of tuberculosis including pulmonary tuberculosis, extrapulmonary tuberculosis and drug-resistant tuberculosis. The clinic also serves as a referral centre for tuberculosis patients from primary and secondary hospitals in nearby towns and other parts of the country. A 250-bedded regional specialist hospital which came into

existence on 21st April 1993 with a philosophy of excellence in the provision of medical services to the gateway state of Ogun and other neighbouring states and nations. Over the years, the scope of this philosophy has gradually expanded to further encompass excellence in training and research so that today we can rightly say that the hospital stands on a tripod of excellence in research, training, and healthcare service delivery.

Sampling technique

A multistage sampling technique was used in this study. The first stage was the selection of facility: Simple random sampling was used to select two out of the three tertiary health institutions in Ogun State with DOTS programmes; OOUTH Sagamu, BUTH Ilishan and FMC Abeokuta. A simple random sampling method was used to select BUTH as the intervention (Experimental group) while FMC was used as the (Control group). Systematic sampling was used to select the participants in selected facilities.

Instrument and data collection

The instrument used was a well-structured, self-administered questionnaire that sought information on socio-demographic characteristics, knowledge of tuberculosis and prevention practices relating to tuberculosis from the two health facilities. Data was collected at three different phases i.e. baseline, immediate post-intervention measures and follow-up of the intervention. The questionnaire was pretested with Cronbach's alpha of 0.76 – 0.80 and

was used to collect information about the prevention practices of tuberculosis.

Data processing and analysis

Computation was subjective to descriptive statistics (means and standard deviation) and inferential (independent t-test and paired t-test.) with statistical significance at P=0.05. The t-test was used to determine a significant difference in the mean of the analyzed variables in the experimental and control groups and the effect within groups. Descriptive statistics were used to compare the baseline, immediate post-intervention and follow-up period to show the difference in response to each item in the variables in the questionnaire. The data analysis was conducted using IBM SPSS version 23.

Results

Demographic Characteristics of Participants

The age range of participants was 20 to 56 years with a mean of 42.73±2.93 years, 60% were females and 65% of the participants were married. Sixty per cent of the participants were Christians and the majority of the participants were Yoruba (81.3%). Eighty per cent of the participants were traders, and the highest level of education attained by 85% of the participants was secondary school education. Most of the respondents across the two groups did not take prompt steps to seek treatment when they had the signs and symptoms of this disease or before receiving ARV therapy (Table 1 and Figure 1).

Table 1. Demographic Characteristics of Participants

Variables	Control group (FMC)	Intervention group (BU)	Total	
	N=40(%)	N=40(%)	N =80	%
Age (mean)	(47.03±3.99)	(37.83±1.99)	(42.73±2.93)	
<25	0	1(2.5)	1	1.5
26-30	1(2.5)	3(7.5)	4	5.0
31-35	1(2.5)	4(10)	5	6.1
36-40	4(10)	8(20)	12	15.0
41-45	13(32.5)	8(20)	21	26.2
46-50	14(35)	11(27.5)	25	31.2
51>	7(17.5)	5(12.5)	12	15.0
Gender				
Female	14(35)	34(85)	48	60.0
Male	26(65)	6(15)	32	40.0
Ethnicity				
Yoruba	30(75)	35(87.5)	65	81.2
Igbo	5(12.5)	2(5)	7	8.8
Hausa	5(12.5)	3(7.5)	8	10.0
Others	0 (0.0)	0 (0.0)	0	0.0
Educational level				

No formal education	0 (0.0)	0 (0.0)	0	0.0
Primary	6(15)	1(2.5)	7	8.8
Secondary	32(80)	36(90)	68	85
Tertiary	2(5.0)	3(7.5)	5	6.3
Nature of Occupation				
Civil Servant	2(5.0)	0 (0.0)	2	2.5
Farmer	0(0.0)	5(12.5)	5	6.4
Housewife	31(77.5)	33(82.5)	7	8.9
Trader	31(77.5)	33(82.5)	64	81
Student	0 (0.0)	1(2.5)	1	1.2
Others	0 (0.0)	0 (0.0)	0	0.0
Religion				
Christianity	22(55.0)	26(65.0)	48	60
Islam	18(45.0)	13(32.5)	31	38.8
Others	0 (0.0)	1(2.5)	1	1.2
Marital Status				
Single	0 (0.0)	1(2.5)	1	1.2
Married	29(72.5)	23(57.5)	52	65
Divorced/separated	11(27.5)	16(40)	27	33.8
Widower	0 (0.0)	0 (0.0)	0	0.0

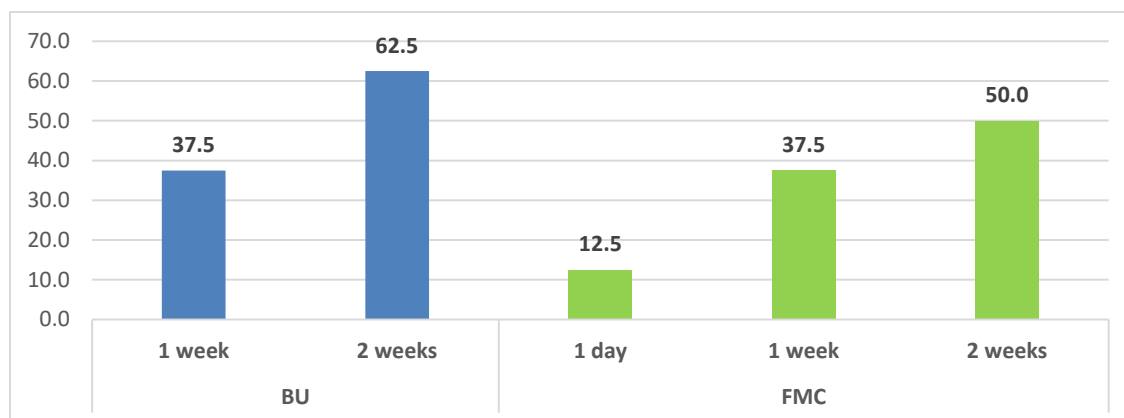


Figure 1. How long it took participants to seek for treatment when they had the signs and symptoms of this disease

Comparison of preventive practices of patients across control and intervention groups at the immediate phase

The result for the preventive practice of the control group was a mean score of $\bar{X} = 3.90 \pm 0.71$ on a 9-point scale and a mean score of immediate post-intervention (6.90 ± 0.71) for the intervention group (Tables 2 and 3). The control group and

intervention group showed that there were significant differences at immediate stage evaluation using T-test statistic computations on the preventive practices of TB patients ($p = 0.000$). Those who, due to the volume of contact, are at a high risk of developing TB disease, especially those under the age of six, should receive isoniazid preventative medication.

Table 2: Respondents' Comparison of preventive practices score across control and intervention groups at baseline phase

Variables	Maximum Points on constructed Scale	Control group (N=40) FMC	Intervention group -BU (N=40)	T (95%CI)	P-value
		Base-line	Base-line		
		$\bar{X} \pm SD$	$\bar{X} \pm SD$		
Preventive practice	9	3.85±0.95	3.98±0.73	-1.51(-1.33 to 0.18)	0.512

Table 3: Comparison of preventive practices of patients across control and intervention groups at the immediate phase

Variables	Maximum Points on constructed Scale	Control group (N=40) FMC	Intervention group -BU (N=40)	t (95%CI)	P-value
		Immediate Post Intervention	Immediate Post Intervention		
		$\bar{X} \pm SD$	$\bar{X} \pm SD$		
Preventive practice	9	3.90±0.93	6.90±0.71	-16.23(-3.37to-2.63)	0.000*

*Significant at P<0.05

Outcome Evaluation at the end of the follow-up for the groups in the study

The basic result of follow-up results for the intervention and the control groups (two groups) were considered and involved responses related to the educational intervention's influence on the main variables. These were measured and presented as means (\bar{X}) and standard deviations ($\pm SD$). The impact of the interventions on these variables is

derived by comparing, for each group, the differences in mean scores between baseline and post-immediate intervention evaluations, and also baseline and follow-up. The Preventive practice for the control group measured on a 9-point scale recorded a mean score of 3.95±0.96 and the intervention group had a mean score of \bar{X} = 6.85±1.85 (Table 4 and Figure 2).

Table 4: Comparison of preventive practices across control and intervention groups at the 12th-week follow-up phase

Variables	Maximum Points on constructed Scale	Control group (N=40) FMC	Intervention group -BU (N=40)	T (95%CI)	P-value
		12 th week follow-up	12 th -week follow-up		
		$\bar{X} \pm SD$	$\bar{X} \pm SD$		
Preventive practice	9	3.95±0.96	6.85±0.86	19.32(7.69 to 9.46)	0.000

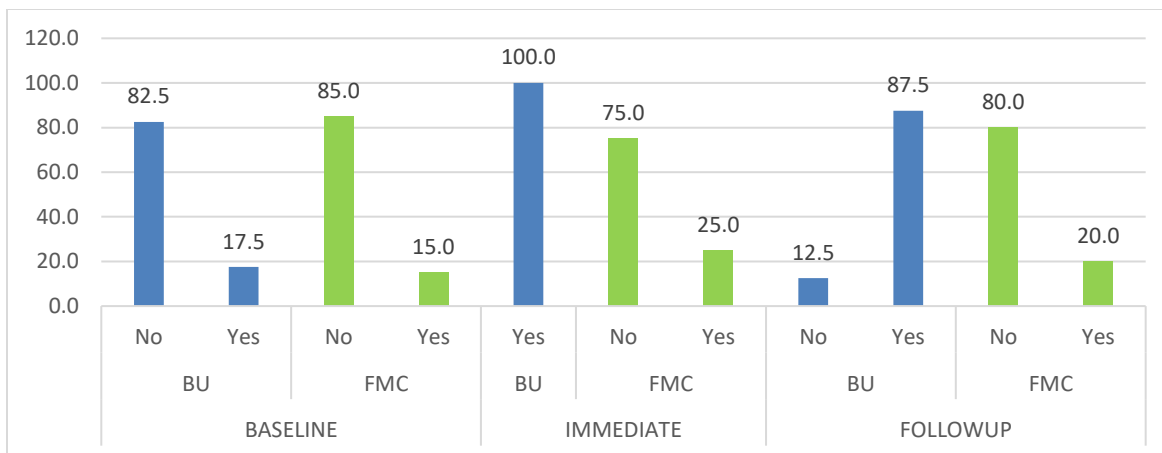


Figure 2: Willingness to be examined for TB every month

Comparing baseline and immediate post-intervention evaluation for the control group in the study

Table 5 shows the outcome of the evaluation across the baseline and the immediate post-

intervention phases of evaluation for the control group. The main variable showed no significant difference after the evaluation for preventive practice at the immediate post-intervention evaluation.

Table 5: Pair sample analysis for baseline and immediate evaluation for the control group in the study

Variables	Maximum Points on constructed Scale	Control group		Effect (95%CI)	size	P-value
		Baseline (N=40)	Immediate (N=40)			
		$\bar{X} \pm SD$	$\bar{X} \pm SD$			
Preventive practice	9	3.85±0.95	3.90±1.10	-0.23(-0.12to 0.02)		0.160

Comparing baseline and immediate post-intervention evaluation for the intervention group in the study

The outcome of the evaluations at the immediate post-intervention evaluation for the intervention group revealed that the main variable showed significant differences ($p < 0.05$) when the mean

scores of factors of preventive practice were compared across baseline evaluation and immediate post-intervention evaluation (Table 6). The effect sizes of the variables are also large as indicated in Table 6. These changes in the mean scores are attributed to the education intervention sessions given to the participants.

Table 6: Pair sample analysis for baseline and immediate post-intervention and evaluation for the intervention group in the study

Variables	Maximum Points on constructed Scale	Intervention group		Effect (95%CI)	size	P-value
		Baseline (N=40)	Immediate (N=40)			
		$\bar{X} \pm SD$	$\bar{X} \pm SD$			
Preventive practice	9	3.98±0.73	6.90±0.71	-3.01(-3.24to 2.61)	-	0.000

Hypothesis 1

There will be a significant difference in the effect of peer-supported health education intervention programmes on *mycobacterium tuberculosis* infection prevention practices of participants between control and intervention groups at the 12th-week follow-up (Table 7 and Figure 3).

The result of a two-tailed independent sample t-test for statistical significance showed that a significant difference ($t_{78} = 14.21$, $p < 0.05$) exists between scores recorded for the control group and intervention group and had an effect size of 3.19 (95% CI: -3.31 to -2.49). The Boxplot for the control

group shows a mean at a score of four with a minimum of two and a maximum of six as a score while for the intervention group, the box plot reveals a mean of close to approximately seven. Therefore, based on these values on prevention practices of participants' mean score we reject the null hypothesis. It can be said there is a significant difference in the effect of the peer-supported health education intervention programme on *mycobacterium tuberculosis* infection prevention practices of participants between control and experimental groups at the 12th-week follow-up.

Table 7: Analysis of scores of prevention practices of participants in the peer-supported Health Education intervention program for the intervention group and control group at the 12th-week follow-up

prevention practices of participants	Control group (N=40) 12th weeks follow-up $\bar{X} \pm SD$	Intervention group (N=40) 12th weeks follow-up $\bar{X} \pm SD$	t-test for equality of Mean					Effect size (95% CI)
			T	Df	Mean Diff	Sig.		
	3.95±0.96	6.85 ±0.86	14.21	78	-2.9	0.000	3.19	-3.31 to -2.49

* $p < 0.05$

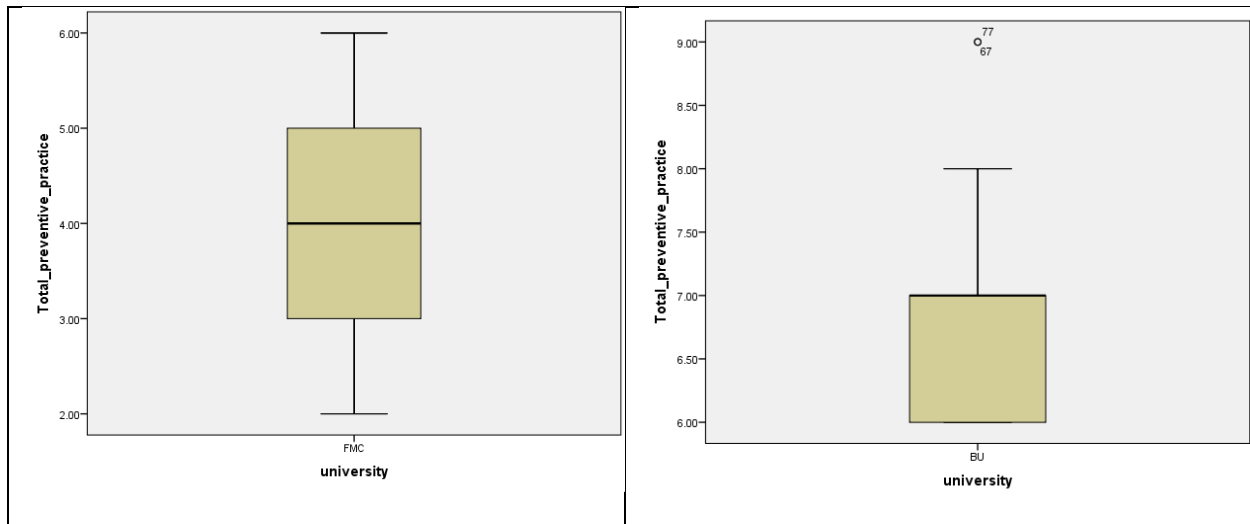


Figure 3: Boxplot for control and intervention group at 12 weeks

Hypothesis 2

There will be a significant difference in the effect of the peer-supported health education intervention program on *mycobacterium tuberculosis* infection prevention practices of participants in the experimental group between baseline and 12th weeks follow-up

As shown in Table 8, scores for prevention practices of participants both of the same intervention group for baseline evaluation was $\bar{X} = 3.98$, $SD = 0.73$ compared with prevention practices of participants in follow-up evaluation ($\bar{X} = 6.90$, $SD = 0.71$) measured on a maximum scale of 9 points. Using an independent sample t-test to

evaluate the null hypothesis, showed that a significant difference ($p=0.000<0.05$) exists between scores for Baseline evaluation and Follow-up evaluation and Effect size of 4.06 (95% CI: -3.24 to -2.61). It can be said, based on these values provided, that there is a significant

difference in the effect of the peer-supported health education intervention program on mycobacterium tuberculosis infection prevention practices of participants in the experimental group between baseline and at 12th weeks follow-up.

Table 8: Analysis of scores of prevention practices of participants in the peer-supported Health Education intervention program for Baseline evaluation and Follow-up evaluation in the Intervention group

prevention practices of participants	Intervention group (N=40) Baseline evaluation $\bar{X}\pm SD$	Intervention group (N=40) Followup evaluation $\bar{X}\pm SD$	t-test for equality of Mean				
			T	Df	Mean diff	Sig.	Effect size (95% CI)
	3.98 ±0.73	6.90 ± 0.71	-19.05	39	2.92	0.000	4.06 -3.24 to -2.61

* $p<0.05$

Discussion

Peer-supported Health Education intervention programmes are one of the most powerful methods for altering behaviour, and it has been used in public health initiatives to encourage a variety of good deeds, resulting in the sharing of information and experience among group members (10). By fostering a sense of cooperation and teamwork, it also empowers peers. According to studies, HIV patients are more likely to adopt new behaviours if they receive health information from peers who share their worries and issues (11). Peer education promotes knowledge and experience sharing among peers, which ultimately results in positive health outcomes (12).

In their study on knowledge, attitude, and preventive practices regarding tuberculosis and its predictors among HIV patients in General Hospital, Minna, North-Central, Nigeria (13), discovered that 26.5% had poor knowledge, 54.4% had a negative attitude, and 48% had poor preventive practices. Even in nations with high TB and TB/HIV burdens, there are still significant gaps in TB screening, TB detection, and TB preventive treatment among people living with HIV (14). The study indicates that comprehensive health education aimed at attitudinal change through community involvement is required, and the solutions proposed in this work are capable of raising awareness and dispelling myths about tuberculosis.

Health educational interventions that improve health behaviour and behaviour modification must

be theory-based (15) because solid theories like the ones mentioned in this work are reliable in justifying why a specific incident continues as well as a predictor of anticipated future purpose and behaviour. This supports the Health Belief Model that includes knowledge as one of the modifying factors associated with the problem, which in turn has an impact on the behaviour and action (16).

Conclusion

Also, findings from this study have shown that peer support can be effectively used as a change agent in national tuberculosis programmes if provided with adequate training and supportive supervision. The human resources needed to implement tuberculosis infection prevention programmes can be found in most ART clinics in Nigeria. This study contributes to the National Tuberculosis and Leprosy Control by discovering the importance of peer-supported behaviour change or health-seeking of the patients. There is a need to explore interventions that will be effective for non-HIV patients in tuberculosis prevention. There are several noteworthy points we can draw from the findings of this study, even though peer-supported Health Education intervention programs can currently be implemented in a variety of settings in any part of the world where peer group interactions continue to play important roles in individual social and cultural development (17, 18), as well as to support other related mental and physical disease management and rehabilitation (19, 20). Credit

has been given to peer groups and their ability to draw from a variety of perspectives for the majority of this work. Advocacy-Based Peer Interventions that are centred on outreach programs, campaigns, or workshops should be adopted by the three levels of healthcare delivery (i.e. Primary, Secondary and tertiary health care) in Nigeria. With personal and political empowerment, it is possible to target socially marginalized, stigmatized, and oppressed populations therefore eradicating health inequalities. Socially marginalized, stigmatized, and oppressed populations may be targeted, with personal and political empowerment viewed as critical to eliminating health disparities.

List of Abbreviations

ART:	Anti-retroviral Therapy
BUHREC:	Babcock University Health Research Ethics Committee
BUTH:	Babcock University Teaching Hospital
CG:	Control Group
DOTS:	Directly Observed Treatment Short-Course
EG:	Experimental Group
FMC:	Federal Medical Centre
HIV:	Human Immunodeficiency Virus
IBM:	International Business Machine
IPT:	Intermittent Preventive Therapy
OOOTH:	Olabisi Onabanjo University Teaching Hospital
SPSS:	Statistical Package for Social Sciences
TB:	Tuberculosis

Declarations

Ethics approval and consent to participate

The study was approved by the Babcock University Health Research Ethics Committee (BUHREC748/22). Necessary permissions were also obtained. Informed consent was obtained, and participation was entirely voluntary and participants could opt out at will without any negative consequence.

Consent for publication

All the authors gave consent for the publication of the work under the Creative Commons Attribution Non-Commercial 4.0 license.

Availability of data and materials

The data generated and analyzed in this study are available from the corresponding author upon reasonable request.

Competing interests

The authors declared no conflict of interest

Funding

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Authors' contributions

NNV designed the study, NNV and AAE did literature review and manuscript writing, UC and AOA performed data analysis, NNV wrote the initial draft, AAE and AOA reviewed the draft while the final draft was approved by NNV, NNV, AAE, UC and AOA.

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