Development and Evaluation of Tuberculosis Case Detection and Management Training for Community Pharmacists in Lagos, Nigeria

Okafor, Ukamaka Gladys[1*], Oreagba, Ibrahim Adekunle[2]

[1]*West African Postgraduate College of Pharmacists, Nigeria Chapter/Secretary, Taylor Drive, Yaba, Lagos, Nigeria*
[2]*Department of Pharmacology, Therapeutics and Toxicology/Professor, College of Medicine, University of Lagos, Nigeria*

Abstract

Training enhances efficiency and develops a systematic way of performing duties. Community pharmacists are well-positioned as safety nets and can be trained to play a significant role in halting the progression of Tuberculosis (TB) disease. The study aimed at developing and evaluating the appropriateness of TB case detection and management training for community pharmacists in Lagos State, Nigeria. A one-day training to identify and refer individuals with TB symptoms to diagnostic facilities, was developed, conducted, and evaluated on a 5-point Likert scale, a semi-structured questionnaire, that was administered to 285 randomly sampled respondents. Participants' opinion was rated on the training content, resource persons, and sufficiency of the training. The results of pre and post-tests were manually analyzed. Quantitative data were coded and analyzed using Statistical Package for Social Sciences Version 17. Descriptive statistics: percentage, frequency, mean and standard deviation were also used to analyze the data. Open-ended responses were analyzed thematically. The response rate was 67.02%. Respondents strongly agreed (47.37%) and agreed (46.05%) that the training was sufficient to enable community pharmacies to provide TB services in their pharmacy. Respondents expressed themselves on what they valued most about the training and made recommendations to improve and ensure the progress of the intervention. Exposure of community pharmacists to appropriate training significantly increased their knowledge in TB case detection and management. The training was fit for the purpose it was designed for. Community pharmacists could be a valuable asset in the prevention and control of TB in Nigeria.

Keywords: Evaluation, Pharmacists, Training, Tuberculosis.

Introduction

The World Health Organization (WHO) declared Tuberculosis (TB) a global emergency in 1993 and it is one of the world's major causes of illness and death. One-third of the world's population carry the TB bacteria. TB disproportionately affects people in resource-poor settings, particularly in Africa and Asia, and poses significant challenges to developing economies as it primarily affects people during their most productive years. More than 90% of new TB cases and deaths occur in developing countries [1].

According to the World Health Organization Report, National Strategic Plan for Tuberculosis (TB) Control, 2015 to 2020, and the First National TB Prevalence Survey Report, Nigeria was rated the third highest Tuberculosis (TB)-burden country in the world and number one in Africa, with 600,000 new cases of TB in Nigeria [2, 3].

Community Pharmacists are on many occasions first point of contact of the health care

system to the community. They are well positioned as safety nets to play a significant role in halting the progression of diseases. It is important to suspect tuberculosis among chest symptomatic patients and subject them to sputum examination. If TB is not suspected, patients with smear-positive pulmonary TB will not be identified. These patients will continue to spread the infection and it is likely that more than half of them will die in three years. Hence, every pulmonary TB suspect should be referred for sputum examination in time. Community pharmacists, all health workers, and community volunteers should be encouraged to identify and refer TB suspects for early diagnosis and treatment to prevent further spread of the infection [9]. For the End TB Strategy to be successful, prioritizing and harnessing the power of private-sector retail drug outlets will be instrumental in accelerating the early detection and referral of the 3 million missing cases [10].

A study carried out on suspected Tuberculosis Patient Identification and Referral by Private Drug Retail Outlet Workers in South Wollo, Ethiopia, found that Drug Retail Outlet Workers cause diagnostic delays, and training interventions are needed to fill the TB knowledge gap and improve their referral practice [22].

In an earlier (baseline) study, the level of community pharmacists' knowledge and involvement in TB case detection and management in Lagos State, Nigeria was assessed. The study revealed that community pharmacists are highly knowledgeable in TB cause, transmission, signs, symptoms, diagnosis, standard treatment regimen, and duration of treatment and are informally involved in TB case detection and management. This notwithstanding, about 35% of the community pharmacists did not refer suspected cases to diagnostic and treatment centers but either treated them with antibiotics or took no further action [23].

Training and development enhance efficiency and develop a systematic way of performing duties and assigned tasks [25]. In a major thrust to address the growing incidence of tuberculosis (TB) and drug-resistant TB in the country, the Ministry of Health, India in association with the Indian Pharmaceutical Association (IPA) developed a training module for community pharmacists under the Revised National Tuberculosis Control Programme. The purpose of the training was for the pharmacists to understand their role in generating community awareness on TB, identification and referral of TB suspects, DOTs provision, recording, reporting, and rational use of anti-TB drugs [9, 26].

Evaluation of training and development is the most essential aspect of the training programme. Generally, all good training and development programme starts with the identification of training and development needs and ends with the evaluation of training [27]. Training evaluation ensures that candidates are able to implement their learning in their respective workplaces or to the regular routines [28]. Different models are used by organisations to evaluate training effectiveness according to the nature and budgets of the business. The Learning level model of evaluation differentiates between what they already knew prior to training and what they actually learned during the training programme. In other words, it can be said that learning level evaluation is the measurement of the increase in knowledge or intellectual capability from before to after the learning experience. The evaluation should focus on measuring what was covered in the training events i.e., learning objectives [25].

In Nigeria, no published study has developed and provided interventional training nor showed that provision of an educational training programme for community pharmacists can improve their knowledge in TB case detection and management. This study therefore aims to design, implement, and evaluate a training intervention for community pharmacists on TB case detection and management in Lagos State, Nigeria from information derived from a

previous baseline survey [23]. The training is expected to increase the knowledge and involvement of community pharmacists in TB case detection, and management and concretize the TB referral processes from the community pharmacies to DOTs centres.

Study Area

The study was conducted in Lagos State in 2018. Lagos State is located in the southwestern part of Nigeria and was created on May 27, 1967. It is the most economically important and most populous state in the country. It is the smallest state, with an area of 356,861 hectares of which 75,755 hectares are wetlands. With over 15 million inhabitants [29], Lagos State is one of Nigeria's states with the highest population density. The Population growth is 600,000 each year, and a poverty rate of 64.1% (with a daily income of US$1), the unemployment rate is 19.5%, and adult literacy is above 85% for both sexes [30]. Based on population prevalence, Lagos is thought to have a 32,850-person TB burden. The state is divided into 57 local council development areas (subunits of an LGA), which are further divided into 20 LGAs (districts or administrative units) [31,32].

Study Design

This is an interventional study consequent to a baseline survey conducted among 285 community pharmacists in Lagos State, Nigeria [23]. Its objectives were to assess the current knowledge and practices of community pharmacists regarding TB management and to evaluate the effectiveness of the one-day training program in improving their knowledge and skills in TB case detection and management. For the baseline survey, a standardized questionnaire addressing particular subjects relating to TB management, referrals, and treatment methods was created. In order to identify gaps and potential areas for development in the training curriculum, the responses were recorded and analyzed.

Sample Size Calculation

Using Conchran's formula [33], with a population size of 946 retail community pharmacies in Lagos State [34] the sample size was calculated as follows:

$$ss = \frac{z^2 x\ p\ x\ (1-p)}{c^2}$$

Where:
ss = sample size.
Z = Z value (1.96 for 95% confidence level).
p = percentage picking a choice, expressed as decimal.
c = confidence interval, expressed as decimal.

Correction for Finite Population

$$new\ ss = \frac{ss}{1 + ss - 1/pop}$$

Where pop = population.
Pop size = 946.
To calculate for sample size.
Z = 1.96 for 95% confidence level.
P = 0.5,
C = 0.05.
Therefore, ss = 1.96^2 x 0.5 x (1-0.5)/ 0.05^2 ss = 384.16.

$$New\ ss = \frac{384.16}{1 + 384.16 - 1/946}$$

$$New\ ss = 273.4173.$$

In order to allow for attrition, 285 retail community pharmacies were sampled. Only one pharmacist was sampled per pharmacy.

The baseline survey was implemented with 285 randomly selected community pharmacists in Lagos State using a multi-staged cluster sampling method and structured questionnaire. Lagos State consists of both urban and rural areas, and it was necessary to conduct the study in both areas and in 50% (10 zones) of the communities in order to have a representative sample. Therefore, equal numbers (5) of rural and urban areas were selected from the 21 zones of Lagos state. Criteria used to identify rural and urban areas were in line with the Lagos State Government definition [48].

The selected zones were mapped to identify all the existing clusters and the community pharmacies practicing within them. Random selection of all the clusters was carried out to identify the particular clusters to be used for the study; thereafter random selection of the community pharmacies was carried out to identify the particular community pharmacies to be included, depending on the proportional sample size needed for the study. All community pharmacies in the selected clusters were sampled and only one pharmacist was sampled per pharmacy; the pharmacist was either the pharmacy owner or the most senior pharmacist in the pharmacy. All the 285 retail community pharmacies sampled during the baseline survey were invited for the training.

Assessment of Training Needs

The findings from the baseline survey, that about 35% of the community pharmacists did not refer suspected TB cases to diagnosis and treatment centres but either treated them with antibiotics or took no further action, guided the development of the curriculum (titles and contents) of the training modules [23]. The following health-related factors that may have an impact on the low case detection and referral rate for tuberculosis, include low TB-trained personnel and low TB education during health talks to raise awareness that TB is preventable, curable, and treatable and that people who suspect they may have the disease (cough for more than two weeks) should seek medical attention [24]. In addition, gaps identified through qualitative investigation; focus group discussions, key informant interviews, and discussions with some pharmacists involved in TB control were used to develop the training curriculum.

Focus Group Discussion (FGD) was conducted with the Executive members of the Association of Community Pharmacists of Nigeria (ACPN) and the respective ACPN coordinators from the 21 zones. It was done using the FGD guide [36]. The FGD was aimed at involving the association in the planning and execution of the intervention so that realistic and relevant training content models could be developed and adopted.

In-depth interviews (IDIs) of practitioners and contact persons of organizations identified during the FGD were carried out using the IDI guide [37]. All interviews were conducted by the Researcher. The purpose of the interview was to explore their perspectives on the research area, in addition to their experiences, expectations related to the research objectives, and any thoughts they had concerning the research methodology and the entire study. Identified key Informants included community pharmacists, related associations, agencies, and organizations, who had been recognized by the public and the health sector to be involved in TB case detection and management in Lagos State, as reported during the FGD and through the review of literature.

Description of the Training

The one-day training took place on February 6, 2018, at the auditorium of the Pharmaceutical Society of Nigeria, Lagos State, in collaboration with the Association of Community Pharmacists of Nigeria, Lagos state branch. Resource persons were drawn from PCN, KNCV Tuberculosis Foundation, Howard University Global Initiative Nigeria (HUGIN), Lagos State Ministry of Health, and ACPN.

The objectives of the training were to:
1. Refresh participants' knowledge of the epidemiology, prevention, and control of TB.
2. Discuss roles of community pharmacists in TB case detection and management.
3. Discuss how to identify suspected cases of TB and adopt an algorithm for referral and follow-up of presumptive cases.
4. Introduce participants to the referral documents and IEC materials and how to use them.
5. Lead participants in instantly developing their action plan with respect to TB case

detection and management and encourage them to undertake an on-the-spot commitment to action by endorsement of their action plan.

The topics focused on the training objectives.

A few days before the training, the Researcher proofread the respective lecture materials submitted by the resource persons to ensure that they were in line with the objectives of the training.

Pre-tests and Post-tests questionnaires were administered prior to and at the end of the training, respectively. The use of algorithms for engaging presumptive TB cases and referral processes and proper documentation of public health activities particularly with respect to TB case detection and referral were highlighted during the training. Samples of the community referral forms and registers for referral of presumptive cases were presented, and participants were taught how to use them in referring and following up the presumptive cases. Information Education Communication (IEC) materials such as wall stickers, flyers, and posters were also distributed in order to aid the community's awareness of TB. The lectures were followed by a question-and-answer session. Participants asked questions which were answered by the resource persons. There were speeches by some special guests and key informants.

Major highlights of the training were the writing of an action plan and the endorsement of commitment to action by the participants. Certificates of Participation were issued, and the participants were requested to display them in their pharmacies to earn the trust of their clients.

Resource Persons' Qualifications and Roles

The resource persons who delivered the training were carefully selected from reputable organizations, including the Pharmacy Council of Nigeria (PCN), KNCV Tuberculosis Foundation, Howard University Global Initiative Nigeria (HUGIN), Lagos State Ministry of Health, and the Association of Community Pharmacists of Nigeria, Lagos state branch. Each resource person possessed specific qualifications and expertise in TB management, pharmacy practice, and public health. Their roles in delivering the training were focused on addressing the specific objectives, including refreshing participants' knowledge on TB epidemiology, discussing the roles of community pharmacists in TB case detection and management, introducing referral documents and Information Education Communication (IEC) materials, and guiding participants in developing action plans for TB case detection and management.

Research Instruments

Design of the Training Evaluation Form was done through the use of standard evaluation forms of the International Pharmaceutical Federation (FIP), the Nigerian Association of Pharmacists and Pharmaceutical Scientists in the Americas (NAPPSA), and PCN's Mandatory Continuous Professional Development. The evaluation form sought participants' opinions about the training program. It rated the contents, resource persons, perceived sufficiency of the training programme in enabling them to provide appropriate services in their pharmacies, suggestions, and recommendations. Respondents were requested to rate their opinions on the training programme on a scale of 1-5 and were scored 'strongly agree =5, agree =4, can't say/indifferent =3, disagree =2, strongly disagree =1. Resource persons were also evaluated on a scale of 1-5, scoring excellent =5, very good =4, good =3, fair =2, poor =1. What the participants particularly valued about the programme and suggestions to improve the programme were requested as open-ended questions, while evidence of the programme having a commercial bias was requested as a Yes/No response. Other instruments used in the study included the 'Commitment to Action' received from participants at the end of the training.

Data Collection

Pre-tests and Post-tests questionnaires were administered prior to and at the end of the training, respectively. The training evaluation forms were distributed at the beginning of the training sessions and were completed and submitted by participants at the end of each lecture.

Data Analysis

Analysis of the data obtained involved both quantitative and qualitative methods. Quantitative data were coded and analyzed using Statistical Package for Social Sciences (SPSS) Version 17. The training evaluation forms rated participants' opinions on the training program and resource persons. Descriptive statistics, including percentages, frequencies, means, and standard deviations, were used to summarize the data. The results of the data analysis were discussed to assess the effectiveness of the training program in improving community pharmacists' knowledge and skills in TB case detection and management.

Ethical Consideration

Ethical clearance (Notice of Exemption) was obtained from the Lagos University Teaching Hospital Health Research Ethics Committee.

The ethics approval number ADM/DCST/HREC/APP/2038. Additionally, written informed consent was obtained from all participants before their involvement in the study. Permission to study Community Pharmacists was received from the Executive Committee of the Association of Community Pharmacists of Nigeria, Lagos State Branch.

Results

A total of 191 out of 285 community pharmacists attended the training. The response rate of attendees based on the number that participated in the baseline survey (285) was 67.02%. The results of the pre and post-tests showed an improvement in performance in 78.7% of the participants. Out of the 191 participants who attended the training, only 152 completed and submitted the evaluation form.

Table 1 shows the participants' opinions on the training programme and represents responses on their percentage agreement on ten identified indicators, mean scores, and standard deviations. The total mean score was 42.97, with an average score of 4.30 out of a total score of 5.0, which was an indication of the high level of agreement of the participants' opinions, based on the indicators measured.

Table 1. Participants' Opinion on the Training Programme

Item		Strongly Agree (5)	Agree (4)	Can't say (3)	Disagree (2)	Strongly Disagree (1)	Mean	SD
The programme met the advertised educational objectives	F	82	63	7	0	0	4.49	0.587
	%	53.9	41.4	4.6	0.0	0.0		
The contents were interesting	F	71	81	0	0	0	4.47	0.501
	%	46.7	53.3	0.0	0.0	0.0		
The contents added to my knowledge on the topic	F	103	47	0	0	0	4.63	0.466
	%	67.8	30.9	0.0	0.0	0.0		
The hand-out materials were useful	F	105	46	4	0	0	4.74	0.542
	%	69.1	30.3	2.6	0.0	0.0		
The information provided will be useful to my practice	F	98	54	0	0	0	4.64	0.480
	%	64.5	35.5	0.0	0.0	0.0		
	F	60	86	6	0	0	4.36	0.557

							Mean	S.D
The delivery methods of the programme met my needs	%	39.5	56.6	3.9	0.0	0.0		
Active participation was encouraged	F	70	73	9	0	0	4.40	0.601
	%	46.1	48.0	5.9	0.0	0.0		
The training gave me new ideas and present new viewpoints	F	84	65	3	0	0	4.53	0.539
	%	55.3	42.8	2.0	0.0	0.0		
The programme met the advertised educational objectives	F	9	7	51	21	64	2.18	1.204
	%	5.9	4.6	33.6	13.8	42.1		
The contents were interesting	F	80	72	0	0	0	4.53	0.501
	%	52.6	47.4	0.0	0.0	0.0		
Total Mean Score		-	-	-	-	-	**42.97**	**5.978**
Average Score	F	**40.34**	**31.44**	**4.24**	**1.11**	**3.39**	**4.30**	**0.598**
	%	**26.5**	**20.7**	**2.8**	**0.7**	**2.2**	**-**	**-**

Scale of 1-5: Strongly agree =5, Agree =4, Can't say/indifferent=3, Strongly disagree=2, Disagree=1. S.D = Standard deviation

Table 2 presents the result of the evaluation of resource persons based on delivery ability, expertise, usefulness and relevance of topics, and completeness of the content. Based on a scale of 1-5, the lowest average score of 4.03 and the highest average score of 4.29 out of the total score of 5 was obtained for the overall performance of the resource persons, with the resource person for adverse drug reactions and drug interaction in tuberculosis being perceived as lowest while the highest value was assigned to the resource person for Drugs in management of tuberculosis.

Table 2. Evaluation of the Resource Persons for the Training of Community Pharmacists

Topic by resource person	Items for presentation	Mean score	S.D
Welcome speech/ introductory remark	Delivery/presentation ability	3.87	0.689
	Expertise	3.83	0.689
	Usefulness of topic	4.17	0.692
	Relevance of topic	4.32	0.665
	Completeness of content	4.32	0.688
	Mean total score	**20.51**	**3.423**
	Average score	**4.10**	**0.685**
Overview of tuberculosis; epidemiology, prevention and control	Delivery/presentation ability	4.16	0.689
	Expertise	4.15	0.682
	Usefulness of topic	4.21	0.692
	Relevance of topic	4.32	0.692
	Completeness of content	4.27	0.688
	Mean total score	**21.11**	**2.761**
	Average score	**4.22**	**0.689**
Role of community pharmacists; Case detection and management	Delivery/presentation ability	4.27	0.634
	Expertise	4.20	0.576
	Usefulness of topic	4.28	0.671
	Relevance of topic	4.28	0.658

	Completeness of content	4.09	0.612
	Mean total score	**21.13**	**3.151**
	Average score	**4.23**	**0.630**
Identification of suspected cases of tuberculosis referral process & follow up	Delivery/presentation ability	4.27	0.676
	Expertise	4.00	0.589
	Usefulness of topic	3.75	0.636
	Relevance of topic	4.28	0.541
	Completeness of content	4.15	0.541
	Mean total score	**20.22**	**2.983**
	Average score	**4.24**	**0.597**
Adverse drugs reactions and drug interaction in tuberculosis	Delivery/presentation ability	4.27	0.934
	Expertise	4.00	0.589
	Usefulness of topic	3.75	0.900
	Relevance of topic	4.28	0.706
	Completeness of content	4.15	0.894
	Mean total score	**22.14**	**4.023**
	Average score	**4.03**	**0.805**
Development of action/plan commitment to action	Delivery/presentation ability	4.01	0.642
	Expertise	4.01	0.642
	Usefulness of topic	4.12	0.667
	Relevance of topic	4.16	0.658
	Completeness of content	4.08	0.719
	Mean total score	**20.14**	**3.328**
	Average score	**4.08**	**0.666**
Drugs in management of tuberculosis	Delivery/presentation ability	4.26	0.642
	Expertise	4.26	0.894
	Usefulness of topic	4.34	0.541
	Relevance of topic	4.32	0.658
	Completeness of content	4.26	0.667
	Mean total score	**21.44**	**3.402**
	Average score	**4.29**	**0.680**
	Overall average score	**4.17**	**0.679**

Scale of 1-5: Excellent = 5, Very good = 4, Good = 3, Fair = 2, Poor = 1

Table 3 shows the perceived sufficiency of the training programme in enabling community pharmacists to provide appropriate services in their pharmacies. Respondents strongly agreed (47.37%) and agreed (46.05%) that the training was sufficient in enabling community pharmacists to provide appropriate services. Only (5.26%) responded as 'can't say' and (1.31%) disagreed that the training was sufficient for them to deliver the appropriate services.

Participants were given the opportunity to freely express themselves on what they found particularly valuable about the training programme, suggestions to improve specific aspects of the programme, mention any evidence of commercial bias, and if they would wish that the training should be continuous. Responses are shown in Table 3.

Table 3. Perceived Sufficiency of the Training Programme in Enabling Community Pharmacists to Provide Appropriate Services in their Pharmacy

Parameters	Training is sufficient	I still need further training
	n = 152 (%)	n = 152 (%)
Strongly agree	72 (47.37)	3 (1.97)
Agree	70 (46.05)	8 (5.26)
Can't say/ indifferent	8 (5.26)	9 (5.92)
Disagree	2 (1.31)	69 (45.39)
Strongly disagree	0 (0.0)	72 (47.37)
Mean score	**4.39**	**1.87**
Standard Deviation	**0.653**	**0.938**

Scale of 1-5: Strongly agree =5, Agree =4, Can't say/indifferent=3, Strongly disagree=2, Disagree=1.

Table 4 – Table 6 presents participants' free expressions on what they found particularly valuable about the training programme, suggestions to improve specific aspects of the programme, any evidence of commercial bias, and if they would wish that the training should be continuous. Participants' responses on what they valued about the programme included improvement in their knowledge of TB (35.53%). The training was very relevant to community pharmacy practice and the organization and resourcefulness were highly commendable. (40.13%), the training was very useful to community pharmacists because they are the first point to call when people have any health issues (24.34%).

Table 4. Free Expressions by Participants

What did you particularly value about this programme?	Frequency	Percent (%)
The training has improved their knowledge of management of tuberculosis	54	35.53
The training is very relevant to community pharmacy practice and the organization and resourcefulness is highly commendable.	61	40.13
The training is very useful to community pharmacists because we are the first point to call when the people have any health issues. We need more knowledge and strategy for detection, referral and control including the facilities for referral.	37	24.34

Note: The question was an open-ended one, hence summation was based on multiple and related responses. N = 152

Table 5. Free Expressions by Participants Cont'd

What would you suggest to improve specific aspects of this programme?	Frequency	Percent (%)
More time should have been allotted for the time to treat case studies.	18	11.84
The environment of the venues for such training should have been more conducive	23	15.13
Adequate referral materials should be provided in subsequent times.	16	10.52
The participating community pharmacists should be followed up monthly to ensure compliance with the contents of their commitment to action'	20	18.16

Awareness on DOTS should be intensified and facilities should be cautioned to stop handing over drugs to patients.	8	5.26
Community pharmacists should be included as DOTS centres.	28	18.42
The Association of Community Pharmacists of Nigeria, Lagos State branch should be engaged for an increased awareness to the public.	15	9.89
There should be regular review meetings to ensure progress.	12	7.89
IEC materials on TB services such as posters and handbills should be conspicuously available in community pharmacies.	7	4.60
Language barrier is a problem in some communities and could be addressed by engaging community leaders /traditional rulers so they can disseminate the information to their subjects because many of them live in congested clusters.	5	3.29

Note: Question was an open-ended one, hence summation was based on multiple and related responses. N = 152

Table 6. Free Expressions by Participants Cont'd

Please mention any evidence of commercial bias in this programme	Frequency	Percent (%)
There is commercial bias	7	4.6
There is no commercial bias	145	95.4
Do you wish that this kind of training should continue?		
Yes	136	89.5
No	16	10.5

N = 152

On what they would suggest improving specific aspects of the training programme, the respondents indicated that more time should have been allotted for the time to treat case studies (11.84%), the environment of the venues for such training should have been more conducive (15.13%), adequate referral materials should be provided in subsequent times (10.52%), the participating community pharmacists should be followed up monthly to ensure compliance with the contents of their commitment to action (18.16%), awareness on DOTS should be intensified and facilities should be cautioned to stop handing over drugs to patients (5.26%), Community pharmacists should be included as DOTS centres. (18.42%), the Association of Community Pharmacists of Nigeria, Lagos State branch should be further engaged for increased awareness to the public (9.89%), there should be regular review meetings to ensure progress (7.89%), IEC materials on TB services such as posters and handbills should be conspicuously available in community pharmacies (4.60%), language barrier is a problem in some communities and could be addressed by engaging community leaders /traditional rulers so they can disseminate the information to their subjects because many of them live in congested clusters (3.29%), there was commercial bias (4.6%), there was no commercial bias (95.4%), while 89.5% wished that the training should continue.

Discussion

This study developed, successfully implemented, and evaluated the appropriateness of TB case detection and management training for community pharmacists in Lagos, Nigeria. With respect to TB case detection and management in Nigeria, this is the first published pharmacy educational intervention that has been developed, implemented, and evaluated by practitioners, and shown to be relevant to the community pharmacy practice. The training was able to engage pharmacists, address their learning objectives, and provide them with the

appropriate knowledge and skills to deliver targeted services for TB case detection and management.

This intervention incorporates an innovative approach to involve community pharmacists in the detection and management of TB cases. It also addresses a vital gap in TB management in the community pharmacy context through the development of a training program exclusively for community pharmacists in Lagos, Nigeria. Community pharmacists are crucial when it comes to early TB identification, referral, and adherence support due to their easy accessibility and knowledge, which helps to enhance TB management in the community as a whole. The knowledge and skills acquired in this training are expected to be utilized in scaling Community Pharmacists' involvement in TB case detection and management, thereby reducing the overload being experienced by hospital pharmacists and the stigma suffered by patients who had been earlier assessed and treatment initiated in the hospitals.

The high improvement in participant performance after the training program demonstrates the intervention's potential influence on improving TB management in community pharmacies. This remarkable outcome suggests the training effectively addressed knowledge gaps and provided community pharmacists with the knowledge and skills necessary to detect TB symptoms, facilitate referrals to DOTS facilities understand treatment regimen, duration of treatment, and how pulmonary TB treatment should be monitored during follow-up visits. This agrees with a study that designed and evaluated training to enable community pharmacists to deliver a service in hypertension management, where all of the pharmacists reported that they were highly satisfied with the education received and that the content addressed through the training was relevant and appropriate [38]. However, these findings are contrary to that of a similar study which reported that good knowledge was not found to be significantly associated with recent training in TB and that there was no significant difference between the mean scores of those participants who had received training in TB recently and those that had not which further insinuates that training did not significantly impact knowledge [39]. It is important to consider several possible reasons for this discrepancy compared to our findings. One possible reason could be differences in the content and delivery of the training programs. Our intervention was specifically tailored to address the needs and challenges faced by community pharmacists in Lagos, Nigeria, whereas the intervention in reference [39] might not have been as targeted to their specific context. Additionally, the duration and intensity of the training could also differ, leading to varying levels of knowledge retention and application. Furthermore, the participant engagement and receptiveness to the training content could have varied between the two interventions. Our study ensured the active participation and engagement of community pharmacists throughout the training process, fostering a conducive learning environment. On the other hand, the intervention in reference [39] might not have achieved the same level of participant involvement, impacting the effectiveness of the training on knowledge improvement.

The high level of agreement (strongly agree) by the participants indicated that the training met the purpose for which it was designed. This is in consonant with a similar study that developed and evaluated the appropriateness and applicability of health promotion training provided for community pharmacists in Oyo State, Nigeria, where the participants reported that the training was adequate for use by community pharmacists and fit for the purpose it was designed for [40]. Another study on the development and process evaluation of an educational program to foster the use of written information available in Australia in pharmacy practice also corroborated the above and reported the feasibility of implementing the

educational program and extending it to other pharmacists. It reported that the training was found to be useful, and participants were able to incorporate the written protocol into their dispensing and counseling processes. All participants agreed that the workshop had been relevant to their practice [38, 41].

The high average score shows how highly and sufficiently the participants valued the overall performance of the resource persons based on delivery ability, expertise, usefulness and relevance of topics, and completeness of the content. This finding agrees with that of an educational intervention to train community pharmacists in providing specialized Asthma care where the intervention pharmacists rated the resource persons high on the talk on medications, and sessions on interactive practice with the medical devices as well as communication and counseling skills [42]. Also, in a study aimed at developing and evaluating training for community pharmacists to deliver interventions on alcohol issues, participants felt it was feasible for trained pharmacists to provide brief interventions. The training was positively evaluated and led to an increase in knowledge, attitudinal scores, and self-related competence [43].

The current training was perceived by participants to be sufficient in enabling community pharmacists to provide appropriate services in their pharmacy and agrees with a similar study where the majority of the respondents strongly agreed that the training was sufficient to deliver health promotion services [40].

Participants' responses on what they valued most about the programme were in consonant with those of similar training which include performing more role plays or presenting case studies and discussing "real" examples [41,42], continuing with periodic training [38,40] and their suggestion to improve specific aspects of the training programme includes further engagement of Association of Community Pharmacists of Nigeria.

Retail drug outlets do not operate in isolation and have linkages with wholesalers, distributors, and retail associations. The cooperation of the Association of Community Pharmacists of Nigeria, Lagos State branch was instrumental to the success of this study. In a study to analyse various models of evaluation of training and development, the majority of the 52 reviewed interventions primarily trained retail drug outlets to provide referrals. A country's national pharmaceutical association must be engaged to tap into its network of pharmacy professionals and provide policy guidance to identify educational, managerial, and regulatory approaches to engage retail drug outlets. Cambodia, India, and the Philippines, for example, have involved their local pharmacy associations significantly in advocacy and mobilization among their member networks of retail drug outlets [25,44,45,46].

This training also prepared pharmacists for the challenges encountered in implementing and evaluating services in practice by making appropriate materials available to them such as a list of DOTs centres, names, and contacts of the TB focal persons in their locations, and comprehensive materials for documentation.

Furthermore, the study has provided useful resources for further training of community pharmacists in skills that can be engaged in TB case detection and management. It has also emphasized the need for the private and public sectors to work together if TB is to be brought under control. The government needs to involve the private sector in tuberculosis control programmes, so as to ensure a more comprehensive management of TB patients.

There is a growing body of scientific evidence from around the world that supports the training and engagement of retail pharmacies in TB prevention and control [47]. There is, therefore, a need to further engage the country's national pharmacy professional associations in order to tap into its network of pharmacy professionals and provide policy guidance to identify

educational, managerial, and regulatory approaches to engage retail drug outlets.

The writing and endorsement of the commitment to the action plan were welcomed by the participants and included their commitment to refer suspected TB cases to the DOTs centres and discontinuation of antibiotics recommendation to patients that have symptoms suggestive of TB; to join and actively participate in the "Make Lagos TB free" group; step down the learnings to the other staff in the pharmacy; paste TB awareness posters on their pharmacy doorposts, organize TB awareness outreaches in their communities; identify the DOTs centres in their communities and commence collaborations with the TB focal persons in their communities; attend further TB related training whenever invited; accepted willingly to be added to the Community Pharmacists in TB Intervention WhatsApp chat rooms; ensure proper documentation of all TB related cases and referrals and be willing to offer more services. These commitments are expected to influence the participants to either commence or intensify their involvement in TB case detection and referrals in their community pharmacies.

Conclusion

Exposure of community pharmacists to appropriate training significantly increased their knowledge in TB case detection and management. The study has provided useful resources for further training of community pharmacists in skills that can be engaged in TB case detection and management and has provided evidence that building the capacities of community pharmacies in Nigeria on TB is quite feasible. The positive findings highlighted the utility of this model of training for pharmacists who are seeking to advance their practice. The study has also provided evidence for advocacy to strengthen community pharmacists' role in early TB case detection and referrals.

Structured, multi-modal training involving simulated and inter-professional learning is effective in preparing selected community pharmacists for advanced practice and the implementation of new services in the context of TB management. This training was sufficient to give pharmacists competency in TB case detection and providing therapeutic recommendations for medication management of TB but could be further enhanced by addressing adherence issues in patients through simulated learning as well as specific training to prepare pharmacists for the challenges encountered in implementing and evaluating services in practice.

Recommendations

1. The community pharmacist training intervention should be scaled up and reproduced in other contexts to improve TB management in community pharmacies worldwide.

2. Governments and healthcare providers should actively engage private-sector community pharmacists in tuberculosis control initiatives, as they can play an important role in early diagnosis and referral of TB cases.

3. Regular review meetings should be held to guarantee progress and continuing development in the detection and management of tuberculosis cases in community pharmacies.

4. The country's National Pharmaceutical Association can work with pharmacy schools to revise their curricula to ensure that Pharmacists and Pharmacy Technicians have the requisite knowledge of TB and the rational use of antimicrobials. Pharmacy schools are a major resource not only for any baseline assessments and evaluation activities but also for engaging pharmacy students to collect data, monitor retail drug outlet performance, recognize real-world challenges, and stimulate thinking on options for policy and practice.

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Conflict of Interest

The Authors declare that there is no conflict of interest.

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