MedCrave
Step into the World of Research

Nursing and Care Open Access Journal

Research Article

Open Access

CrossMark

Impact of nurse-led health education on factors affecting non-compliance to anti-tuberculosis drug regimen among pulmonary tuberculosis patients in referral hospitals, Nigeria

Abstract

Background: Pulmonary tuberculosis (PTB) remain one of the leading causes of morbidity, incapacity, and mortality around the globe. Effective TB control is hampered by the evolution of drug resistance to TB treatments.

Objective: The study assessed the impact of nurse-led health education on factors affecting non-compliance to anti-tuberculosis drug regimens among pulmonary tuberculosis patients in referral hospitals, Delta state, Nigeria.

Method: A quasi-experimental design involving intervention and control groups was employed, and a sample of 198 was drawn from the total population of 360 patients, using the multistage sampling technique. The study three-phased work, pre-intervention, intervention and post-intervention. A self-developed validated structured questionnaire and checklist developed by the researchers were used for data collection. The pre-post-test was administered to both the intervention and control groups while only the intervention group received health education intervention. Post-test data were collected from both groups one (1) month after the health education intervention groups. Findings were analysed using descriptive and inferential statistics. Inferential statistics were used for group comparisons and tested the impact of the intervention. Independent sample t-test and chi-square were used for group comparison at a 5% level of significance.

Result: Baseline findings revealed that long duration of taking the drugs, discontinuance due to feeling of side effects and relief from ailment were identified as the most common factors affecting compliance to PTB drug regimen at the pre-intervention phase [long duration: con. (38.9%), int. (91.1%); side effects: con. (10.0%), int. (90.0%); feeling relief: con. (6.7%), int. (90.0%)] the post-intervention impact of the contributory factors to non-compliance was drastically reduced in the intervention than in the control group. Health education had a significant effect on compliance with the TB drug regimen.

Conclusion: The study concluded that health education has a significant impact on factors affecting compliance. The study recommends that TB education should be adopted as part of the referral centres' management policy.

Keywords: pulmonary tuberculosis, non-compliance, factors, TB patients.

Volume 8 Issue 2 - 2022

Onorikpori O Timothy, Ehiemere O Ijeoma, Maduakolam Ijeoma O, Ilo J Ijeoma
Department of Nursing, University of Nigeria, Nigeria

Correspondence: Maduakolam Ijeoma O, Department of Nursing Sciences, University of Nigeria, Enugu, Nigeria, Tel 0806 163 7628, Email ijeoma.maduakolam@unn.edu.ng

Received: August 02, 2022 | **Published:** August 19, 2022

Introduction

Mycobacterium tuberculosis, which causes TB, is a chronic bacterial disease with serious communal health difficulties. It is known as Pulmonary TB (PTB) when the infection infects or extends to the lungs[1] inflammatory alterations, caseation, tubercle development, and fibrosis are its pathological hallmarks.[2] Nigeria has a significant public health issue with TB, with an estimated prevalence of 616 cases per 100,000 people (National TB Prevalence Survey Report, 2012).[3] According to Ibekwe and Nwosu (2017)[4] TB is one of the main causes of illness and mortality globally, particularly in developing nations like Nigeria. Drug treatment compliance is arguably the biggest many difficult challenges encountered by today's healthcare providers, it can be a major cause of worry and annoyance. However, several factors have been accountable for the difficulties that have resulted in non-compliance with the TB medication regimen.

These factors have been classified as either having an impact on an individual or the health care system. Social-economic or behavioural foundations can be present in an individual.[5] More so, from one region to another, different factors are linked to non-adherence. In Nigeria, lack of transportation, the unfriendliness of medical personnel, culture, stigma, poor orientation, and lack of information were reported to be barriers to adherence in a study on the factors affecting adherence to the TB medication regimens.[6] Additionally, it was discovered that symptom relief, a lack of transportation, and socioeconomic obstacles all significantly contribute to TB treatment non-compliance (WHO, 2010).[7] This non-compliance with the prescribed medication regimen during PTB treatment can lead to Multi-Drug Resistant Tuberculosis (MDR-TB), poor clinical outcomes, a high hospitalisation rate, higher treatment costs, and a lower quality of life (Fereidouni et al., 2019).[8] Given the substantial effort put forth in recent years to address the issue of MDR-TB, 20% to 80% of patients who are obliged to take treatment do not (WHO, 2014).[9,10]

An intervention in health education regarding PTB disease is necessary to increase compliance with the tuberculosis drug regimen. According to documented research, a patient needs to be adequately informed about the disease condition to manage their medical condition

at a considerably high compliance rate. This is possible through nurse-led health education, which offers essential health knowledge and information (The Wellness Network, 2016).[11] Consequently, it is anticipated that to successfully treat tuberculosis, the patient will need to comply by taking the anti-tuberculosis medications as directed for a lengthy period of six to nine months. This does not appear to be the case with patients at the referral hospital in Delta State, Nigeria due to various reasons described in the literature, including lack of awareness of non-compliance, prolonged therapy, and lack of anti-TB medication, to name a few.[12] The study was aimed at assessing the impact of nurse-led health education on factors affecting non-compliance to anti-tuberculosis drug regimens among pulmonary tuberculosis patients in referral hospitals, in Nigeria.

Material and methods

This quasi-experimental design was adopted for the study. The population for the study comprised 339 male and female patients in their first line of drug treatment. The target population was all pulmonary tuberculosis patients both old and new who were diagnosed and registered for treatment in the referral hospitals, in June 2021 and were still in the first six months of treatment on their first-line drugs Eku and Central Hospital, Warri, Delta Nigeria. Furthermore, Warri TB referral served as the intervention group while Eku Tb referral Centre served as the control Centre. The sample size of 198 was obtained using a population formula of power analysis. A multi-stage sampling technique was utilized. The first stage involved the use of a purposive sampling technique to select two referral centres; simple random sampling techniques were used to select the hospital wards and participants. Inclusion Criteria were willingness to participate in the study, having been diagnosed with pulmonary tuberculosis and being registered for treatment in the month June to November 2021, patients within 15-65 years of age and who are physically and mentally stable.

26 item self -validated questionnaire and observation checklist was used for data collection. The questions were both open and closed-ended and assessed compliance levels to drug treatment, factors affecting compliance to drug treatment regimen measured using a four-point Likert scale. The questionnaire consisted of three (3) sections: A-C, Section A contains 10 (ten) items on socio-demographic characteristics, section B contains sixteen (16) items on compliance with drug treatment and was closed-ended, Section C measured factors militating against compliance to drug treatment regimen among TB patients with sixteen (16) items presented closed-ended. Furthermore, a structured educational module contains concepts on pulmonary tuberculosis, signs, and symptom of tuberculosis, the effect of non-compliance, and factors affecting compliance by the researcher. Ethical approval was obtained from the research and ethical committee of the Ministry of Health, Asaba, Delta State while informed consent was obtained from individual respondents before data collection. Descriptive statistics of frequency and percentage were used to analyse the data on sociodemographic variables and factors affecting compliance with the treatment regimen. Inferential statistics were used to test the among variables using the Pearson chi-square test. Data generated in the pre-test and post-test were analyzed using descriptive and inferential statistics. The results were compared to determine whether the intervention was impactful. The overall affirmative responses ('yes') to variables that measured factors that affect compliance were used to identify the factors affecting compliance to PTB drug regimen among the participants.

Inferential statistics were used to compare the groups and test the effects of the intervention on the compliance level of the participants. Chi-square homogeneity of proportion test was used for comparison in the compliance level between groups (intervention vs. control) as associated with their age and level of education. A probability value less than 0.05 was considered statistically significant. Significance difference/relationship hence existed if the p-value is less than 0.05. The analyses were done with the aid of the Statistical Package for Social Sciences (SPSS) version 23.0 and Microsoft Excel.

Training package

The health education module developed by the researchers was used to provide lessons to the intervention group. The educational programme commenced one week after the collection of baseline data and took the form of interactive lectures. However, IEC materials such as Microsoft power points, posters, charts, pamphlets, and role play were used to increase and consolidate learning. The health education package was provided to the participants in the intervention group for two (2) consecutive weeks. Subsequently, the second data was collected from the intervention group one month after the educational programme, more so, a telephone Whatsapp group chat was created for both the intervention and control, these served as a follow-up on the level of adherence to the treatment regimen. After obtaining the post-intervention data, participants in the control group were provided with the same health education lessons delivered to the intervention group to compensate them. Data collection lasted for one (1) week.

Results

Demography:

Table 1 shows the socio-demographic characteristics of the participants in the pre-test. The mean age of the participants was 42 years (SD ± 15.7) and 36 years (SD ± 12.9) for the control and intervention groups respectively. A greater proportion of those in the control group were males who were married (61.1% and 57.8% respectively) while those in the intervention group were predominantly females and were married (61.1% and 52.2% respectively). Those who were Urhobos and Christians were the majority in both groups [Urhobo: control (71.1%) and intervention (46.7%); Christian: control (94.4%) and intervention (93.3%)].

Table 1 Socio-demographic characteristics of the participants (post-test)

Variables	Options	Control n=90	Intervention n=84
Age	≤ 20	9 (10.0)	9 (10.7)
	21 – 30	14 (15.6)	22 (26.2)
	31 – 40	23 (25.6)	27 (32.1)
	41 – 50	17 (18.9)	11 (13.1)
	≥ 51	27 (30.0)	15 (17.9)
Mean (±SD) age		42 ± 15.7	36 ± 12.3
Gender	Male	58 (64.4)	34 (40.5)
	Female	32 (35.6)	50 (59.5)
Marital status	Single	34 (37.8)	34 (40.4)
	Married	51 (56.7)	42 (50.0)
	Separated	3 (3.3)	4 (4.8)
	Divorce	2 (2.2)	4 (4.8)
Tribe	Urhobo	67 (74.4)	39 (46.4)
	Itsekiri	4 (4.4)	14 (16.7)

Citation: Onorikpori OT, Ehiemere OI, Maduakolam OI, Ilo JI. Impact of nurse-led health education on factors affecting non-compliance to anti-tuberculosis drug regimen among pulmonary tuberculosis patients in referral hospital, Nigeria. *Nurse Care Open Acces J.* 2022;8(2):54–59. DOI: 10.15406/ncoaj.2022.08.00238

Table Continued...

Variables	Options	Control n=90	Intervention n=84
	Igbo	7 (7.8)	8 (9.5)
	Yoruba	1 (1.1)	4 (4.8)
	Hausa	0 (0)	4 (4.8)
	Others*	11 (12.2)	15 (17.9)
Religion	Christianity	85 (94.4)	78 (92.8)
	Islam	2 (2.2)	5 (6.0)
	African traditional religion	3 (3.3)	1 (1.2)
Education	Primary	23 (25.6)	16 (19.0)
	Secondary	50 (55.6)	42 (50.0)
	Tertiary	11 (12.2)	19 (22.6)
	None	6 (6.7)	7 (8.3)
Occupation	Employed	14 (15.6)	24 (28.5)
	Self-employed	49 (54.4)	35 (41.7)
	Unemployed	15 (16.7)	11 (13.1)
	Student	12 (13.3)	14 (16.7)
Place of residence	Close to the referral centre	26 (28.9)	43 (51.2)
	Far from a referral centre	64 (71.1)	41 (48.8)
Living situation	Living alone	27 (30.0)	20 (23.8)
	Living with family	63 (70.0)	64 (76.2)

***** Others - Ukwuani, Isoko, Anang, Agbor, Okpe (control)/ Ijaw, Izon, Edo, Isoko, Isan (intervention)

Secondary education was the highest educational attainment of a greater proportion of the participants in both groups (54.4% and 53.3% for control and intervention groups). Those who were self-employed were more in the control group than in the intervention group (55.6% and 45.6% respectively). The place of residence of the majority of the patients in the control group was situated far from the referral centre (73.3%) while the majority of those in the intervention group lived close to the referral centre (51.1%). Those who were living with their family members were in the majority in both groups (72.2% and 77.8% in the control and intervention groups respectively).

Table 2 baseline findings showed that several factors were found to affect the compliance level to PTB among the patients. However, the influence of these factors was more observed among participants in the intervention group than in those in the control group during the pre-intervention phase. Long duration of taking the drugs, discontinuance due to feeling of side effects and relief from ailment were identified as the most common factors affecting compliance to PTB drug regimen [long duration: con. (38.9%), int. (91.1%); side effects: con. (10.0%), int. (90.0%); feeling relief: con. (6.7%), int. (90.0%)]

Other high-ranking factors that were identified before the health education intervention include a lack of confidence in orthodox treatment [con. (14.4%, int. (88.9%)], the social stigma associated with TB prevents me from going to the hospital [con. (8.9%, int. (88.9%)], poor attitude in swallowing the drugs [con. (7.8%), int. (87.8%)], difficulty in opening the drugs' containers pack [con. (4.4%, int. (87.8%)] and distance of hospital deters my keeping doctor's appointments [con. (11.1%, int. (87.8%)].

During the post-intervention phase, the influence of these factors on participants' compliance to PTB drugs was found to reduce considerably, especially among those who were in the intervention group. For instance, those who identified long duration of taking the drugs, discontinuance due to feeling of side effects and discontinuance due to feeling relief from the ailment as factors affecting compliance were in the minority in the intervention group after the health education intervention [long duration: con. (53.3%), int. (14.3%); side effects: con. (8.9%), int. (9.5%); feeling relief: con. (4.4%), int. (13.1%)].

Table 2 Factors that affect compliance with PTB drug regimen among participants before and after health education intervention (n = 90)

Characteristics	Pre-test Control		Intervention		Post-test Control		Intervention (n = 84)	
	Yes	No	Yes	No	Yes	No	Yes	No
	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)
Inadequate emotional and empathy from health care providers	11 (12.2)	79 (87.8)	78 (86.7)	12 (13.3)	8 (8.9)	82 (91.1)	13 (15.5)	71 (84.5)
Difficulty in opening the drugs' containers pack	4 (4.4)	86 (95.6)	79 (87.8)	11 (12.2)	3 (3.3)	87 (96.7)	4 (4.8)	80 (95.2)
Poor attitude in swallowing the drugs	7 (7.8)	83 (92.2)	79 (87.8)	11 (12.2)	5 (5.6)	85 (94.4)	4 (4.8)	80 (95.2)
Lack of knowledge and beliefs about prescribed medications	14 (15.6)	76 (84.4)	79 (87.8)	11 (12.2)	8 (8.9)	82 (91.1)	4 (4.8)	80 (95.2)
Lack of understanding of the disease,	31 (34.4)	59 (65.6)	77 (85.6)	13 (14.4)	20 (22.2)	70 (77.8)	9 (10.7)	75 (89.3)
The attitude of health care worker affect my adherence	5 (5.6)	85 (94.4)	76 (84.4)	14 (14.4)	4 (4.4)	86 (95.6)	5 (6.0)	79 (94.0)
Lack of finance	19 (21.1)	71 (78.9)	75 (83.3)	15 (16.7)	20 (22.2)	70 (77.8)	13 (15.5)	71 (84.5)
Lack of free TB drugs	6 (6.7)	84 (93.3)	77 (85.6)	13 (14.4)	2 (2.2)	88 (97.8)	8 (9.5)	76 (90.5)
Transportation limitations	15 (16.7)	75 (83.3)	77 (85.6)	13 (14.4)	13 (14.4)	77 (85.6)	18 (21.4)	66 (78.6)
Discontinuance due to feeling of side effects	9 (10.0)	81 (90.0)	81 (90.0)	9 (10.0)	8 (8.9)	82 (91.1)	8 (9.5)	76 (90.5)
Discontinuance due to feeling relief from the ailment	6 (6.7)	84 (93.3)	81 (90.0)	9 (10.0)	4 (4.4)	86 (95.6)	11 (13.1)	73 (86.9)
Distance of hospital deters my keeping doctor's appointment	10 (11.1)	80 (88.9)	79 (87.8)	11 (12.2)	7 (7.8)	83 (92.2)	13 (15.5)	71 (84.5)

Table Continued...

Characteristics	Pre-test Control		Intervention		Post-test Control		Intervention (n = 84)	
	Yes	No	Yes	No	Yes	No	Yes	No
	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)
The social stigma associated with TBS prevents me from going to the hospital	8 (8.9)	82 (91.1)	80 (88.9)	10 (11.1)	5 (5.6)	85 (94.4)	9 (10.7)	75 (89.3)
Lack of confidence in orthodox treatment	13 (14.4)	77 (85.6)	80 (88.9)	10 (11.1)	6 (6.7)	84 (93.3)	10 (11.9)	74 (88.1)
My religion does not support drug medication	6 (6.7)	84 (93.3)	78 (86.7)	12 (13.3)	11 (12.2)	79 (87.8)	5 (6.0)	79 (94.0)
Long duration of taking the drugs	35 (38.9)	55 (61.1)	83 (91.1)	8 (8.9)	47 (52.2)	43 (47.8)	12 (14.3)	72 (85.7)

Table 3 baseline findings revealed that participants who were above 51 years, between 31 – 40 years, less than 20 years and between 41 – 50 years in the control group had greater compliance levels with the drug regimen before the health education intervention (14.3%, 12.5%, 9.1% and 6.3% respectively). In the intervention group, only those who were between the ages of 41 – 50 years and 31 – 40 years had greater compliance with the drug regimen (25.0% and 6.1% respectively). This suggests that there seemed to be variation in the compliance level of the participants according to their ages. However, further findings showed that the influence of age on the compliance level of the participants was not statistically significant for those in the control and intervention groups before the health education intervention ($\chi 2 = 5.785$, $P > 0.05$)

Table 3 Association between the age of the patient and compliance to drug regimen before health education intervention among pulmonary tuberculosis patients (n = 180)

		Control		Intervention			
		Compliant	Non-compliant	Compliant	Non-compliant	X2	P-value
		N (%)	N (%)	N (%)	N (%)		
Age	≤ 20	1 (9.1)	10 (90.9)	0 (0)	10 (100.0)	5.785	0.216
	21 – 30	0 (0)	19 (100.0)	0 (0)	21 (100.0)		
	31 – 40	2 (12.5)	14 (87.5)	2 (6.1)	31 (93.9)		
	41 – 50	1 (6.3)	15 (93.8)	3 (25.0)	9 (75.0)		
	≥ 51	4 (14.3)	24 (85.7)	0 (0)	14 (100.0)		

* Chi-square test (level of significance at $p < 0.05$)

Table 4 post-intervention findings revealed that participants who were less than 20 years, above 51 years and between 21 – 30 years in the control group had greater compliance levels with the drug regimen after the health education intervention (11.1%, 7.4% and 7.1% respectively). In the intervention group, all the age groups had increased compliance with the drug regimen but it was highest for those who were less than 20 years, between 21 – 30 years and greater than 51 years (100.0%, 95.5% and 93.3% respectively). This suggests that there seemed to be variation in the compliance level of the participants in both groups according to their ages. However, further findings showed that the influence of age on the compliance level of the participants was not statistically significant for those in the control and intervention groups after the health education intervention ($\chi 2 = 5.658$, $P > 0.05$).

Table 4 Association between the age of the patient and compliance to drug regimen after health education intervention among pulmonary tuberculosis patients (n = 174)

		Compliant	Non-compliant	Compliant	Non-compliant	X2	P-value
Age		N (%)	N (%)	N (%)	N (%)		
	≤ 20	1 (11.1)	8 (88.9)	9 (100.0)	0 (0)	5.658	0.226
	21 – 30	1 (7.1)	13 (92.9)	21 (95.5)	1 (4.5)		
	31 – 40	1 (4.3)	22 (95.7)	25 (92.6)	2 (7.4)		
	41 – 50	1 (5.9)	16 (94.1)	10 (90.9)	1 (9.1)		
	≥ 51	2 (7.4)	25 (92.6)	14 (93.3)	1 (6.7)		

* Chi-square test (level of significance at $p < 0.05$)

Discussion

Socio-demographic characteristics of the participants: The participants of this study were mostly within the age range of 31-41yrs and 40-50yrs and above for intervention and control groups respectively. There were more male patients in the control group and more female patients in the intervention group, the participants were predominantly of the Urhobo tribe and mostly Christians. However, the majority of the participants have mostly secondary school education, followed by primary basic education while only seven per cent had tertiary education. Also, more than half of the participants are mostly self-employed, the majority of the intervention group lived close to the referral Centre while more than half of the control group live far from the referral home. And almost all the participants lived with their families.

The findings of the present study showed that the ages most affected by pulmonary tuberculosis are those between the ages of 31yrs and 50yrs and above. This could be explained by the vulnerability of the immune system of older adults and due to the development of daily activities stress, diseases like HIV/AIDS, poor HIV/AIDS information, and inadequate nutrients that often leads to infectious diseases like Pulmonary tuberculosis that occurs due to compromised immune system, poor living conditions, poor housing and many others. This is similar to findings of a study done by Amara Eritrea and China by Gebreweld et al. (2018) and Xu et al.[20] that reported that most participants infected with pulmonary tuberculosis were between the ages of 37 years and 51years above.

Factors that affect compliance to PTB drug regimen among participants before and after health education intervention

At baseline, many factors that affect medication adherence were identified by the participants in both groups, regardless, many of these factors were mostly identified by the participants in the intervention groups than the control group. The participant in the intervention reported most frequent reasons given for medication non-adherence were: the long duration of taking TB medications, side effects of the drugs causing them to discontinue their medication regimen and lack of access to free medications were the factors affecting their compliance to the treatment regimen. While the control reported very few factors such as the long duration of taking medication and the attitude of health care workers as contributory factors affecting non-adherence to their medication regimen. Added prominent factors that were observed before the health education intervention include lack of confidence in orthodox treatment, the social stigma associated with TB preventing me from going to the hospital, and a poor attitude toward swallowing the drugs. The explanation of the above findings demonstrated that the intervention group lack correct information on the benefits of good compliance to their death regimens than their counterparts in the control group, this is shown as they still consider those negative reasons as hindrances to their adherence to the medication regimen. Findings are in line with the findings of Khidir-Elnimeiri and El-Muttalut[13] that revealed that patients discontinued treatment upon feeling better. It is supported by the finding of a study done in North-west Nigeria by Iweama[14] that showed that one-third of TB patients defaulted on their medication adherence. More so, it also agrees with the finding by Tola et al.[15] that reported that TB patients stop taking their medication after a few weeks of feeling better. Finding disagrees with Bangladesh's study which showed equal contributory factors among the intervention and control groups at baseline.

Nevertheless, after the post-intervention phase, the impact of these contributory factors to non-adherence to the treatment regimen was drastically reduced in the intervention than in the control group, although, the control group still uphold its reduction in these factors. The intervention participants who identified long duration of taking the drugs, discontinuance due to feeling of side effects and discontinuance due to feeling relief from the ailment as factors affecting compliance were however very few and the control presented very few participants that showed a lack k of understanding of the TB disease after health education.

The current result showed that the patients in the control group had better TB education in their referral centre or other sources of TB education than those in the intervention group. The present study results showed that health education intervention continues to be a controlling tool towards behavioural change in medication adherence. The finding is in line with a Kenya study by Mbuti et al.[16] that showed health education intervention improved adherence to medication regimens. It also agrees with Lee et al.[17] that reported greater adherence to the intervention than the control group.

The difference in the present study from previous findings is that there was unequal adherence between the intervention and control at baseline, more after health education the control still had reduced contributory factors to non-adherence to their treatment regimen. Most importantly, the cure for TB relies on the patient receiving a full, non-stop progression of treatment, which can only be attained if the patient adheres to their medication regimen as prescribed by the caregiver.

Comparing association between age of the patient and compliance to drug regimen before and after health education intervention

Hypothesis testing revealed that the influence of age on the compliance level of the participants was not statistically significant for those in the control and intervention groups before the health education intervention ($\chi 2 = 5.785$, $P= 0.216$). The P-value was greater than the level of significance, showing there is no level of association between the age of the participants and compliance to the treatment regimen at baseline. Findings are similar to the findings of Daniel et al.[18] that equally reported that age was not statistically significant to compliance with the treatment regimen.

Additionally, post-intervention findings showed that the influence of age on the compliance level of the participant was not statistically significant for both the control and intervention groups ($\chi 2 = 5.658$, $P =0.226$, $P>0.05$). To this end, the prediction of a null hypothesis which stated that there will be no significant difference between age and compliance level still holds. This entail that the age of participants was still not significant after delivering PTB education to both groups. The outcome of the present study shows that the age of a patient does not determine their compliance to the treatment regimen, hence health education intervention should be targeted to all the patients in the referral hospital to ensure compliance. The finding corresponds with the observations of Mbuti et al.[19] that reported no significant association between age and compliance to treatment regimen after post-intervention. Findings are in disagreement with the findings of a study done in South Africa by Garfar et al.[20] that observed a significant association between participants' age and compliance level. The similarity and difference with previous studies showed that each PTB patient required adequate health education during their clinic days.

Conclusion

The long duration of taking TB medications, drug side effects that caused them to stop taking their medication regimen, and lack of access to free medications were factors affecting non-adherence

to medication regimens by the intervention groups, compared to the control groups' that identified a long duration of taking medication and the attitude of healthcare professionals. These factors that contribute to non-adherence to the treatment regimen had a much lesser impact on the intervention group than on the control group after health education intervention. The influence of age on participants' compliance levels was not statistically significant for those in the control and intervention groups before and after health education intervention. There is a need to adopt tuberculosis health education as part of the referral Hospital's management policy and should be made available and reinforced on each clinic day.

Acknowledgements

None

Conflicts of interest

There are no conflicts of interest.

References

1. Kooffreh M, Offor J, Ekerette E, et al. Prevalence of tuberculosis in Calabar, Nigeria: a case study of patients attending the outpatients department of Dr Lawrence Henshaw memorial hospital, Calabar. *Saudi Journal of Health Sciences.* 2016;5(3):130–133.
2. Barberis I, Bragazzi NL, Galluzo L, et al. The history of tuberculosis: from the first historical records to isolation of Koch's bacillus. *J prev med hyg*. 2017:58(1):9–12.
3. National tuberculosis and leprosy control programme. First national TB prevalence survey, Nigeria, 2012.
4. Ibekwe MU, Nwosu C. Pure tone audiometric findings in patients on second line treatment for multidrug resistant tuberculosis. *Port Harcourt Med J*. 2017;26(10):97–101.
5. Tola H, Shojaeizadeh D, Garmaroudi G. Tuberculosis treatment non-adherence and lost to follow up among TB patients with or without HIV in developing countries: a systematic review. *Iran J Public Health.* 2015;44(1):1–11.
6. Mangveep 1, Idris H, Patrick N, et al. Factors associated with interruption of treatment among pulmonary Tuberculosis Patients. *Pan Afr Med J.* 2014;17:78.
7. Multidrug and extensively drug-resistant TB (M/XDE-TB) 2010 global report on surveillance and response. *WHO*. 2010.
8. Fereidouni Z, Sabet R, Hariri G, et al. Moving into action: the master key to patient education. *The Journal of Nursing Research.* 2019;27(1):1–6.
9. Global tuberculosis report. *WHO*. 2014.
10. Global tuberculosis control surveillance, planning and financing. *WHO*. 2016.
11. The impact of knowledge: patient education improves compliance and outcomes. *The Wellness Network.* 2016.
12. Federal ministry of health. National tuberculosis, leprosy and burilli ulcer management and control guidelines 6th edition. Federal ministry of Health, Abuja, 2015.
13. EL Muttalut, Khidir E. Factors contributing to non-compliance with treatment among tuberculosis patients kassala state – Sudan – 2016. *Int J Public Health Epidemiol.* 2017:6(3):332–338.
14. Iweama, C N, Agbaje OS, Umoke P, et al. Nonadherence to tuberculosis treatment and associated factors among patients using directly observed treatment short-course in north-west Nigeria: a cross-sectional study. *SAGE Open Med*. 2021;9:2050312121989497.
15. Tola H, Shojaeizadeh D, Tol A, et al. Psychological and educational intervention to improve tuberculosis treatment adherence in Ethiopia based on health belief model: a cluster randomized control trial. *PLoS One.* 2016;11(5):0155147.
16. Mbuti H, Oguya F. Randomized control trial study on the effect of health education in promoting adherence to treatment among the urban and rural tuberculosis patients in Kenya. *Research Square.* 2020.
17. Lee S, Khan OF, Seo J, et al. Impact of physician's education on adherence to tuberculosis treatment for patients of low socioeconomic status in Bangladesh. *Chonnam medical journal.* 2013;49(1):27–30.
18. Daniel O, Osman E, Bakare R, et al. Ofloxacin resistance among mycobacterium tuberculosis isolates in two states of south-west Nigeria. *Afr J Respir Med*. 2011;6(1):18–20.
19. Mbuti H, Oguya F. Randomized control trial study on the effect of health education in promoting adherence to treatment among the urban and rural tuberculosis patients in Kenya. *Research Square.* 2020.
20. Gafar MM, Nyazem NZ, Dambisya YM. Factor influencing treatment outcomes in tuberculosis patients in limpopo province, South Africa, from 2006 to 2010: a retrospective study. *Curationis.* 2014;37(1):1–7.