

Factors Influencing Tuberculosis Medication Adherence in a Tertiary Health Institution in Nigeria

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ABSTRACT

Background: Adherence to tuberculosis medication has been shown to be a major determinant of tuberculosis treatment outcomes.

Objectives: This study was done to determine the extent of association between the level of adherence and factors influencing TB medication adherence; and the impact of a cognitive intervention.

Methods: A cross-sectional study using a three-sectioned questionnaire was used to determine and evaluate the effect of the factors on TB medication adherence in 272 patients between July 2010 and June 2012. Data analysis was done with the aid of SPSS software version 16, Chicago, Illinois.

Results: The adherence level of the respondents was 70.3% from patient records. The factors significantly associated with TB medication adherence were: patient, social and health service factors ($p < 0.05$). Knowledge level was a predictor of tuberculosis medication adherence (7 times). A cognitive intervention was done, resulting in a positive impact, where patient's average TB knowledge score was 1.81 ± 0.18 and 3.86 ± 0.08 out of 4, pre- and post-intervention respectively. Statistical analysis also showed a significant difference between pre- and post-cognitive intervention: $P < 0.001$.

Conclusion: Patients with a high knowledge level of TB are more likely to adhere to taking their medications. Therefore, further cognitive interventions can be made to improve adherence and other treatment outcomes.

Key words: Adherence, Tuberculosis medication, DOTs, Treatment outcomes

Les Facteurs qui Influencent sur l'adhérence aux Médicaments Antituberculeux dans une Institution de santé Tertiaire au Nigeria

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RESUME

Contexte : L'adhérence aux médicaments antituberculeux s'est avérée un déterminant majeur dans l'efficacité du traitement de la tuberculose.

Objectifs : Cette étude avait pour objectif de déterminer la synergie entre le niveau d'adhérence et les facteurs qui influencent sur l'adhérence aux médicaments antituberculeux et l'impact d'une intervention cognitive.

Méthodologie : A l'aide d'une étude portant sur un échantillonnage démographique et basée sur un questionnaire triparti, nous avons déterminé et évalué l'effet des facteurs sur l'adhérence aux médicaments antituberculeux chez 272 malades entre juillet 2010 et juin 2012. L'analyse des données a été faite au moyen du logiciel SPSS version 16, Chicago, Illinois.

Résultats : Le niveau d'adhérence chez les répondants était de 70,3% selon les dossiers des malades. Les facteurs liés, d'une façon significative, à l'adhérence aux médicaments antituberculeux étaient : les malades et des facteurs concernant les services sociaux et sanitaires ($p < 0,05$). Le niveau de connaissance était une variable indépendante de l'adhérence aux médicaments antituberculeux (sept fois). Une intervention cognitive entreprise a donné lieu à un impact positif, là où, par rapport à la connaissance sur la tuberculose, les malades ont eu, sur 4, les points moyens de $1,81 \pm 0,18$ avant l'intervention cognitive et de $3,86 \pm 0,08$ après. L'analyse statistique a montré aussi une différence importante entre les points d'avant et après l'intervention cognitive ($p < 0,001$).

Conclusion : Les malades qui possèdent une connaissance d'un niveau élevé sur la tuberculose sont plus susceptibles de prendre fidèlement leurs médicaments. Par conséquent, de plus amples interventions cognitives peuvent se faire pour améliorer l'adhérence et d'autres résultats du traitement.

Mots clés : Adhérence, médicaments antituberculeux, DOTS (RTDO), Résultats du traitement.

INTRODUCTION

Adherence is defined by the World Health Organization (WHO) as the extent to which a person's behaviour- taking medication, following a diet, and or executing lifestyle changes, corresponds with agreed recommendations from a health care provider.¹ Medication non-adherence is the number of doses not taken or taken incorrectly that jeopardizes the patient's therapeutic outcome.² Adherence to tuberculosis (TB) medication has been shown to be a major determinant of tuberculosis treatment outcomes. Non-adherence is the most serious problem hindering tuberculosis treatment and control, contributing to the development of resistance, increased morbidities and mortalities.³ The emergence of Multi-Drug Resistant TB (MDR-TB), Extensive Drug Resistant-TB (XDR-TB) and increase in the incidence of HIV/AIDS and TB co-infection has made TB a major cause of illness and death worldwide. Nigeria is ranked 5th among 22 high-burden countries in the world and has the 2nd highest burden in Africa.⁴ In 2010, there were 8.8 million incident cases of TB, 1.1 million deaths from TB among HIV-negative people and an additional 0.35 million deaths from HIV-associated TB.⁵ In 2009 there were almost 10 million children who were orphans as a result of parental deaths caused by TB. The absolute number of TB cases has been falling since 2006 (rather than rising slowly as indicated in previous global reports).⁵ Directly Observed Therapy short course (DOTs) is the TB treatment strategy adopted globally and is implemented in 184 countries that account for 99% of all estimated TB cases in 2006. Between 1995 and 2009, a total of 41 million tuberculosis patients were successfully treated and up to 6 million lives were saved, due to effective international protocols for the treatment of tuberculosis.⁶ Targets for global control have been set within the framework of the Millennium Development Goals (MDGs). MDG number 6 target 8 is to halt and reverse TB incidence by 2015. This can be measured using indicators 23 and 24 of target 8 of the MDG number 6. Indicator 23 is the Prevalence of death rates associated with TB while indicator 24 is the proportion of TB cases detected and cured under DOTs. The greater the impact of TB control in incidence, the more likely it is that prevalence and death rates will be halved by the MDG deadline of 2015. Current forecasts however suggest that the Stop TB Partnership's target of halving TB prevalence by 2015 compared with a baseline of 1990 will not be met.⁵

In 2003, the World Health Organization declared non-adherence to medical treatment a major public health concern, particularly among patients with chronic conditions.¹ In Zambia, a study established that 29.8% of TB patients failed to comply with TB drug-taking regimen once they started feeling better.⁷ Non-adherence levels were 5.4% for 280 patients in Nigeria's city of Ilorin⁸ and 12% in China for 670 patients.⁹ In 2006 Bam et al. reported a defaulting rate of 10% in Nepal.¹⁰ Erhabor, in his study in Ile-Ife in 2000, reported a non-adherence level of 27%.¹¹ Non-adherence to pharmacotherapy has been reported to range from 13%-93%, with an average rate of 40%. The problem encompasses all ages and ethnic groups.² As with HIV treatment, TB therapy requires high (> 90%) compliance to facilitate cure. Good adherence results in high compliance and absence of treatment default.¹² The negative impact of non-adherence was seen in a study where non-adherent patients took longer than adherent patients to convert to negative culture results (254 versus 64 days), were more likely to acquire drug resistance, and required longer treatment regimens (560 versus 324 days).¹³ Studies have reported various associated factors influencing tuberculosis medication adherence, which this study also intended to achieve. They include: Patient/Personal, Social, Structural and Health Care Service factors.^{14, 15} The study also determined the extent of the association between the factors and the level of adherence as well as the impact of a cognitive intervention.

METHODS

Study design/Setting

The cross-sectional study, with a retrospective review of patients' record was carried out in a DOTs Clinic in Plateau State Specialist Hospital (PSSH), located in Jos North Local Government Area of Plateau State, Nigeria. Most of the DOTs patients live within close proximity to the hospital. DOTs Clinic PSSH was established in 2000. Treatment of TB is free and consists of a standard 8-month regimen (2 months of an intensive phase of combined Fixed Dose Combination-FDC made up of Rifampicin, Isoniazid, Pyrazinamide and Ethambutol [RHZE], followed by a 6-month continuation phase of combined Ethambutol and Isoniazid [EH]). Inclusion Criteria were: Persons diagnosed with TB and currently attending DOTs Clinic PSSH and adults and children (male and female) aged 15-75 years.

Sample size

A minimum sample size of 225 was obtained using the formula: $N = \frac{Z^2 pq}{d^2}$ where the prevalence rate of TB globally (p) was 0.178 (WHO, 2011) and margin of error (d) was 0.05. In all 272 patients participated in the study, while 21 patients participated in the intervention study.

Data collection

A three-sectioned semi-structured questionnaire was used to collect data from the patients. The first section contained questions to elicit demographic information, the second was on respondents' understanding of TB and the third section was on factors influencing TB medication adherence. Patient records were used to determine TB treatment outcomes, as well as to measure adherence levels. The questionnaire items were constructed and validated using Felton's adherence to treatment manual for health care providers as guide.¹⁶

Ethical consideration

Approval for the study was obtained from the Health Research Ethics Committee of Plateau State Specialist Hospital, Jos. It was explained to the respondents that participation in the study was voluntary and information obtained from them would be treated confidentially.

Data analysis

Data was collated and analyzed by Chi-square to and paired t-test with the aid of SPSS software version 16, Chicago, Illinois.

RESULTS

Two hundred and seventy-six (276) copies of the questionnaire were distributed to the respondents between July 2010 and June 2012. Two hundred and seventy-two (272) of them were correctly filled and returned, giving a response rate of 98.6%.

A. Demographic characteristics

A higher percentage of the TB patients were males (59.6%) than females 40.4%. Most of the patients were self and government employed (33.5% and 30.1% respectively), most of the patients were secondary school holders (43%), majority of the TB patients were married (62.9%). A higher percentage of the patients (63.8%) were within the productive age (21-40 years).

B. Adherence level: The level of adherence from patient report (questionnaire) was 233 (85.7%) (N=272).

C. Reasons for defaulting: Thirty-eight patients defaulted by skipping medication and twenty-seven by skipping clinic visits. The most frequent reason for skipping medication taking was forgetfulness (44.7%), while most patients (37%) missed their clinic visits because of the side effects of the medications.

Table 1: Reasons for defaulting

Reason for not taking medications (N = 38)	Frequency	Percentage
I felt better	7	18.4
Too many drugs	2	5.3
Side effects	7	18.4
No transport money	2	5.3
Stigma	3	7.9
Forgetfulness	17	44.7
Reason for missing clinic visit (N=27)		
High transport cost	4	14.8
Stigma	2	7.4
I felt better	5	18.5
Side effects	10	37.0
Forgetfulness	6	22.2

D. Knowledge assessment: Majority of the patients had an average level of knowledge of TB, where most of them did not know the cause of the disease as seen in Tables 2a and 2b.

Table 2a: Knowledge level of respondents

Knowledge Level	Frequency	Percentage
Low	60	22.1
Average	115	42.3
High	97	35.7

Table 2b: Percentage of respondents with correct knowledge of subject area assessed

Subject area	Frequency	Percentage
Cause of disease	118	43.4
Mode of spread of disease	195	71.7
Cure of disease	264	97.1

E. Association between adherence and TB patient's demographic factors

None of the demographic variables was significantly associated with adherence— Table 3.

Table 3: Association between adherence and TB patient's demographic factors

Variable	N	Did not adhere	Adhere	Chi -sq value	P-value
Gender					
Male	162	21 (13.0)	141 (87.0)	0.617	0.432
Female	110	18 (16.4)	92 (83.6)		
Occupation					
Self – employed	91	12 (13.2)	79 (86.8)	2.060	0.841
Org. Employed	82	13 (15.9)	69 (84.1)		
House wife	46	8 (17.4)	38 (82.6)		
Applicant	19	1 (5.3)	18 (94.7)		
Student	33	5 (15.2)	28 (84.8)		
Others	1	0 (0)	1 (100.0)		
Education					
Tertiary	66	11 (16.7)	55 (83.3)	0.391	0.942
Secondary	117	16 (13.7)	101 (86.3)		
Primary	66	9 (13.6)	57 (86.4)		
No formal education	23	3 (13.0)	20 (87.0)		
Marital status					
Single	85	13 (15.3)	72 (84.7)	3.881	0.275
Married	171	22 (12.9)	149 (87.1)		
Divorced	8	3 (37.5)	5 (62.5)		
widow/Widower	8	1 (12.5)	7 (87.5)		

Org. = Organization (government and private)

F. Association between adherence and factors influencing TB medication adherence

Knowledge level (patient/personal factor), support (social factor), frequency of missing clinic visit

(structural), treatment received from health workers during clinic visits (health service factor) were significantly associated with adherence as seen in table 4.

Table 4: Association between adherence and factors influencing TB medication adherence

Variable	N	Not adhere N (%)	Adhere N (%)	Chi-Sq value	P-value
Personal Factors :					
Knowledge level of respondents					
Inadequate	60	15 (25.0)	45 (75.0)	7.125	0.008*
Adequate	212	24 (11.3)	188 (88.7)		
Belief of TB cure					
Yes	267	38 (14.2)	229 (85.8)	0.540	0.763
No	1	0 (0)	1 (100.0)		
Don't know	4	1 (25.0)	3 (75.0)		
Social Factors:					
Disclosure of TB status					
Family	248	34 (13.7)	214 (86.3)	2.271	0.518
Friend	15	4 (26.7)	11 (73.3)		
Pastor/Imam	2	0 (0)	2 (100.0)		
Nobody	7	1 (14.3)	6 (85.7)		
How do they treat you? (Support)					
Encourage	258	33 (12.8)	225 (87.2)	11.536	0.003*
Don't care	11	4 (36.4)	7 (63.6)		
Keep away from me	3	2 (66.7)	1 (33.3)		
Structural Factor:					
Adherence to clinic appointment					
Never	245	12 (4.9)	233 (95.1)	179.1	0.000*
Sometimes	26	26 (100.0)	0 (0)		
Often	1	1 (100.0)	0 (0)		
Health Service Factor:					
Treatment received from doctor					
Satisfactory	206	31 (15.0)	175 (85.0)	14.056	0.001*
Fair	62	5 (8.1)	57 (91.9)		
Bad	4	3 (75.0)	1 (25.0)		
Treatment received from the nurse					
Satisfactory	214	31 (14.5)	183 (85.5)	6.175	0.046*
Fair	57	7 (12.3)	50 (87.7)		
Bad	1	1 (100.0)	0 (0)		
I take my drugs with					
Food	9	4 (44.4)	5 (55.6)	7.787	0.020*
Without food (on empty s tomach)	255	33 (12.9)	222 (87.1)		
Between meals	8	2 (25.0)	6 (75.0)		

* P < 0.05

G. Multivariate adjusted odd-ratios of adherence

The logistic regression in Table 5 showed a significant association between knowledge level and adherence,

where patients with adequate knowledge of TB were 7 times more likely to adhere to TB medication taking (CI: 2-25) than those with inadequate knowledge level of TB.

Table 5: Multivariate adjusted odd-ratios of adherence

Variable	% adherence	OR (CI)	P-value
Knowledge level of respondents			
Inadequate	75.0	Referent	
Adequate	88.7	6.771 (1.797-25.511)	0.005*
How do they treat you? (community members)			
Encourage	87.2	54.860 (2.826-1065)	0.008*
Don't care	63.6	2.396	0.998
Keep away from me	33.3	Referent	
Treatment received from the doctor			
Satisfactory	85.0	0.544 (0.000-2018)	0.889
Fair	91.9	1.913 (0.002-1643)	0.851
Bad	25.0	Referent	
Treatment received from the nurse			
Satisfactory	183 (85.5)	2.961	1.000
Fair	50 (87.7)	7.065	1.000
Bad	0 (0)	Referent	
I take my drugs with			
Food	5 (55.6)	1.112	1.000
Without food (on empty stomach)	222 (87.1)	0.000	0.999
Between meals	6 (75.0)	Referent	
Frequency of missing clinic visit			
Never	233 (95.1)	4.580	0.999
Sometimes	0 (0)	0.919	1.000
Often	0 (0)	Referent	

H. Intervention

Maximum "mean score" is 1.00, which means 100% of respondents got the question correctly. Therefore, the

percentages of respondents with correct knowledge of the cause of TB were 14% and 86% pre- and post-intervention respectively from Table 6.

Table 6a: Intervention analysis

	Mean score \pm SEM	P-value*
Pre -intervention	1.81 \pm 0.18	0.000
Post -intervention	3.86 \pm 0.08	

N=21; * P < 0.01

Table 6b: Effect of intervention on knowledge area assessed

Knowledge area	Mean score \pm SEM		P-value
	Pre -intervention	Post -intervention	
Cause of TB	0.14 \pm 0.08	0.86 \pm 0.08	0.000
Spread of TB	0.24 \pm 0.10	1.00 \pm 0.00	0.000
Cure of TB	0.81 \pm 0.09	1.00 \pm 0.00	0.042
Site of infection	0.62 \pm 0.11	1.00 \pm 0.00	0.002

DISCUSSION

Level of adherence

The level of non-adherence in Plateau State Specialist Hospital was 14.7% from patient report (questionnaire), and 29.7% from patient's records. Patients may perceive that adherence to treatment is one of the duties expected of the 'good patient' and may be reluctant to admit to non-adherence because they fear that this will offend or disappoint their health worker or risk their disapproval. Consequently, in an attempt to present themselves as more adherent, patients may create a falsely elevated adherence score by taking more medication immediately prior to testing or by under-reporting non-adherence. The above may explain some of the reasons for the difference in adherence levels between that from patient report and patient records. This necessitates the need for proper medication education and adherence counseling, where patients are educated on the importance of adhering to medication taking to improve adherence levels, as well as the need for honest reporting of defaulting so that the definition of adherence comes into play (negotiation between the patient and the health worker).

The non-adherence level of 29.7% was high compared to the standard of 5% or less as given by the National Tuberculosis and Leprosy Control Programme in 2008.¹⁷ The most frequent reason for patients' defaulting was forgetfulness, necessitating again the need for a cognitive intervention where patients are educated on the disease and the need for absolute adherence to medication taking. As with HIV treatment, TB therapy requires high (> 90%) compliance to facilitate cure. Good adherence results in high compliance and absence of treatment default.¹²

Demographic factors

None of the demographic factors was significantly associated with adherence. This was similarly observed in other researches.^{7,11,18}

Patient/Personal factor

Most of the patients had average knowledge about TB. There was a significant relationship between patient knowledge level about TB and adherence; therefore, the more the knowledge level of the TB patients about TB, the more likely they would adhere (7 times) to taking their anti-TB medications. During

the knowledge intervention, most of the patients knew the main cure for TB and the main sites of TB infection (81% and 62% respectively). This increased to 100% in both cases after the intervention. However, only 14% of the 21 patients knew the cause of TB and 24% knew the main mode of spread/ transmission. These also increased to 86% and 100% respectively after the intervention. Similar studies have reported that the long treatment period was poorly understood by patients and adherence appeared to be facilitated where patients understood the importance of completing treatment.^{10,14,19}

The cognitive intervention done generally showed an increase in knowledge level after the intervention (3.86 ± 0.08), which was significantly related to the pre-intervention (1.81 ± 0.18), as most of the patients remembered what they were taught. Therefore, the more the patients were educated about TB, the more likely they would adhere to taking their anti-TB medications.

One of the TB patients, who was interviewed two weeks after education, reported: (translated from Hausa language) "You said a germ causes TB which we cannot see with our eyes. It is transmitted mainly through coughing, so we should always have a white handkerchief to cover our mouths when coughing to avoid giving another person the disease." Thiam's 2007 interventional study similarly showed that treatment outcome in terms of successful treatment was also seen to improve with medication education/counseling (88%) compared to the control group (76%). The proportion of patients defaulting was reduced in the intervention group to 5.5%, compared with 16.8% in the control group.²⁰

Social factor

Those who knew that the patients had TB (disclosure) was not as important (not significant) as the support they needed in the course of their treatment (significant); therefore, the more encouragement and support TB patients had from those who know they have TB, the more they would adhere to taking their anti-TB medications. Patients with social support networks have been shown to be more adherent and patients who believe in the seriousness of their problems with tuberculosis are more likely to be adherent.¹⁸ Family support, involvement in TB clubs and adequate knowledge about the disease have been shown to be facilitators of TB treatment adherence.^{20,21} In their studies researchers found that fear of catching the disease was a factor in household members' negative reactions to care of the TB patient.^{22,23}

Health service factors

The treatment received by the TB patients from the health workers was significantly associated with adherence, implying that the more satisfied the patients were with the treatment they received from health workers when they came to the DOTs clinic for treatment, the more they would adhere to taking their medication. Studies that have been carried out in Africa and other parts of the world found that health care providers discriminated against AIDS patients. The type of language used at both the health facility and the homes has a strong bearing on the reactions patients may have and their compliance with treatment.^{23,24}

Structural factors

Patients who did not pay for TB treatment (85.6%) adhered to medication taking, but this was not significantly associated with adherence. Studies however provided evidence that free treatment is very important to ensure patient adherence. Structural barriers to adherence include: lack of money to pay for transportation, long distance from clinics, and the difficulties associated with daily treatment and rigid routines at health facilities.^{11,16,25}

Two out of the thirty-eight (38) patients did not take their medications because of high transport costs, while 4 out of the 27 patients missed their clinic visit due to high cost of transport as well, as shown in Table 1. Frequency of missing clinic visits was significantly associated with adherence (adherence to clinic appointment in Table 4), implying that patients who never missed their clinic visits were more likely to adhere to taking their medication than those who missed their clinic visits. This is because it is during these visits that they get their medicines refilled and discuss their health welfare and progress with their health worker(s).

The limitations to this study were that not all of the respondents agreed to participate in the study. Secondly, the factors influencing tuberculosis medication adherence were obtained solely from patient report, with a difficulty to verify the truth from the report. It was also observed that no pharmacist was involved in TB management, particularly to offer adherence counseling with respect to medication taking (medication education) and the Drug Supply Management of anti-TB medications. Therefore, it was recommended that pharmacists be involved in tuberculosis treatment and the other health workers should offer more educational services on TB management to improve treatment outcomes.

CONCLUSION

The level of adherence to TB medication taking in DOTs clinic, PSSH was (85% from patient report and 70.3% from patient records), compared to the standards of 95% and above. The factors significantly associated with medication adherence to tuberculosis were patient knowledge, support, patient satisfaction with health worker's service, and patient's visit to the clinic. Cognitive intervention showed a positive impact. Since knowledge was a predictor of adherence level in PSSH, more researches on cognitive intervention as it applies to PSSH should be carried out to achieve better treatment outcomes.

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