Tuberculosis Medication Adherence among TB-HIV Co-infected Persons undergoing Concomitant Treatment in Selected Local Governments in a North Central State in Nigeria

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Abstract

The aim of this study was to investigate Tuberculosis medication adherence among patients undergoing concomitant treatment for HIV and TB in selected Local Government Areas of Benue State, Nigeria. The study adopts a cross-sectional descriptive survey design using a quantitative instrument to generate information on factors that have significant influence on TB medication adherence among persons using concurrent TB-HIV medication.

The overall rate of adherence was 72.7%. Perception of TB disease and TB medication, Family and peer support, Health Service factors, Media and Policy were positively and significantly associated with adherence practice among participants in the study. The study revealed a high prevalence of knowledge (96%) (9.6±0.86) about TB disease among respondents, although knowledge had no significant association with TB medication adherence among the study group. In relation to the socio-demographic characteristics of respondents, analysis of age, gender and level of education did not reveal any significant association with medication adherence and likewise marital status or living arrangement.

The study concluded that factors associated with adherence TB medication adherence among persons undergoing concomitant treatment are factors that could be modified with concerted efforts and strategies by stakeholders and health programs to improve adherence levels and cause a decline in the level of non-adherence (27.3%) reported in the study. The study recommends further studies to assess factors that could provide evidence for interventions to help persons suffering from co-morbidities like TB and HIV.

Keywords: TB, Medication, Concomitant, Adherence, Factors, HIV.

Introduction

In the 21st century, Tuberculosis still remains a formidable public health challenge and is among the top infectious disease killers in the world. On the back of the HIV epidemic in the late 20th century, Tuberculosis became the foremost opportunistic infection in patients suffering from HIV/AIDS and it quickly morphed into the number one killer of people living with HIV/AIDS (PLWHA) at which point mortality and morbidity attributed to the disease became a critical global public health concern. Tuberculosis (TB) is an airborne curable contagious disease mostly caused by *Mycobacterium tuberculosis*. TB mostly affects the lungs, but can also affect other parts of the body, such as abdomen, lymph nodes, kidneys and the spinal cord. It is called a pulmonary infection when it affects the lungs and referred to as Extra pulmonary tuberculosis when it affects any other parts of the body.[1]

Tuberculosis is a major public health problem in Nigeria, a country of over 160 million inhabitants, with the country currently ranked 10th among the 30 high TB burden countries of the world and the 4th highest in Africa [2]. According to the 2014 Global Tuberculosis report, WHO estimates that 210,000 new cases of all forms of TB occurred in Nigeria, equivalent to 133/100,000 population. In 2012, there were estimated 320,000 prevalent cases of TB in Nigeria, equivalent to 199/100,000)[3].

The convergence of the TB and HIV dual epidemic, is of great public health challenge in many developing countries. It is believed that

worldwide, the TB epidemic is fueled by the HIV epidemic [4]. TB is regarded as the foremost cause of death among people living with HIV/AIDS, making it the single most important opportunistic infection in these patients [1]. The chances of death, in TB-HIV coinfected individuals are higher than in patients with either HIV or TB and there is a high correlate of association in the progression of TB with prevalent HIV infections[5]. Nigeria is a country among the 30 high-burden countries and one of the top three of ten countries that accounted for 80% of the lag between TB incidence and reported cases in 2018 [6]. Benue state has the third highest TB burden in the country with a TB prevalence rate of about 4.1% along with a high HIV prevalence, which drives the TB disease burden in the state [6]. Some high population density areas of the state have significant number of persons who are coinfected with TB and HIV and therefore are a good focus area for this study to be carried out.

With the rise in the number of individuals coinfected with TB and HIV, early detection, diagnosis, prophylaxis, treatment and prevention of TB has become increasingly challenging. The Global response to TB is the use of a short course of Antibiotic therapy usually for 6-months or more. Low medication adherence levels and poor treatment outcomes had led to the development of the Directly Observed Therapy Short course (DOTS) strategy to promote patient accountability and improve medication adherence as adherence to medication is highly important in reducing the transmission of infection and eventual elimination of the disease in line with global targets. Treatment default may aggravate disease, encourage emergence and development of multidrug resistance as is already the case with Multi-Drug Resistant Tuberculosis (MDR-TB), prolong infectivity, increase treatment failure, cause a rise in poor health outcomes and also increase treatment related morbidity and mortality.

Non/Poor adherence to prescribed tuberculosis medication is the most important cause of treatment failure in tuberculosis programs [7]. In Nigeria, tuberculosis treatment success is 71%; far below the World Health Organization (WHO) target of 90% [6]. The monitoring of medication adherence is a vital part of surveillance needed to successfully eliminate TB, especially for persons coinfected with HIV and TB.

This study reports on the level of TB medication adherence and associated factors and in patients coinfected with HIV and TB who are undergoing concomitant treatment in a relatively high TB/HIV coinfection prevalence area of Benue State, Nigeria.

Methodology

Setting and study population

The study adopted a descriptive survey design which was conducted in selected local governments of Benue State, a North Central state in Nigeria. A community and facility based cross-sectional study with quantitative method of data collection was carried out among TB/HIV co-infected patients receiving treatment at home or attending DOT centers in the selected local governments. The DOT centers usually are based in the local government headquarters and are made up of primary and secondary health facilities that provide in-patient and out-patient TB care working jointly with the State Tuberculosis and Leprosy Control Program, State Ministry of health, National Tuberculosis and Leprosy Control Program and the World Health Organization.

Concomitant treatment was defined as a TB/HIV co-infected patient receiving simultaneous TB treatment and ART for a minimum of one month. Adherence to concurrent treatment was defined as taking ≥ 95% of TB doses by directly observed therapy (DOT, i.e. taking doses daily at the clinic under supervision of a clinician or at a mutually agreed upon community location under supervision of a community treatment supporter).

Sampling technique and sample size

Selection of local governments was done using a random sampling technique from a list of high TB/HIV burden local governments in the state as provided by the state TB control program. To account for spread and representation across the study population, the high burden LGAs in the state were grouped into the three (3) senatorial zones in the state before random sampling was used to select the LGAs in the study, making sure the study included at least one LGA from each senatorial zone.

The sample size was computed using the formula for the normal approximation to the hypergeometric distribution that estimates sample size for a finite population with a 5% level

of precision and 95% confidence level. The estimated sample size for the study was 131 including the addition of 10% attrition/Non-response rate. The obtained sample size was purposively scaled up to cater for the inclusion of all patients that can be found within the study population. A total of 149 patients were approached and recruited into the study. Same number of questionnaires were administered and a total of 143 copies were properly filled and returned representing a 96% response rate and these were then included in the data analysis.

Research tool/instrument

The questionnaire comprises of five (5) sections (55-item questionnaire) and data generated follows same procedure as set in the questionnaire. The first section (section **A**) comprises of demographic data such as Age, Gender, Ethnic Origin, Level of education, employment status, living arrangement and Religion. Section A measured the Predisposing factors; knowledge and perception. Knowledge about TB and TB medication was measured with 9 question items with a maximum score of 1 point for each question. This section was measured on 9-point reference scale with dichotomous (Yes/No) responses. Perception of TB and TB medication among study respondents was measured using 4-point Likert scale on a 39-point reference scale consisting 13 questions with each having a maximum score of 3 points.

Section C measured environmental/reinforcing factors; family, peer support, health service factors, Media influence. This section consists of 16 question items with a maximum score of 3 points for each question which was measured on a 48-point reference scale using a 4-point Likert scale.

Section D measured Enabling factors including policy governing TB medication and treatment costs, availability of medication and accessibility to medication or treatment centers. The section consists of 5 questions with dichotomous (true or false) responses and was measured on a 15-point reference scale.

Section E measures the level of medication adherence among the respondents and self-reported reasons for default or non-adherence. This was measured on a 6-point reference scale while respondents are able to select from a list of reasons for default as applies to them, with space provided to identify in detail other reasons for default if not provided in the instrument.

Likert rating scale used for this study ranged from strongly disagree, disagree, agree and strongly disagree with scores assigned from 0 to 3 on the basis of correctness in relation to the variable being measured.

Statistical issues

The quantitative data was entered in Statistical Package for Social Sciences (SPSS) version 23 (SPSS, IBM Corp., USA) for analysis. Categorical data (e.g. Socio demographic data) was summarized as percentages and frequencies. Likert rating scales were used to score the independent variables. Correlation analysis using cross tabulations was carried out to determine associations between the independent variables, group of factors and adherence practice. Regression analysis was carried to examine the strength of associations between the study variables and the dependent variable. A 5% level of significance was used and all tests were two tailed and carried out at 95% CI. Variables with p-values less than 0.05 at the bivariate level were considered statistically significant.

Results

A total of 143 participants were enrolled into the study. Analysis of demographic characteristics of the respondents shows that the respondents within age bracket 26-33 years constitute the majority, which is represented by 25.2%, followed closely by respondents within age bracket 34-41 years (22.4%), 42-49 years (18.2%), 50-57 years (15.4%), 18-25 years (12.6%) and respondents above 57 years (6.3%). The predominant ethnic affiliation among the respondents was the Tiv ethnic group with 81.8%, followed by Idoma (11.2%), Igede (1.4%) and other tribes including Hausa, Igbo and Yoruba making up 5.6%. With regards to the gender of the respondents, the study established that 52.4% were Males and 47.6% were Females, with males being the majority. It is also indicated that of the 143 respondents, 58.7% were married, 30.1% were single, 8.4% were widowed and 2.8% were separated or divorced. Findings related to living arrangements revealed that 11.9% of respondents lived alone, 83.9% lived with family and 4.2% lived with friends. This inferred that most of the respondents still had familial associations and interaction. Relating to

occupation of respondents, majority (44.8%) were farmers, 17.5% self-employed, 14.0% unemployed, with Private and Government employees making up 15.4% of the participants in the study and 8.4% are housewives. Findings revealed that the proportion of respondents who had no formal education and those who had primary education were equal (20.3%), majority (43.4%) had secondary education and 16.1% had tertiary education.

Table 1. Socio-Demographic Characteristics of Respondents in the study

Socio-demographic variable	Respondents in the Study N = 143	
	Frequency (n)	**Percent (%)**
Age		
18-25 years	18	12.6
26-33 years	36	25.2
34-41 years	32	22.4
42-49 years	26	18.2
50-57 years	22	15.4
Above 58 years	9	6.3
Ethnicity		
Tiv	117	81.8
Idoma	16	11.2
Igede	2	1.4
Others	8	5.6
Gender		
Male	75	52.4
Female	68	47.6
Marital Status		
Single	43	30.1
Married	84	58.7
Widowed	12	8.4
Separated/Divorced	4	2.8
Education		
No Formal Education	29	20.3
Primary	29	20.3
Secondary	62	43.4
Tertiary	23	16.1
Occupation		
Unemployed	25	17.5
Farming	64	44.8
Self-Employed	20	14.0
Housewife	12	8.4
Private Employee	9	6.3
Govt Employee	13	9.1
Living Arrangement		
Alone	17	11.9
With Family	120	83.9
With Friends	6	4.2

Respondents level of adherence

The prevalence of non-adherence to anti-TB drugs was 27.3%. reports on the reasons cited for TB 6.3% of respondents reported that cost of travel from their homes or communities to the health facility was a major reason for treatment default. 4.2% of respondents indicated that adverse side effects experienced upon drug intake was a reason for default. Feeling of cure or

wellness was responsible for default in 8.4% of respondents. 2.8% of respondents cited lack of information about dosage and schedule as reasons for default. 5.6% of respondents reported forgetfulness as a major reason for TB medication default. These findings align with other studies that have been carried out in literature.

Table 2. Categorization of Respondents' level of TB medication adherence

Level of Adherence	Number of Respondents (%)
Non/Poor Adherence	39 (27.3)
Good adherence	104 (72.7)

Table 3. Respondents' reasons for TB medication non-adherence

Reason for default	Number of Respondents (%)
Could not afford cost to get medication	9 (6.3)
Side effects of medications	6 (4.2)
Feeling cured/well	12 (8.4)
Lack of information about regularity of medication (dosage and schedule)	4 (2.8)
Forgetfulness	8 (5.6)

Table 4. Summary of relationships between study variables and TB medication adherence

Variable of Interest	Respondents in this study N=143	
	Pearson correlation (r)	p-value
Comprehensive knowledge about TB disease	0.001	0.792
Perception of TB and TB medication	0.473	0.001*
Family and Peer support for TB medication adherence	0.319	0.001*
Health Service support for TB medication adherence	0.401	0.001*
Accessibility to medication	0045	0.593
Media	0.401	0.001*
Policy regarding TB medication	0.401	0.001*
Side Effects	0.84	0.318

*Statistically significant at P-value below 0.05.

Table 5. Logistic regression analysis of study variables and TB medication adherence

Variable	COR (95% CI)	p-value
Knowledge	1.7(0.38-7.52)	0.49
Perception	1.4(0.74-2.61)	0.00*
Family and Peer support	1.22(0.90-1.66)	0.196
Health Service Factors	1.79(1.29-2.50)	0.00*
Accessibility	0.691(0.27-1.766)	0.44
Media	0.471(0.14-1.59)	0.23
Policy	1.52(0.138-6.684)	0.734
Side Effects	0.21(0.07-0.69)	0.01*

*COR- crude odds ratio, CI - confidence interval.
*Statistically significant at P-value below 0.05.

Discussion

This study was conducted to investigate the factors associated with Tuberculosis medication adherence among TB-HIV co-infected persons undergoing concomitant treatment in selected local government areas of Benue State, Nigeria. The study sought to determine the predisposing factors that are associated with TB medication adherence, to assess environmental factors that would reinforce TB medication adherence, to examine enabling factors that would encourage TB medication among the respondents and also determine the level of medication adherence among study participants. The study hypothesized that there is significant association between perception of respondents about TB disease and their individual adherence behaviors, that there is significant association between support from the health service and TB medication adherence and that there is significant association between accessibility to medication and medication adherence. Relationships between study variables and TB medication adherence were assessed.

Data containing 143 patients were included in this study. This study investigated the level of TB medication adherence among TB-HIV coinfected patients attending DOT centers or undergoing community-based treatment under the assistance of treatment supporters.

In relation to this study, adherence was classified as optimal and suboptimal. Optimal adherence is said to be achieved when a patient scored above 95% in the adherence rating scale as used by the study. This variable was measured on a 6-point reference scale in which respondents who have missed their medication schedules once or more are regarded as non-adherent.

Non-adherence to TB medication as recommended by the World Health Organization could result in the increase of development of drug resistance, prolonged infectiousness, increased spread, and can also cause TB disease relapse and death [6]. The data derived from this study could be useful for health program planning, design, implementation and evaluation of health programs and for resource advocacy and social mobilization.

The study found that there is no significant difference between male and female respondents with regard to TB medication adherence among the study participants. However, forgetfulness was a reason that was cited majorly by females as responsible for treatment default and could be due one or more combination of juggling of work, taking care of the children and general care of the home as the men are largely the bread winners in the family. The majority age group (25.2%) of the respondents was 26-33 years, followed closely by persons between 34-41 years (22.4%). This reinforces the notion that TB mostly affects the most economically active segment of the population especially in developing countries [8]. 78.3% of participants in the study were between the ages of 18 and 49 years old. The study does not find any significant relationship between respondents' ages and medication adherence behavior and is similar to findings in study carried out by Dooley et al in 2011 and Fang et al. in 2019.[9, 10]

The study recorded a high knowledge score with a knowledge prevalence of 96%. 100% of respondents know that the disease is curable and 93% of participants in the study know that they

have to treat TB and HIV at the same time, however, inferential statistics show there is no relationship between level of knowledge and TB medication adherence. This implies that although person undergoing treatment way have good knowledge about the disease and medication, it doesn't always translate to good adherence practices. This agrees with study carried out by Getahun and colleagues in a cohort study carried out in Ethiopia in 2013 to assess the impact of knowledge as a predictor of medication adherence among TB patients.[11]

Perception of TB disease and TB medication had a positive moderate significant association with level of medication adherence among respondents in the study. This indicates that perception has significant influence on the medication adherence of participants in the study. This agrees with studies carried out in a high TB-HIV prevalence province of South Africa and in Uganda [12, 13]. Perception about cause of the disease, severity of disease regardless of coinfection and susceptibility as well as perception about adherence to medication are significant predictors of medication adherence in these persons.

As with many chronic diseases with long treatment durations, support from family, peers and significant others, exerts significant influence on patients' adherence behavior. This study finds that family and peer support had a significant association with level of medication adherence. 95.1% of study participant's reports having adequate support from their family and peers with 83.9% of respondents living with their families. Kebede & Tajure in 2012 reported similar findings where peer and family support showed a strong positive direct correlation with treatment adherence.[14]

Health Service factors that could influence medication adherence were also examined in the study. Interactions with health personnel, comfortability at the health centers on visits, motivation by health workers were all factors that seem to support TB medication adherence among the participants. There was a positive significant association between health service support and TB medication adherence. A significant relationship between health service factors and medication adherence was also reported in a several studies across literature. Findings in this study is similar to that reported by Gebremariam and colleagues in 2010 where the study reported

that poor relationship between providers and patients, as well as misunderstanding and miscommunication between patients and health providers were found to adversely affect adherence.[15]

Regression analysis showed significant association between experience of side effects and medication adherence among the respondents. This aligns with other studies that have shown that side effect of medications and self-efficacy in management of these side-effects have important bearing on adherence [15, 16] and even more so when dealing with concomitant treatment where each therapy may have distinct side effects peculiar to each medication.

This study finds that community support, Media and Policy were factors significantly associated with adherence behavior among participants in the study and can heavily influence adherence behavior, not only for TB medication, but in treatment of other chronic diseases as well. This agrees with findings that have been well documented in previous studies carried out in Nigeria and Ethiopia.[3,17]

The study reports a non-adherence rate of 27.3%. This is in line with studies done in a high TB/HIV burden district of Thailand[18], where a reviewed study reported default rate of 26.5%. Also, in Zambia, a default rate of 29.8% was found [19]. Similarly, In Malaysia, a default rate of 28.8% was found in a prospective cohort study [20]. Patients who have misconceptions about TB and its treatment, with many getting the information from friends or relatives, Patients who thought about disappearance of symptoms as cure tended to have higher default rates. Cost of travel for prescription refill, feelings of wellness, forgetfulness and lack of information were the major reasons for most participants for interruption of taking their medications in this study.

The finding of this study gives evidence-based information for TB control programs and health stakeholders in the region and the information could be used to design strategies and take action to further decrease the level of drug non-adherence to TB medications among TB-HIV coinfected persons undergoing concomitant treatment.

Conclusion and recommendations

This study provides information on level of TB MA in patients coinfected with TB and HIV.

TB/HIV programs are encouraged to not focus solely on patients' cognitive factors such as knowledge or attitudes and perception, but to also consider environmental characteristics, including Media and the health system itself. This study reports on current levels of medication adherence in a high TB/HIV prevalence state indicating sub-optimal Self-Reported Medication Adherence (SRMA). Identified factors should be considered in order to build customized profiles of patients, plan sensitization and awareness programs, plan projects and in health research development and program implementation.

The study revealed factors that were significantly associated with TB medication adherence and also examined the level of medication adherence among participants in the study. The study finds the level of non-adherence among these patients was high. Interventions to reduce it need to be instituted It is imperative that the default rates be decreased and rates of treatment non-adherence must decline in order to improve treatment outcomes and meet global targets.

Health professionals, health programmers and other stakeholders should give emphasis to changing of perceptions via behavior change communication programs. The health service must continually be optimized to render services that encourage adherence and provide integrated TB-HIV services. Transport costs for patients could be reduced by bringing the services closer to where they live or by providing transport to those who live far. Emphasis must be given to communities with the goal of increasing awareness and improving knowledge on the need for the support of persons with TB disease and avoidance of stigmatization and discrimination of people suffering from TB and HIV.

The Media is a powerful tool for disseminating information regarding treatment adherence, health communication specialists and strategists should create optimized and targeted messages that will provide adequate information about TB disease and TB medication as well as informational support for people undergoing concomitant TB-HIV treatment, with the aim of improving adherence among these persons.

Limitations of the study

Non adherence was assessed according to data provided by participants in the study (Self-Reported Medication Adherence). Patient register was not available for the validation of the reported adherence rates. The study could be conducted using a bigger sample size and more rigorous study designs so that more important associations can be detected. In reporting of adherence rates, patients might be subjected to recall bias. In addition, this study did not assess the frequency of missed medications.

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