Determinants of Treatment Outcome of Public-Private Mix Tuberculosis Control Programme in South-Eastern Nigeria

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ABSTRACT

Background: *Determinants for non-compliance to anti-tuberculosis treatment range from a poor correlation between patient and programme needs and priorities among other socio-economic factors.*

Objectives: *This is to assess determinants of treatment outcome of public private mix tuberculosis control programme in South-Eastern Nigeria.*

Methods: *A retrospective cohort study design using Multivariate Logistic Regression to analyze secondary data set (2007-2010) of patients to assess determinants of TB-Directly Observed Treatment Short course Treatment outcomes in public and private facilities in Anambra State.*

Results: *A total of 2,018 patients (1,899 patients in public health facilities and 119 in private health facilities) were reviewed. The mean ages in public and private facilities were 34.0±4.2 years and 32±3.7 years. Males were 60.0% (1100 patients) and 75%(90 patients) at public and private health facilities respectively. Cure rates of 37.6%(714 patients) and 48.7%(61patients);Defaulter rates of 28.2%(532 patients) and 7.6%(9 patients); Interruption rates of 3.9%(74 patients) and 0%(0 patients); Transfer-out rates of 3.2%(61 patients) and 1.7% (2 patients);Failure rates of 1.9%(36 patients) and 0.8%(1 patient);Death rates of 4.1%(78 patients) and 0.8%(1 patient); and treatment completion rates of 19.7%(375 patients) and 6.7%(8 patients) were found at public and private health facilities respectively.*

Conclusion: *Determinants that affected treatment outcome for public facilities were year, HIV status of patients, category of treatment, sex and age of patients. The determinant for private facilities was only year. Future research should focus on identifying factors that influence health seeking behaviour to accessing care in private facilities.*

Key words: *Tuberculosis, Determinants, Treatments Outcome, Public-Private Mix.*

INTRODUCTION

Tuberculosis(TB) is the leading cause of death from any single infectious disease in the world.[1] Moreover, Nigeria has the highest estimated number of new TB cases among the African countries (200,000 annually). [2] Completion of treatment of active cases is therefore the most important priority of tuberculosis control programmes using Directly Observed Therapy Short course (DOTS) strategy.[3] WHO reports that infection with HIV is the main reason for failure to meet tuberculosis control targets in regions with high HIV prevalence. [4] Moreover, other risks factors that have contributed toward the persistent increase in the burden of tuberculosis in developing countries are political strife and war ,lack of political commitment from government, lack of resources to effectively manage and deliver health care, poverty, alcohol and drug abuse, the long duration of treatment, the need for multiple drugs, socio- economic factors, personalities of patients, and poor monthly compliance of patients to bacteriological surveillance via sputum smear microscopy .[5-9]

Studies in Nigeria report that males have a higher risk of poor treatment outcome than females[10]. Patients with a poor knowledge of tuberculosis, older age , rural residence , smear negative PTB , and on retreatment have a higher risk of having a poor treatment outcome[11.] Determinants for successful treatment might require addressing multiple factors beyond simple supervision of drug intake: HIV status of patients , inadequate health service infrastructure, insufficient decentralization of both diagnostic and treatment services and inadequate human, material and financial

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resources. [11-17] The treatment of TB in Nnewi North Local Government Area (LGA) is organized to follow the National Tuberculosis and Leprosy Control Programme (NTBLCP) guidelines. [18] Although, completion of treatment is monitored primarily by the Department of Health Services Tuberculosis and Leprosy Control Unit (DHSTLCU), Nnewi North LGA, information on treatment outcome of public private mix form of collaboration is rarely reported. The objective of this study is to assess determinants of treatment outcome of public private mix tuberculosis control programme in South-Eastern Nigeria.

METHODS

Nnewi has an area dimension of 72 km^2 and an approximate population of 155,443 (77,517 males and 77,926 females) with average population density of 2159 people per km^2 . [19] Igbo language is the vernacular though English is widely spoken. There are about 64 registered hospitals at Nnewi, 2 missionary hospitals, 1 tertiary (Nnamdi Azikiwe University Teaching Hospital) and 24 primary health centres . [20]

The sampling technique used to select two public health facilities (Nnamdi Azikiwe University Teaching Hospital (NAUTH) and Department of Health Services Tuberculosis and Leprosy Unit (DHSTLCU)) and two private health facilities (Immaculate Heart Catholic Hospital (IHCCH) and Diocese of Anglican Communion Hospital (DACH)) was a multi-stage sampling technique. The study population were tuberculosis patients that accessed anti-tuberculosis care in Nnewi North Local Government Area at NAUTH, DHSTLCU, IHCCH and DACH from the period of 2007 to 2010 (a four year period).

In this retrospective study, patient treatment cards (with information on any of the six treatment outcomes according to WHO[10] and Treatment completion rate outcome according to Maimela [22]), socio-demographic data (age, sex and HIV status), year of treatment initiation and category of DOTS administered were evaluated. Treatment outcome definitions, adapted from an international standard classification[21], were as follows: (1) cured (a smear-positive patient based on the medical record, who had a negative sputum smear during the eighth month of treatment and on at least one previous occasion); (2) died (a patient who died during treatment irrespective of cause (3) failed (a smear-positive patient who remained smear-positive at the fifth month of treatment); (4) defaulted (a patient who did not come back to complete therapy and there was no evidence of cure through the sputum result during the fifth month of therapy); (5) treatment interruption (a patient who did not collect medications for 2 months or more at a particular time or at interval, but still come back for treatment and in the 8th month of treatment, the sputum result was positive); and (6) transferred out (a patient who was transferred to another treatment center and for whom treatment results are not known). In this study, treatment success rate is the percentage of patients who were cured plus those who have completed treatment but without laboratory proof of cure, of new smear positive patients.[22]

Data was analyzed using computer software, SPSS version 17. Statistical significance was carried out using appropriate tests of Multivariate Logistic Regression; statistical significance set at p value < 0.05.

Ethical approval for this study was obtained from the Nnamdi Azikiwe University Teaching Hospital Ethical Committee . Permission to conduct this study was obtained from heads of the four DOTS Centres.

RESULTS

A total of 2,018 patients (1,899 patients in public health facilities and 119 in private health facilities) were reviewed with mean ages of 34.0±4.2 years and 32±3.7 years at public and private facilities respectively. Also, majority were males 60.0% (1100 patients) and 75%(90 patients) at public and private health facilities respectively. One hundred percent of patients were of Igbo origin.

In the public health facilities, 37.6% (714 patients) were cured with only the covariates of HIV status of patients contributing statistically significantly to determinants with p-value of 0.022 (Table I) ; 28.2% (535 patients) defaulted treatment with covariates of category of treatment and sex contributing statistically significantly with p-values of 0.019 and 0.001 respectively (Table II); 3.9% (74 patients) interrupted treatment with only covariate of age contributing statistically significantly with p-value of 0.028 (Table III); 3.2% (61 patients) were transferred-out with none of the covariates contributing statistically significantly (Table IV); 1.9% (36 patients) failed treatment with covariates of category of treatment and age contributing statistically significantly with p-values of 0.003 and 0.009 respectively(Table V); 4.1% (78 patients) died with only covariate of category of treatment contributing statistically significantly with p-value of 0.028 (Table VI); 19.7% (375 patients) completed treatment with covariates of year, HIV status of patients and sex contributing statistically significantly with p-value of 0.001, 0.005 and 0.038 respectively (Table VII).

The determinants for the private health facilities are as follows: 51.3% (61 patients) were cured with none of the five covariates contributing statistically significantly (Table VIII); 7.6% (9 patients) defaulted treatment with only covariate of year of treatment contributing statistically significantly with p-value of 0.038(Table IX); nil case of interrupted treatment; 1.7% (2 patients) were transferred-out of the private health facilities with none of the five covariates contributing statistically significantly (Table X); 0.8% (1 patient) failed treatment with none of the five covariates contributing statistically significantly(Table XI); 0.8%(1 patient) died with no none of the five covariates contributing statistically significantly (Table XII); 6.7% (8 patients) were success rate with none of the five covariates contributing statistically significantly(Table XIII).

Table I: Logistic Regression of determinants of cured rate outcome In Public Health Facilities.

Classification Table[a,b]

Observed		Predicted		
		Cure		Percentage Correct
		.00	1.00	
Step 0	Cure .00	1185	0	100.0
	1.00	714	0	.0
	Overall Percentage			62.4

a. Constant is included in the model.

b. The cut value is .500

Block 1: Method = Enter

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	year	.049	.043	1.287	1	.257	1.050
	Category	-.104	.128	.655	1	.418	.902
	HIVstatus	.221	.096	5.225	1	.022	1.247
	Sex	-.121	.095	1.629	1	.202	.886
	Age	-.067	.075	.788	1	.375	.935
	Constant	-.420	.250	2.822	1	.093	.657

a. Variable(s) entered on step 1: year, Category, HIVstatus, Sex, Age.

Table II: Logistic Regression of determinants of Default rate outcome.
Block 0: Beginning Block

Classification Table[a,b]

Observed		Predicted		
		Defaulted		Percentage Correct
		.00	1.00	
Step 0	Defaulted .00	1364	0	100.0
	1.00	535	0	.0
	Overall Percentage			71.8

a. Constant is included in the model.

b. The cut value is .500

Block 1: Method = Enter

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	year	.078	.047	2.782	1	.095	1.081
	Category	-.336	.144	5.463	1	.019	.715
	HIVstatus	.019	.104	.033	1	.856	1.019
	Sex	.338	.104	10.680	1	.001	1.403
	Age	-.025	.081	.096	1	.757	.975
	Constant	-.894	.274	10.625	1	.001	.409

a. Variable(s) entered on step 1: year, Category, HIVstatus, Sex, Age.

Table III: Logistic Regression of determinants of Treatment Interrupted rate outcome.
Block 0: Beginning Block

Classification Table[a,b]

			Predicted		
			Interrupted		Percentage
	Observed		.00	1.00	Correct
Step 0	Interrupted	.00	1825	0	100.0
		1.00	74	0	.0
	Overall Percentage				96.1

a. Constant is included in the model.

b. The cut value is .500

Block 1: Method = Enter

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	year	-.071	.106	.452	1	.501	.931
	Category	.411	.280	2.156	1	.142	1.509
	HIVstatus	.112	.241	.218	1	.641	1.119
	Sex	-.144	.238	.366	1	.545	.866
	Age	.427	.194	4.821	1	.028	1.532
	Constant	-4.443	.625	50.469	1	.000	.012

a. Variable(s) entered on step 1: year, Category, HIVstatus, Sex, Age.

Table IV: Logistic Regression of determinants of Transferred-out rate outcome.
Block 0: Beginning Block

Classification Table[a,b]

			Predicted		
			Transferred		Percentage
	Observed		.00	1.00	Correct
Step 0	Transfered	.00	1838	0	100.0
		1.00	61	0	.0
	Overall Percentage				96.8

a. Constant is included in the model.

b. The cut value is .500

Block 1: Method = Enter

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	year	.085	.119	.509	1	.476	1.089
	Category	.557	.300	3.456	1	.063	1.746
	HIVstatus	-.200	.265	.573	1	.449	.818
	Sex	-.271	.261	1.076	1	.300	.763
	Age	-.042	.208	.042	1	.838	.958
	Constant	-3.983	.667	35.698	1	.000	.019

a. Variable(s) entered on step 1: year, Category, HIV status, Sex, Age.

Table V: Logistic Regression of determinants of Failure rate outcome.

Block 0: Beginning Block

Classification Table[a,b]

			Predicted		
			Failure		Percentage
	Observed		.00	1.00	Correct
Step 0	Failure	.00	1863	0	100.0
		1.00	36	0	.0
	Overall Percentage				98.1

a. Constant is included in the model.

b. The cut value is .500

Block 1: Method = Enter

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	year	.073	.155	.225	1	.635	1.076
	Category	1.046	.350	8.906	1	.003	2.846
	HIVstatus	.130	.341	.145	1	.704	1.139
	Sex	.449	.352	1.628	1	.202	1.566
	Age	.747	.286	6.796	1	.009	2.110
	Constant	-7.508	.950	62.441	1	.000	.001

a. Variable(s) entered on step 1: year, Category, HIVstatus, Sex, Age.

Table VI: Logistic Regression of determinants of Death rate outcome.

Block 0: Beginning Block

Classification Table[a,b]

			Predicted		
			Death		Percentage
	Observed		.00	1.00	Correct
Step 0	Death	.00	1821	0	100.0
		1.00	78	0	.0
	Overall Percentage				95.9

a. Constant is included in the model.

a. The cut value is .500

Block 1: Method = Enter

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	year	.185	.108	2.938	1	.086	1.204
	Category	.581	.265	4.805	1	.028	1.788
	HIVstatus	.339	.237	2.042	1	.153	1.403
	Sex	.123	.234	.277	1	.599	1.131
	Age	.119	.183	.421	1	.517	1.126
	Constant	-4.869	.610	63.636	1	.000	.008

a. Variable(s) entered on step 1: year, Category, HIVstatus, Sex, Age.

Table VII: Logistic Regression of determinants of Treatment completion rate outcome.
Block 0: Beginning Block

Classification Table[a,b]

Observed			Predicted		
			Success		Percentage Correct
			.00	1.00	
Step 0	Success	.00	1524	0	100.0
		1.00	375	0	.0
	Overall Percentage				80.3

a. Constant is included in the model.

b. The cut value is .500

Block 1: Method = Enter

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	year	-.180	.052	12.003	1	.001	.835
	Category	.100	.152	.432	1	.511	1.105
	HIVstatus	-.331	.118	7.818	1	.005	.718
	Sex	-.241	.116	4.303	1	.038	.786
	Age	-.057	.093	.382	1	.536	.944
	Constant	-.653	.301	4.694	1	.030	.521

a. Variable(s) entered on step 1: year, Category, HIVstatus, Sex, Age.

Table VIII: Logistic Regression of determinants of cured rate outcome.

Block 0: Beginning Block

Classification Table[a,b]

Observed			Predicted		
			Cure		Percentage Correct
			.00	1.00	
Step 0	Cure	.00	0	58	.0
		1.00	0	61	100.0
	Overall Percentage				51.3

a. Constant is included in the model.

b. The cut value is .500

Block 1: Method = Enter

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	year	-.070	.193	.133	1	.716	.932
	Category	-1.976	1.109	3.174	1	.075	.139
	HIVstatus	.122	.552	.049	1	.826	1.129
	Sex	.285	.396	.517	1	.472	1.330
	Age	.490	.499	.963	1	.326	1.632
	Education	.130	.226	.332	1	.565	1.139
	Constant	.892	1.875	.226	1	.634	2.439

a. Variable(s) entered on step 1: year, Category, HIV status, Sex, Age, Education.

Table IX: Logistic Regression of determinants of Default rate outcome.

Block 0: Beginning Block

Classification Table[a,b]

			Predicted		
			Defaulted		Percentage
	Observed		.00	1.00	Correct
Step 0	Defaulted	.00	110	0	100.0
		1.00	9	0	.0
	Overall Percentage				92.4

a. Constant is included in the model.

b. The cut value is .500

Block 1: Method = Enter

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	year	-.705	.340	4.298	1	.038	.494
	Category	-18.478	14490.187	.000	1	.999	.000
	HIVstatus	.062	1.167	.003	1	.958	1.064
	Sex	-.657	.777	.714	1	.398	.518
	Age	.006	.852	.000	1	.995	1.006
	Education	.386	.482	.640	1	.424	1.471
	Constant	17.658	14490.187	.000	1	.999	4.665E7

a. Variable(s) entered on step 1: year, Category, HIVstatus, Sex, Age, Education.

Table X: Logistic Regression of determinants of Transferred-out rate outcome.

Block 0: Beginning Block

Classification Table[a,b]

			Predicted		
			Transferred		Percentage Correct
	Observed		.00	1.00	
Step 0	Transferred	.00	117	0	100.0
		1.00	2	0	.0
	Overall Percentage				98.3

a. Constant is included in the model.

b. The cut value is .500

Block 1: Method = Enter

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	year	-.152	.624	.060	1	.807	.859
	Category	-17.390	13980.483	.000	1	.999	.000
	HIVstatus	-17.184	8420.355	.000	1	.998	.000
	Sex	17.650	5174.064	.000	1	.997	4.625E7
	Age	-1.017	2.459	.171	1	.679	.362
	Education	.076	.951	.006	1	.936	1.079
	Constant	-1.029	14907.209	.000	1	1.000	.358

a. Variable(s) entered on step 1: year, Category, HIVstatus, Sex, Age, Education.

Table XI: Logistic Regression of determinants of Failure rate outcome.

Block 0: Beginning Block

Classification Table[a,b]

			Predicted		
			Failure		Percentage Correct
	Observed		.00	1.00	
Step 0	Failure	.00	118	0	100.0
		1.00	1	0	.0
	Overall Percentage				99.2

a. Constant is included in the model.

b. The cut value is .500

Block 1: Method = Enter

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	year	.479	3239.651	.000	1	1.000	1.615
	Category	34.121	6676.030	.000	1	.996	6.587E14
	HIVstatus	-.607	9080.902	.000	1	1.000	.545
	Sex	-30.689	9886.736	.000	1	.998	.000
	Age	2.810	7557.917	.000	1	1.000	16.603
	Education	.935	3223.686	.000	1	1.000	2.548
	Constant	-64.713	24845.560	.000	1	.998	.000

a. Variable(s) entered on step 1: year, Category, HIV status, Sex, Age, Education.

Table XII: Logistic Regression of determinants of Death rate outcome.

Block 0: Beginning Block

Classification Table[a,b]

			Predicted		
			Death		Percentage
	Observed		.00	1.00	Correct
Step 0	Death	.00	118	0	100.0
		1.00	1	0	.0
	Overall Percentage				99.2

a. Constant is included in the model.

b. The cut value is .500

Block 1: Method = Enter

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	year	-6.307	1386.031	.000	1	.996	.002
	Category	21.239	4554.507	.000	1	.996	1.675E9
	HIVstatus	-1.694	7484.929	.000	1	1.000	.184
	Sex	11.041	5999.685	.000	1	.999	62373.968
	Age	-7.388	8200.022	.000	1	.999	.001
	Education	-19.158	2139.660	.000	1	.993	.000
	Constant	-10.472	20045.053	.000	1	1.000	.000

a. Variable(s) entered on step 1: year, Category, HIV status, Sex, Age, Education.

Table XIII: Logistic Regression of determinants of Treatment completion rate outcome.

Block 0: Beginning Block

Classification Table[a,b]

			Predicted		
			Success		Percentage
	Observed		.00	1.00	Correct
Step 0	Success	.00	111	0	100.0
		1.00	8	0	.0
	Overall Percentage				93.3

a. Constant is included in the model.

b. The cut value is .500

Block 1: Method = Enter

Variables in the Equation

B	S.E.	Wald	df	Sig.	Exp(B)
-.601	.338	3.158	1	.076	.548
-18.638	13906.108	.000	1	.999	.000
-18.147	9040.915	.000	1	.998	.000
.375	.828	.205	1	.651	1.454
.171	.898	.036	1	.849	1.186
-.068	.475	.021	1	.886	.934
17.483	13906.109	.000	1	.999	3.914E7

a. Variable(s) entered on step 1: year, Category, HIV status, Sex, Age, Education.

DISCUSSION

The primary aim of Public-Private Partnership in TB control in Nigeria is to engage all healthcare providers in TB care and control according to NTBLCP guidelines.[18,23]

The study found that both public and private health facilities in Nnewi North Local Government Area had complementary roles in the TB programme. The public health care facilities saw significantly more patients and had better treatment outcome than the private health care facilities. This is contrary to the report of Gidado and Ejembi where the private healthcare facilities in northern Nigeria had more patient load with better treatment outcome. [24] The mean age of 34.0±4.2 years and 32±3.7 years for public and private health facilities was in keeping with the age range reported by another study in Eastern Nigeria. [11]

Also, a greater percentage of the patients in the cohorts in public and private health facilities are males, consistent with other reports. [25,26] The cure rate of 37.6 % and 48.7% of public and private health facilities, respectively found in this study are below the recommended target of 85% by the WHO. [4] More so, cure rate of the two categories of health facilities is less than that reported for Anambra State (84.48%) [23] and for Ebonyi State(57.7%).[11] The treatment success rate found in this study is higher for the public health facilities (57.3%) compared to 54.8% treatment success among those managed by the private facilities. However, the treatment success rate among patients managed by the private facilities (83.7%) was higher compared to 78.6% treatment success among those managed by the public facilities. This is as reported by another study conducted in northern Nigeria.[24] This implies there is need for continuous research to address this gap deficits with regards to international standard as well as awareness creation through the public–private mix structures in order to improve treatment outcome at both public and private health facilities.

While the determinants in this study for the public health facilities were different for the different treatment outcome-and the determinants for failure rate were category of treatment and age- that for the private was only year of treatment initiation. Much patient load at public health facilities with consequential challenge of resources for administering the standard treatment could have caused the observed determinant. Thus, there may be need to refer patients to private facilities in order to avoid overstretching the public facilities as well as encourage health seeking behaviour to accessing care at private health facilities.

Also, attention should be paid to address category of treatment and age as determinants of treatment failure at the public health facilities with larger patient load. The implication of category of treatment is that when category II of DOTS is administered and there is failed therapy this leads to a higher risk of exposing the general public (and indeed the health worker!) to the dreaded Multi-Drug Resistant TB. The implication of age cannot be overlooked because a healthy work force is the bedrock of any economy. Generally, the unsuccessful treatment outcome for the two categories of health facilities (defaulted, interrupted, transferred-out, failed and died) had determinants ranging from year, category, sex, HIV status and age. This finding is in keeping with reports by others. [5-11]

The limitations of the study are that Private DOTS services providers used in Nnewi North Local Government Area were all faith-based, non-profit health facilities and so there was no opportunity to compare the TB programme and TB treatment outcome of the public facilities with those of private for-profit organizations. Also, the accuracy of secondary data collected from patient's record card for the study depended on the accuracy and completeness of the record cards as filled in by the health workers in the facilities.

CONCLUSION

Determinants for public health facilities were year of treatment, HIV status, category of treatment, sex and age of patients. Determinant for private facilities was only year of treatment. Future research should focus on determinants for disaggregated respective years, identify centre-specific factors associated with poor treatment outcome, identifying factors that will positively influence health seeking behaviour to accessing care in private health DOTS facilities, emphasizing the place of treatment completion (and success) rate in developing economies and analyzing primary data set. The NTBLCP should improve the treatment card data matrix for comprehensiveness of socio-economic information on patients.

Source of Support: Nil.
Conflict of Interest: None declared.

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