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Comparative assessment of Directly Observed Treatment Short-course (DOTS) for tuberculosis patients in a primary and a tertiary health centre in Nigeria

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Abstract
Nasarawa State, Nigeria has HIV prevalence of 7.5%. This is capable of fueling and worsening the tuberculosis/HIV epidemic. This study compared TB treatment outcomes between a primary health care and a tertiary health centre; it assessed the overlap between TB and HIV. A cross-sectional retrospective design was adopted. Data from the directly observed treatment register for 15 months was abstracted from both facilities. A total of 1678 TB patients files were assessed; the tertiary health centre accounted for 33% of the TB population while the primary health care centre represented two-thirds. Of the 75% of TB patients who had HIV testing, about 48% were HIV positive. Primary health care facility achieved statistically significant outcomes in cured (43%) representing 86.8% of cured outcome within program, p-value 0.000; treatment completed of 46.1% representing 60.4%, p-value 0.000; and had the least case of treatment default, 1.7% which accounted for 18%, p-value 0.000 while the tertiary health facility attained better outcomes in treatment failure and death rates p-value 0.013 and 0.033 respectively. With an overall successful treatment outcome of about 84%; the primary health care centre recorded successful treatment outcome of 89% compared to tertiary health facility which achieved 73%. The overlap between TB and HIV was high. Comparatively, treatment outcomes were significantly better at primary health centre.

Keywords: DOTS; Tuberculosis; HIV; Nigeria

INTRODUCTION

Tuberculosis (TB) is a disease of great public health concern. It precedes the Human Immunodeficiency Virus (HIV) as the 7th major leading causes of death worldwide (WHO, 2008). In 2011, the incidence rate for TB was estimated at 8.7 million cases; about 1.1 million (13%) of which were co-infected with HIV, while the prevalence rate was projected at 12 million cases equivalent to 170 cases per 100,000 population (WHO, 2012). Although, Nigeria still has the highest estimated number of new TB cases in Africa, 162,471 cases annually; when the prevalence rates per 100,000 was considered, Nigeria ranked 6th in Africa (WHO, 2012).

With a TB/HIV co-infection incidence rate of 26%, far above the global average (WHO, 2012), the goal of a TB policy in Nigeria is to reduce TB/HIV associated

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morbidity and mortality through collaboration between National Tuberculosis and Leprosy Control Programme (NTBLCP) and the National AIDS and Sexually Transmitted Diseases Control Programme (NASCP) at all levels (FMOH, 2004). Achieving these in the light of inadequate human resource and poorly equipped laboratory services require the adoption of the primary care model, decentralization of health centres, integration of HIV/TB care and mobilization of highly skilled specialized professionals to improve capacities of health workers through task shifting and monitoring that improve treatment outcomes (WHO, 2007).

Treatment outcomes monitoring as a key indicator is imperative in the evaluation of progress towards the elimination of tuberculosis (Vasankari *et al*., 2007). In Finland, these researchers recorded favourable outcome of 70.1% below the international benchmark; this consists of 31.6% cured and 38.5% treatment completed, whereas immunosuppression, social risk factors and old age were strongly associated with death. In Nigeria, studies conducted in the South-West (Egbewale *et al*., 2007; Fatiregun *et al*., 2009; Babatunde *et al*., 2013), North-East (Njepuome and Odume, 2009), and the North-Central (Bello, 2010) geopolitical regions of the country revealed that treatment outcomes for all pulmonary TB were below the WHO benchmark of 85%.

This study sought to assess the percentage of successful treatment outcomes in TB patients in Nasarawa State and to compare treatment outcomes between a resource deficient primary health care facility and a tertiary health facility as well as to assess the extent of overlap between TB and HIV.

EXPERIMENTAL

Study sites. The study was conducted in two hospitals in Nasarawa State, North-Central Nigeria: Dalhatu Araf Specialist Hospital (DASH), Lafia, a tertiary health centre owned by the State government; and the Evangelical Reformed Church of Christ (ERCC) Medical Centre, Alushi, Nassarawa Eggon, a primary health care (PHC) centre privately owned by Evangelical Reformed Church of Christ. These centres are the major accredited TB centres in the state and are located in the Southern and Northern Senatorial districts of the state respectively. ERCC Medical Centre is one of the oldest TB centre in the state, it receives support from the Netherland. Both facilities practice the integrated and exemption policy on TB and ART medicines.

Study design and population. The study was cross-sectional retrospective research. All TB patients enrolled for TB treatment in these hospitals from 1st January 2012 to 31st March 2013 were evaluated retrospectively. The study relied strictly on the review of official Directly Observed Treatment (DOT) activity documentation. The diagnosis of TB was based on the Nigeria National Tuberculosis and Leprosy Control Programme (NTBLCP) which relied exclusively on sputum smear positive on acid fast bacilli (AFB) and or chest radiology (FMOH, 2004). Diagnosis for extra pulmonary TB was an exclusive preserve of a certified medical officer or consultant.

Study outcome measures. This research adopted the WHO framework for evaluating treatment outcomes in TB patients (WHO, 2003). Information on such outcome indicators were incorporated into the TB programme and routinely collected and documented. "Cured'' and "treatment completed outcomes" were referred to as "treatment success" (successful) while outcomes such as death, default and treatment failure were considered "unsuccessful".

Data analysis. The study recruited all TB patients irrespective of anatomical sites of infection and/or history of previous TB treatment to assess the proportion of such

patients compared to those with new pulmonary TB. However, for the purpose of estimation of the percentage of treatment success, only those with new pulmonary tuberculosis infection were captured while patients who were previously treated for TB and those with extra-pulmonary TB were excluded. Data was entred into the Microsoft Excel and loaded into the Statistical Package for Social Sciences (SPSS) version 21 for descriptive and inferential statistics. Treatment outcomes were compared between facilities using the X^2 test at statistical significance of $p < 0.05$.

RESULTS

Combining both facilities. The study evaluated a total of 1678 TB cases from both facilities, 556 (33.1%) of these patients were enrolled at the tertiary health centre while the primary health care centre (private PHC) constituted the highest number of TB patients 1122 (66.9%). Majority of these patients were males (57%) while the age group 16-30 has the highest prevalence, 41.5%. An extrapolation of the population structure revealed that 71% of these TB patients were within the productive age group of 16-45. The age group, 1-5 represented 5.1% of these patients while the least prevalence was recorded among those greater than 75 years, (Figure 1).

Diagnosis distribution. Majority of cases (96.4%) were pulmonary TB while extra-pulmonary TB accounted for 3.3%. The least diagnostic parameter was sputum AFB, whereas X-ray and clinical parameter were commonly exploited (63.6%) for the diagnosis of TB. Of these 1678 reported cases of TB, 1511 (90%) were patients with new TB comprising pulmonary and extra-pulmonary TB; while 9.2% of the patients were those who were previously treated but returned to clinic for retreatment due to relapse, default or failed treatment. Majority of the patients (90.6%) were on category 1 (CAT 1) treatment regimen while patients on category 2 (CAT 2) treatment regimens represented about 10% of the population (Table 1).

This study found that majority of the patients, 1254 (75%) had their HIV counseling and testing (HCT) out of which 47.8% were confirmed HIV-positive (Table 2). When the treatment outcomes for patients categorized as ‘new’ pulmonary TB (PTB) was extrapolated for the entire program (Facility 1 and 2), 1426 such cases where identified out of which 1401 (98.2%) satisfied the data requirement for the study. Of these 1401 subjects, cure outcome was achieved in 33% of the patients’; treatment completion was achieved in 51% of the patients, 13 (1%) had treatment failure, 126 (9%) died while 6% defaulted. For these new PTB patients in the entire program, a successful treatment outcome of about 84% was recorded.

Table 1: Treatment regimen across population

	Freq	(%)
CAT 1	1521	90.6
CAT 2	157	9.4
Total	1678	100.0

Table 2: Sero-status of TB population

	Freq	(%)
HIV positive	600	35.8
HIV negative	654	39.0
Total	1254	74.8
HCT not done	424	25.2
Total	1678	100.0

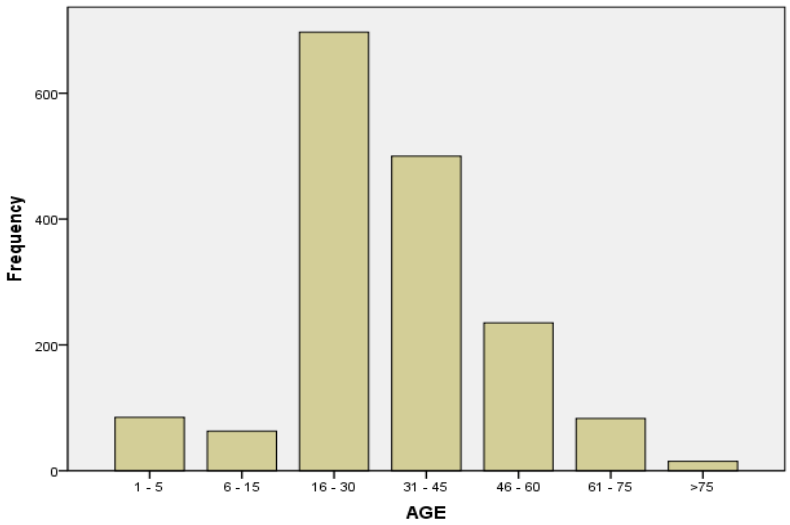

Figure 1: Distribution of TB patients by age group

Table 3: Treatment outcomes across facilities

	Facility	OUTCOME					
		Cured	Treatment completed	Treatment failure	Death	Defaulted	Total
DASH	Count	61	282	2	51	73	481
	% within Facility	13.0	60.1	.4	10.9	15.6	100.0
	% within Outcome	13.2	39.6	15.4	40.5	82.0	33.5
ALUSHI	Count	400	430	11	75	16	953
	% within Facility	43.0	46.1	1.2	8.0	1.7	100.0
	% within Outcome	86.8	60.4	84.6	59.5	18.0	66.5
Total	Count	461	712	13	126	89	1434
	% within Facility	33.0	51.0	1.0	9.0	6.0	100.0
	% within Outcome	100.0	100.0	100.0	100.0	100.0	100.0
	p-value	0.000*	0.000*	0.013*	0.033*	0.000*	

*p-value <0.05

Tertiary health care centre. This facility had a total of 556 patients for the period under review, 469 (84%) of these patients had new pulmonary TB. A cure outcome was recorded in 69 (13%), treatment completed was documented in 282 (60.1%), treatment failure in 2 (0.4%), death recorded in 51 (10.9%) while 73 comprising about 16% of these population defaulted from the program. This study calculated a successful treatment outcome of 73% for tertiary health care centre (Dalhatu Araf Specialist Hospital, Lafia, Nasarawa State, Nigeria).

Private Primary Health Care Centre. A total of 1122 which translated to 66.9% of entire clients in the study were enrolled in this facility, 932 (83%) of these clients were categorized as new pulmonary TB. An outcome for cure was observed in 400 (43%), treatment was completed in 430 (46.1%), treatment failure was diagnosed in 11 (1.2%), death occurred in 75 (8%) while 16 of these patients which represented 1.7% of the population defaulted from the scheme. The resource constrained private primary health care centre (ERCC, Alushi, Nasarawa State,

Nigeria) recorded successful treatment outcome of 89%.

Comparative assessment of outcomes between facilities. An overview of the study outcomes in both facilities revealed that the primary health care centre (ERCC Medical Centre, Alushi), constituted greater proportions of favourable outcomes: It recorded 87% of cure outcomes for the entire program; it accounted for 60% of treatment completion and had the least proportion of defaulted cases (18%). However, the tertiary facility (Dalhatu Araf Specialist Hospital) recorded the least cases of treatment failure 2 (15%) and deaths 51 (40%).

DISCUSSION

This study revealed that about three-fourth of TB patients' was within the productive age structure (16-45years). TB shares similar epidemiological characteristics with HIV; it inadvertently affects the economically productive age groups which includes the highly active and experienced skilful workforce that drives the economic development of a nation (Armstrong, 1995; WHO, 2012). The study showed that majority of the patients (57%) were males; this concurs with Bloss *et al*., 2012; WHO, 2012; Narayanan *et al*., 2010; Fatiregun *et al*., 2009; Egbewale *et al*., 2007; Babatunde *et al*., 2013.

The proportion of patients with TB and HIV co-infection in this study was high; about a half of the 75% of patients with known Sero-status were HIV-positive. This finding provides justification for this research. Nasarawa State, Nigeria has an average HIV prevalence rate of 7.5% and is located in North-Central geo-political region of the country, a region known to have the highest prevalence rates in the country (FMOH, 2010). A study among TB patients in Kwara State, North-Central Nigeria found a TB/HIV overlap of 28.9% (Bello, 2010); Kwara State has the least HIV prevalence rate in this region (2.2%). In the South-West region of the country, Babatunde *et al*., 2013, found a co-infection level of 20% while in Gombe State, North-Eastern region, TB/HIV co-infection accounted for 23% of TB patients (Njepuome and Odume, 2009); these figures were above the global rate of 13% (WHO, 2012). Studies have shown that both TB and HIV/AIDS exhibit significant pathophysiological interaction which fuels the rapid progression of both diseases (Narayanan *et al*., 2010; Lancioni *et al*., 2011); this leads to complexities and complications capable of obscuring early diagnosis of TB and worsening the treatment outcomes.

When the two study facilities were considered as a single state program because they provide care to majority of TB patients in the state, a successful treatment outcome of about 84% was recorded. However, statistical significant variations in outcomes were recorded between the two facilities. The tertiary health centre (DASH) recorded successful treatment outcome of 73% compared to primary health care centre (ERCC Medical Centre, Alushi) which achieved successful treatment outcome of 89% above the international bench mark of 85%. While the cure (p-value 0.000), treatment completed (p-value 0.000) and default (0.000) outcomes as well as overall program outcomes (p-value 0.000) were better at the resource constraint primary health care facility, the tertiary health facility achieved better and statistically significant outcomes in death rate (p-value 0.033) and decreased cases of treatment failure (p-value 0.013). The reduction in deaths and decreased prevalence of treatment failure in tertiary health centre could be associated with specialized competence and creative skills synonymous with highly trained professionals; they are more knowledgeable in handling complicated and life-threatening situations. Whereas, improved outcomes recorded in primary health centre is arguably due to strict adherence to guidelines and

social interaction mechanisms and possibly task shifting which incorporates the 'treat, train and retrain' initiatives which create a 'family health team' scenario where a physician delegates certain roles to lower cadres in a collaborative team comprising nurses, community health workers and social workers. This was demonstrated by the low default rate of 18% at primary health centre compared to 82% at tertiary facility which is indicative of improved social networking mechanisms capable of improving adherence to medicine and encouraging patients to make informed choices that promote their health seeking behaviour. This study is consistent with Chan *et al*., 2010 who found that among HIV/AIDS patients' receiving antiretroviral therapy (ART), those assigned to decentralized primary health care (PHC) centres were associated with lower odds of defaulting and lower mortality compared to tertiary health facility.

The rapid achievement recorded following the declaration on universal access to antiretroviral therapy was in-part due to task shifting and decentralization of care to lower facilities where nurses and community health workers were delegated to perform functions that were hitherto an exclusive preserve of physicians; this contextual delegation was due to human resource inadequacy (El-Sadr *et al*., 2012, Philips *et al*., 2008). However, highly specialized professionals are often disconnected from the reality of life in the community and may not be socially disposed to render certain services (WHO, 2007).

This research findings corroborates with a study in Ibadan which evaluated treatment outcomes in 11 health facilities within Ibadan city, South-Western Nigeria, nine of these facilities were primary health care facilities; however, the primary health care facilities recorded improved treatment outcomes and successful treatment compared to the tertiary health care facilities (Fatiregun *et al*., 2009). Although, it is generally known that drug stock-outs, negative attitudes of health staffs, large cohort size and poor tracking capacity have adverse effects on treatment outcomes; a study conducted among multi-drug resistant TB (MDR-TB) cohorts in four TB/HIV decentralized clinics in KwaZulu-Natal, South Africa, revealed wide variations across clinics demonstrating associations between outcomes and health system performance. Thus, clinics with high health system performance (HSP) scores determined by four domains: context, mechanism, intervention and output, have higher statistically significant treatment outcomes compared to sites with lower performance index (Loveday *et al*., 2014). A functional health system promotes monitoring of activities through routine visitation which encourages site-level resolution of problems and helping health workers to deal with emerging difficulties; it promotes specialization among clinical staff against the routine rotation of such staffs to different units (Loveday *et al*., 2014). Good organizational governance within the health systems has motivational attributes that make the health workers to believe that they own the programme; this ensures commitment to patients and promotes accountability. These attributes are independent of level of healthcare or resources; thus this arguably provides possible rationale for improved treatment outcomes observed at the lower level of care compared to the tertiary level.

Collaboration within facilities at the state level, adoption and implementation of the integrated primary health care model, improved health system performance and mobilization of resources are possible strategies capable of reducing the burden of TB. Highly trained professionals could be mobilized to sites for monitoring of activities and provision of technical support so as to improve the capacity of staffs and to improve treatment outcomes.

Conclusion

The TB and HIV/AIDS co-infection rate in Nasarawa State is very high capable of fueling both epidemics in the state. Attainment of optimum outcomes for TB could be achieved using the primary health care model which explores social mechanisms and community involvement that encouraged patients' to adhere to their medications; however, complex and life threatening cases requires specialist intervention.

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