

SPUTUM GRADING AND CONVERSION RATES AND TREATMENT OUTCOMES AMONG TUBERCULOSIS CASES MANAGED IN A TEACHING HOSPITAL IN SOUTHWESTERN NIGERIA: A FIVE YEAR REVIEW

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ABSTRACT

BACKGROUND: Sputum grading and conversion rates are some of the indicators being used to monitor client's progress and response in community TB care. This study assessed sputum grading and conversion rates in relation to TB treatment outcomes among cases managed in LAUTECH teaching hospital in southwestern Nigeria.

METHODS: Retrospective study involving a review of 176 TB cases managed between 2011 and 2015. A validated checklist was used in collating data from the National TB Control Programme tools. Data was analyzed using the SPSS software version 17.0.

RESULTS: The mean age of respondents 39.4±2.3 years, 94.9% had pulmonary TB, while 114 (64.8%) tested smear positive. Majority 144 (79.5%) of the total cases seen were cured while 0.6% had treatment failure. Baseline TB grading showed 33.3% (1+), 32.5% (2+), 28.9% (3+) and 5.3% (scanty). About 107 (93.9%) and 114 (100.0%) had sputum conversion after two and five months respectively. Respondents who were cured were about 3 times more likely to have had a sputum conversion compared to those who were not, (OR 3.8, 95%CI 0.9852-14.4865 and p 0.0336)

CONCLUSION: The conversion rate of sputum is associated with initial sputum grading, suggesting the need to maximize the efficiency of TB control programmes.

KEY WORDS: Tuberculosis, treatment outcomes, sputum grading, sputum conversion rate, Southwestern Nigeria.

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BACKGROUND

The high importance accorded to Tuberculosis (TB) in the Sustainable Development Goals demonstrates that it is still a problem of public health concerns, causing significantly high morbidity and mortality. It has been estimated that someone in the world is newly infected with TB every second, while nearly 1% of the world population gets infected with TB every year.¹ Overall one third of the world population is infected with Mycobacterium TB.² In 2015 alone, there were an estimated 10.4 million new TB cases (incidents) worldwide with about 1.4 million estimated deaths.³

As TB remain a leading cause of illness and death among persons living with HIV/AIDS, Nigeria has one of the largest burdens of both chronic diseases in the world. The prevalence of HIV among TB patients in Nigeria is between 21- 22%.^{4,5,6,7} While TB-DOTs treatment centers in Nigeria can be described as accessible, the development of drug-resistant Mycobacterium Tuberculosis is of high concern. Cases of Loss to Follow up (LTFU), discontinuation of treatment after a short period of recovery and late presentation amidst stigma and discrimination are common. Thus to predict completeness of TB treatment as eventual treatment outcomes is a huge task.

The Gold standard for the diagnosis of TB adopted by the National TB and Leprosy Control Programme (NTBLCP) in Nigeria is the identification of the acid-fast bacilli organism using a Ziehl Nelson stain performed on sputum specimen.^{2,8} While high sputum grading could indicate high intensity of bacterial

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presence, the ultimate goal is to have a positive to negative conversion rate in which the bacteria could no longer be found and its presence appeared to have been neutralized. Several factors has influenced the timing of clients presenting to the treatment sites and sputum grading and conversion before and after commencement of clients on treatment respectively. This study assessed sputum grading and conversion rates in relation to TB treatment outcomes among cases managed in LAUTECH teaching hospital in southwestern Nigeria.

Methods

Study Area: was Osogbo in Southwestern Nigeria, with a population of about 750,000 people,⁹ distributed among 3 urban local Government areas. The prevalence of TB in the city is not known but the HIV prevalence is low compared to the national average put at 5.1%.¹⁰ LAUTECH Teaching Hospital (LTH) is the only teaching and tertiary health facility among other TB care centers which include the general hospital (funded by Damien Foundation) and 3 Primary Health Centers serving as DOTs referral centers. The teaching hospital has a system of community referrals for TB care which compliments community Disease Surveillance and Notification of TB cases, funded by the NTBLCP.

Study population: include all clients enrolled into TB care of LTH Osogbo in the last 5 years (2011-2015), the period that LTH adequately received support from the NTBLCP.

Study design: Retrospective study involving a review of all cases seen within the study period.

Data collection and instruments: was carried out by examining the records of all cases enrolled into care in the teaching hospital between 2011 and 2015. These include the NTBLCP daily registers, the national monthly summary forms and sputum results worksheet. A validated checklist approved by the joint LTH-TB group team was used to collect TB data relating to socio-demographic characteristics, results of sputum examination, and treatment outcomes.

Data management: Data collected were entered into the computer system and analyzed using the SPSS software version 17.0. Charts and graphs were drawn to showcase simple data in proportions and percentages in addition to tables. Both bi-variate and multi-variate analysis were carried out to determine relationship between some variables of interest which would showcase the outcome variables most especially sputum grading, sputum conversion and treatment outcomes. Statistical association was considered significant for p values less than or equals to 0.05.

Results

Table 1 showed the socio-demographic characteristics of all the 176 clients who were reviewed during the study period. The mean age of respondents 39.4±2.3 years. Most respondents were females 94 (53.4%) while 82 (46.6%) were male. Clients who belonged to treatment Category1 (CAT1) predominates at 94.3% while those on treatment Category2 (CAT2) were 5.7%. As many as 94.9% of the clients had pulmonary site of lesion while only 1.1% had extra-pulmonary site. Table 2 showed that one hundred and fourteen (64.8%) of total respondents tested smear positive. Majority 144 (79.5%) of the total cases seen were cured with another 19.9% completing their treatment while only 0.6% had treatment failure.

Table 3 showed the pattern of sputum grading and conversion rates among sputum smear positive cases. The majority 64(56.1%) were female. Baseline TB grading showed about 33.3% had 1+, 32.5% had 2+, 28.9% had 3+ while 6(5.3%) had scanty. As many as 107(93.9%) had sputum conversion (SC) after two months on treatment while only 6.1% had none. However all (100.0%) had sputum conversion after 5 months on treatment. The pattern of positive TB smear at baseline yielded 1+ for 38(33.3%) of respondents and scanty for another 5.3% according to Figure 1. Majority of these smear positive cases treated were cured 104 (91.2%), another 7.9% completed their treatment while only one (0.9%) had treatment failure according to Figure 2.

Table 4 showed statistical association between some variables of interest and treatment outcomes and sputum conversion. Most bi-variate associations done were not statistically significant except that between HIV status and treatment outcomes ($p > 0.05$). Regression models of key outcome variables (sputum conversion and treatment outcome) and some variables of interests were done. Respondents with age less than 40 years are 2.4 times more likely to have a better treatment outcomes compared to those who are above 40 years though this observation was still not statistically significant (OR 2.4, 95% CI 0.5992-9.6136 and $p = 0.1208$). HIV negative respondents were 3.1 times more likely to have higher sputum conversion rates when compared to the HIV positive clients (OR 3.1; 95% CI 0.8359-11.1696 and $p = 0.0553$). Respondents who were cured were more than 3 times more likely to have had a sputum conversion compared to those who were not cured, and this observation was statistically.

However respondents who were cured were more than 3 times more likely to have had a sputum conversion compared to those who were not cured, and this observation was statistically significant (OR 3.8, 95% CI 0.9852-14.4865 and $p = 0.0336$)

DISCUSSIONS

This study was conducted to determine sputum grading, conversion rates and treatment outcomes among tuberculosis clients attending a tertiary health institution in Southwestern Nigeria.

In the study, there were more females than males affected by tuberculosis though there is no difference in gender ratio, which is similar to findings from a study done by Fatiregun¹¹ in Ibadan. This is probably related to the high incidence of HIV infection in females which predisposes them to TB. This may also be linked to females socio-cultural vulnerability as well as being traditionally subservient to their husbands^{11,12}

Majority of the cases fell within the reproductive age group of <40years age. This is consistent with studies done by Fatiregun¹¹ in Ibadan and Erhabor¹³ in Ile Ife. The reason may be that they belong to sexually active age group in which TB and HIV prevail most. The pattern of sputum grading showed only very few as scanty, but a (downward) graded decrease from the numbers graded from 1+ to 3+, showing that the presence of the tubercle bacilli is still the hallmark of diagnoses among TB infected individuals under study. This is consistent with findings from other studies.^{14,15} Sputum AFB conversion is a suitable indicator to evaluate treatment response.^{2,16}

TB sputum conversion done at 2 months was 93.9% while at the end of 5 months, all the clients were converted negative (100%). This is a sharp contrast to a study done in Umuahia in which there were still numerous bacilli (3+) signifying non conversion of positive sputum smear after two months of anti tuberculosis drug therapy.^{17,18} In this study, this may equally be responsible for the higher treatment success rate and the cure rate. The high conversion rates may not be unconnected with the strict adherence to DOTs provision at this referral center,; that many of the cases were being brought in through community referrals and followed up with ancillary services at local DOTs PHC centers including provision of incentives for treatment completion given by the supporting or funding organization.

There exists no statistically significant association between sputum conversion and treatment outcome in this study ($p>0.05$). However, when treatment outcome was compared with the clients' TB/HIV status, cure was impressive more among TB/HIV positive while sputum conversion in patients co-infected with HIV was high (in about a three-quarter of cases). The most affected age group also fell within the reproductive age group and the sexually actives.²

HIV can cause immune suppression among TB clients,

so TB-HIV co-infected cases in this study might not readily sputum- convert because of overwhelming immune-suppression, moreover HIV co-infected cases are likely to have undergone adherence counseling sessions for HIV.

This study has implications for national programmes as regards diagnosis and decision to treat TB viz-a-viz possible treatment outcomes. While quality TB treatments should be pursued, it is important to remember that continuity be ensured beyond the 2 months initiation stage in order to allow full conversion which is around 5 months in this study. Hence barriers to accessing TB treatment should be removed by all stakeholders involved in community and health facility TB care.

CONCLUSION

The conversion rate of sputum is associated with initial sputum grading. Clients with higher sputum grading before commencement of treatment usually have increased risk of poor outcome than those with lower smear grading. Increased sputum grading may adversely affect the conversion rate. Any possibility of treatment outcome in which a cure (sputum conversion to negative) is not established if found among active TB cases is a threat hence, prevention of such occurrences is necessary to maximize the efficiency of TB control programs. It is however recommended that clients with high sputum smear grading if identified early should be commenced on adequate intervention and close monitoring. Effective TB treatment has been shown to have a signified effect on its control while completion of treatment of active cases must be given a priority.

Table 1: Socio-Demographic Characteristics of all TB Clients. N = 176

Variable	Frequency (n)	Percentage (%)
Age (Years)		
11 – 20	19	10.8
21 - 30	43	24.4
31 - 49	48	27.3
41 - 59	23	13.1
51 - 60	20	11.4
61 - 70	12	6.8
71 - 80	5	2.8
81 – 90	6	3.4
Gender		
Male	82	46.6
Female	94	53.4
Treatment Category		
CAT-1	166	94.3
CAT-2	10	5.7
Site of Lesion		
Pulmonary	174	98.1
Extra-pulmonary	2	1.1

Table 2: Sputum Grading and conversion among smear positive cases (N = 114)

Variable	Frequency (n)	Percentage (%)
Age in years (mean age=)		
<40	84	73.3
>40	30	26.3
Gender		
Male	50	43.9
Female	64	56.1
Baseline TB smear		
Scanty	6	5.3
1+	38	33.3
2+	37	32.5
3+	33	28.9
TB Smear 2 months		
Zero (Sputum conversion SC)	107	93.9
Scanty	7	6.1
TB Smear 5 months (SC)	114	100.0

Fig 2: Treatment Outcomes among positive smear cases (n=114)

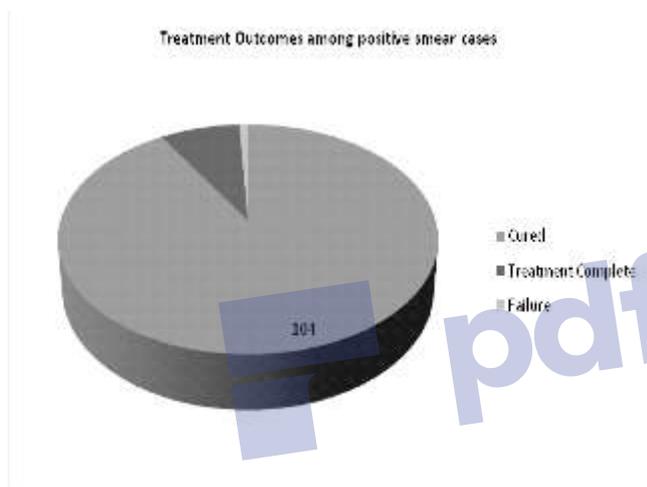


Figure 1: Sputum grading or baseline TB Smear positive results (n=114)

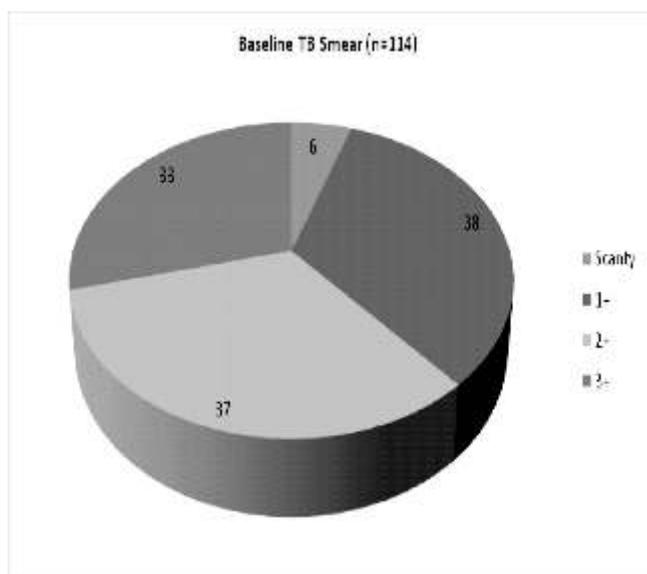


Table 3: Associations between Treatment Outcomes, SC and other variables(n=114).

Bi-variate analysis							
Variables	Treatment Outcomes			Statistics	Sputum Conversion		
	Cured	Treated	Failure		Treated	Failure	Statistics
Gender							
Male	44(88.0)	6 (12.0)	0(0.6)	$\chi^2 = 2.784$ p = 0.249	48(96.1)	2(4.0)	$\chi^2 = 0.708$ p = 0.400
Female	60(93.8)	3 (4.7)	1(1.6)		59(92.2)	5(7.8)	
Treatment Category							
CAT 1	99(90.8)	9(8.3)	1(0.9)	$\chi^2 = 0.503$ p = 0.778	102(93.6)	7(6.4)	$\chi^2 = 0.342$ p = 0.559
CAT 2	5(100.0)	0(0.0)	0(0.0)		5(100.0)	0(0.0)	
Age Category							
<40	78(92.9)	5(6.0)	1(1.2)	$\chi^2 = 1.975$ p = 0.372	77(91.7)	7(8.3)	$\chi^2 = 2.664$ p = 0.103
>40	26(86.7)	4(13.3)	0(0.0)		30(100.0)	0(0.0)	
TB/HIV Status (n=95)							
Negative	65(90.3)	7(9.7)	-	$\chi^2 = 0.021$ p = 0.884	72(100.0)	0(0.0)	$\chi^2 = 16.522$ p = 0.001
Positive	21(91.3)	2(8.7)	-		18(78.3)	5(21.7)	
Treatment outcome							
Cured	-	-	-	$\chi^2 = 0.717$ p = 0.699	97(93.3)	(6.7)	$\chi^2 = 0.717$ p = 0.699
Treated	-	-	-		9(100.0)	0(0.0)	
Failure	-	-	-		1(100.0)	0(0.0)	
Binary Logistics Regression							
Variables	Better Treatment Outcomes			Higher Sputum Conversion			Remarks
	OR	95%CI	P value	OR	95%CI	P value	
Age (Ref. Cat =>40 years)	2.40	0.5992-9.6136	0.1208	0.4	0.0447-3.2188	0.2026	Non significant
TB/HIV status(Ref. Cat=Positive)	0.9	0.1704-4.5897	0.4653	3.1	0.8359-11.1696	0.0553	Non significant
Treatment outcomes (ref. Cat = Not cured)	-	-	-	3.8	0.9852-14.4865	0.0336	Significant

REFERENCES

1. Olarewaju SO, Olarewaju O, Adebimpe AO, Olugbenga-Bello AI, Akinleye CA, Olarewaju A et al. Knowledge of tuberculosis management using directly observed treatment short course therapy among final year medical students in South Western Nigeria. *Pan African Medical Journal*, 18:32-41
2. Nwokeukwu HI, Awujo DN, Emma-Ukeagbu U. Association of sputum conversion and outcome with initial smear grading among new smear positive Tuberculosis patients in a Tertiary Health Facility, South East Zone, Nigeria. *IOSR Journal of Dental and Medical Sciences*, 2013; 4(6): 4-9
3. WHO Global TB Control report. Summary 2016.
4. World Health Organization. WHO Report Global TB control:Nigeria. In: WHO, editor. Geneva, Switzerland: WHO; 2008. Accessed 13th March 2-17. Available from: http://www.who.int/globalatlas/predefineReports/TB/PDF_Files/nga.pdf.
5. Lawson L, Yassin MA, Thacher TD, Olatunji OO, Lawson JO, Akingbogun TI. Clinical presentation of adults with pulmonary tuberculosis with and without HIV infection in Nigeria. *Scand J Infect Dis*, 2007;10:1-6.
6. Adebimpe WO, Asekun-Olarinmoye EO, Hassan AO, Abodunrin OL, Olarewaju S, Akindele AA. Treatment Outcomes among Human Immunodeficiency Virus and Tuberculosis Co-Infected Pregnant Women in Resource Poor Settings of South-Western Nigeria. *Sierra Leone Journal Biomed Res*, 2011;3(3)
7. Alau KK, Weaver MR, Ogungbemi MK, Ashefo G, Anenih J, Adeyemi A et al Prevalence of tuberculosis and HIV/AIDS co-infection among HIV clients at global fund supported comprehensive facilities in Nigeria Federal Ministry of Health (FMOH). The National TB and Leprosy Control Programme, 2014 Report, NTBLCP, Abuja Nigeria.
8. National Population Commission (Nigeria) and ICF Macro, Nigeria Demographic and Health Survey 2008, National Population Commission, ICF Macro, Abuja, Nigeria, 2009.
9. National Agency for the Control of AIDs NACA/NASCAP. National HIV/AIDs seroprevalence survey 2014, NACA Abuja Nigeria.
10. Fatiregun AA, Ojo SA, Bamgboye EA Treatment outcomes among pulmonary tuberculosis patients at treatment centers in Ibadan, Nigeria
11. Ejeta E, Birhanu, Wolde T,..... Tuberculosis treatment outcomes among TB/HIV coinfectd case treated under directly observed short-course in Western Ethiopia. *Jof AIDs and HIV Research*, 2014; 6(8):164-171
12. Erhabor GE, Adebayo RA, Omodara JA, Famurewa OC. Ten year review of patterns of presentation and outcome of pulmonary tuberculosis in OAUTHC, Ile-Ife, Nigerian. *J Health*, 2003;3:34-9.
13. Lawson L, Yassin MA, Ramsay A, Olajide I, Thacher TD, Davies PD, et al. Microbiological validation of smear microscopy after sputum digestion with bleach; a step closer to a one-stop diagnosis of pulmonary tuberculosis. *Tuberculosis (Edinb)*. 2006; 86:34-40.
14. Sanjay Rajpal, Dhingara VK. & Agarwal JK: Sputum grading as predictor of treatment outcome in pulmonary tuberculosis. *Ind J Tub*, 2002;49:139-141
15. Kuaban, R. Bame, L. Mouangue, S. Djella and C. Yomgni. Non conversion of sputum smears in new smear positive pulmonary tuberculosis patients in Yaoundé, Cameroon. *East African Medical Journal*, 2009; 86 (5): 23-35