

SPUTUM SMEAR POSITIVE TUBERCULOSIS AMONG PULMONARY TUBERCULOSIS PATIENTS AT UNIVERSITY OF MAIDUGURI TEACHING HOSPITAL: A RETROSPECTIVE STUDY

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ABSTRACT

Background: The identification of sputum smear positive pulmonary tuberculosis cases is recommended by the World Health Organisation (WHO) as part of its directly observed therapy short course (DOTs) for effective global tuberculosis control. Earlier study performed in this centre (University of Maiduguri Teaching Hospital (UMTH) Maiduguri) showed a relatively small prevalence of sputum smear positivity among Pulmonary Tuberculosis (PTB) patients that is not close to the Millennium Development Goals (MDG).

Objectives: To determine the prevalence of sputum smear positive tuberculosis and assess the progress so far, 5 years after the earlier study.

Methods: This is a retrospective study, where the records of all patients treated for tuberculosis at UMTH between April 2008 and December 2008 were retrieved and analysed. Demographic data of PTB patients and their results of sputum smear, stained by Ziehl-Neelson technique were obtained. The effect of HIV seropositivity and of its treatment using HAART on sputum smear was assessed.

Results: Four hundred and thirty nine patients with PTB aged 14 years and above consisting of 254(57.9%) males and 185(42.1%) females were used for this study. The 20-25 year age group had the highest sputum smear positive cases, while those within the 62-67 year age group had the lowest. One hundred and eight patients (41.4%) had sputum smear positive results while 153(58.6%) patients had negative smears. No significant difference in sputum positivity between HIV negative and HIV positive patients.

Conclusion: The higher rate of sputum smear positive pulmonary TB cases showed an increase in detection rate compared with an earlier finding, but is still some miles away from the set target (MDG goals).

Key words: sputum smear, ZN staining, pulmonary tuberculosis, Northeastern Nigeria.

INTRODUCTION

Tuberculosis (TB) is one of the leading cause of morbidity and mortality worldwide, one person out of three is infected with *Mycobacterium tuberculosis*, accounting for 2.5 % of the global burden of disease and currently holds the seventh place in the global ranking of causes of death.^{1,2} Concerted efforts are required from all stakeholders for the global control of TB in the near future.^{2,3}

Diagnosis of pulmonary TB and follow-up of patients' progress under antiTB treatment requires sputum examination among other investigations.⁴ Directly observed therapy-short course (DOTs) is the global TB control strategy recommended by the WHO, and is based on identification of sputum smear-positive pulmonary TB cases.^{5,6}

The prevalence of sputum smear positive cases of pulmonary TB among hospital patients varies widely, ranging between 50% and 60% of cases of pulmonary

TB in well-equipped laboratories with values between 20% and 30% obtained in less-equipped centres.^{7,8} In UMTH, Zailani *et al*, found a prevalence of 12.78% in a retrospective analysis between 2001 to 2003.⁴ This study is therefore, aimed at assessing the progress made in meeting the MDG targets of 70% case detection rate and 85% treatment success rate, in this part of Nigeria since the result of the earlier study was reported.

MATERIALS AND METHODS

This was a retrospective study carried out at the University of Maiduguri Teaching Hospital (UMTH), Maiduguri, a 500-bed hospital in Maiduguri metropolis, Borno State, northeastern Nigeria. Ethical clearance was obtained from the ethical committee of UMTH. The hospital records of 570 patients aged 14 years and above, treated for pulmonary tuberculosis between 1st April 2008 to 31st December 2008, were

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Table 1: Age and sex distribution of the patients

Age (Years)	Sex		Total (%)
	Males (%)	Females (%)	
14 - 19	8(1.8)	12(2.7)	20(4.6)
20 - 25	29(6.6)	49(11.2)	78(17.8)
26 - 31	46(10.5)	53(12.1)	99(22.6)
32 - 37	48(10.9)	30(6.8)	78(17.8)
38 - 43	47(10.7)	19(4.3)	66(15.0)
44 - 49	29(6.6)	3(0.7)	32(7.3)
50 - 55	27(6.2)	9(2.1)	36(8.2)
56 - 61	6(1.4)	6(1.4)	12(2.7)
62 - 67	3(0.7)	2(0.5)	5(1.1)
68 - 73	5(1.1)	2(0.5)	7(1.6)
> 73	6(1.4)	0(0.0)	6(1.4)
Total	254(57.9)	185(42.1)	439(100)

Table 2: Distribution of sputum smear results among the patients

Age (Years)	Sputum smear		Number tested
	Positive	Negative	
14 - 19	7	5	12
20 - 25	29	22	51
26 - 31	26	38	64
32 - 37	17	23	40
38 - 43	12	30	42
44 - 49	7	8	15
50 - 55	7	14	21
56 - 61	1	6	7
62 - 67	0	2	2
68 - 73	2	3	5
> 73	0	2	2
Total	108 (41.4%)	153 (58.6%)	261 (100%)

Table 3: Distribution of sputum smear results among patients according to their HIV status

HIV status	Sputum smear result		
	AFB+, n(%)	AFB-, n(%)	Total, n(%)
Positive	35(31.5)	76(68.5)	111(73.0)
Negative	19(46.3)	22(53.7)	41(27.0)
Total	54	98	152(100)

$\chi^2=2.87$, DF=1, P=0.09

Table 4: Patients' AntiTB treatment outcome according to their HIV status

Outcome of TB treatment	HIV status		
	HIV+ n(%)	HIV- n(%)	Total n(%)
Cured	12(13.0)	3(12.0)	15(12.8)
Completed treatment	53(57.6)	15(60.0)	68(58.1)
Transfer out	7(7.6)	2(8.0)	9(7.7)
Defaulted	17(18.5)	5(20.0)	22(18.8)
Died	3(3.3)	0(0)	3(2.6)
Total	92(78.6)	25(21.4)	117(100)

Fisher's Exact, DF=4, p>0.05

retrieved and demographic data were recorded. The entry criteria include:

1. Consent
2. Age 14 years and above.
3. Diagnosis of PTB with or without extra pulmonary TB (EPTB) and with or without HIV infection.

Four hundred and thirty nine patients fulfilled these requirements and their data were analysed. The records of 131 patients did not satisfy the entry criteria, because 81 patients had extra-pulmonary TB only and 50 patients had incomplete information and/or age below 14 years. HIV test results of patients who consented for voluntary counselling and testing was obtained. The records of the sputum smear results were also obtained.

Ziehl Neelsen Technique was used for sputum examination. This was performed by obtaining three early morning sputum specimens from each patient for the detection of acid-fast bacilli (AFB).⁹ The stained smears were examined directly using x100 oil immersion objective of microscope. When any defined red bacilli were seen, the report of AFB was as follows: more than 10 AFB/field =+++, 1-10 AFB/field = ++, 10-100 AFB/100 fields = +, 1-9 AFB/100 fields- exact number was reported.^{8,10}

Statistical Analysis

The data obtained was entered manually into a computer and a database was generated which was analysed using SPSS version 16.0 (SPSS, Chicago, Ill. USA). Values were expressed as mean \pm standard deviation (M \pm SD). Student's t-test was used to test significant differences between mean values for continuous variables and either Fisher's exact test or Chi-squared test was used for categorical variables. P values < 0.05 were considered significant. Tables were used for illustrations.

RESULTS

A total of 439 patients qualified for this study, comprising 254 (57.9%) males and 185 (42.1%) females. The mean age was 35.76 \pm 12.74 years with a range of 14-101 years. Table 1 shows the age distribution of the patients. The 32-37 year age group were the highest for male patients, while most females aged between 26-31 years with an overall majority (both sexes) being in the 26-31 year age group. One hundred and seventy eight (40.5%) patients among the study population were not tested for AFB in their sputum, as some were not producing sputum, while others did not comply with the request to produce sputum.

Eighty-one patients were diagnosed with extra-pulmonary tuberculosis only without PTB.

Among the sputum smear positive patients, the age range of 20-25 years had the highest number; while those above 62 years of age had the lowest number of sputum smear positive patients as shown on Table 2.

The total sputum smear positive cases were 108 (41.4%), which represent the overall prevalence of sputum smear positive pulmonary TB cases. Among those with positive smears 40(15.3%) had 1+, 33(12.6%), 2+ and 35(13.4%), 3+ of positive sputum smear. Males had the highest smear positivity rate with prevalence of 25.6% while it was 15.7% among females, however, the difference is not statistically significant ($p = 0.273$).

The records of only 200 patients (46.5%) were followed up and their treatment outcome documented at the UMTH DOTs centre, out of which 10.5% were declared *cured*. In addition, a total of 184 patients were counselled for HIV testing of which 161 gave consent and were tested, while, 23(12.5%) patients declined consent and the HIV test results of 9 (5.6%) patients who consented and tested was not seen. No significant difference in sputum positivity was observed between HIV+ and HIV- PTB patients as shown in Table 3. The records of 92 HIV positive vs. 25 HIV negative patients and their AntiTB treatment outcomes are shown on Table 4.

DISCUSSION

This study found an increase in the prevalence of sputum smear positive tuberculosis at UMTH. The prevalence of 41.4% is by far greater than 12.8% previously reported in this centre by Zailani *et al.*⁴ Perhaps, this is a reflection of improvement in the technique of performing ZN stain by the staff as well as teaching the patients on how to cough out sputum from the chest as was recommended by the authors of the previous study since 2003. The current ART programme by PEPFAR (The US President's Emergency Program for AIDS Relief) in this centre might have contributed to the higher sputum smear positivity as well as the increase in the HIV counselling and screening offered to PTB patients who consented, compared with the earlier study with much lower prevalence rate.

The result of this study was less than the 63.6% that was reported from another centre in the same region of Nigeria by Yusuph *et al.*⁶ It however closely resemble the findings of Onadeko *et al.*⁷ and Kolawale *et al.*¹¹ both from Ibadan, with prevalence of 30% and 57% respectively, as well as the findings of Idoko *et al.*¹² in Jos with prevalence of 48%. While that of Wokoma,¹³ in Port Harcourt, was much higher, 78%.

The high proportion of HIV/PTB co-infected patients of 60.3% may explain the lower sputum positive rate in UMTH compared with other centre in Nigeria noted above.

The findings of this study also shows that the DOTs services in this centre clearly falls short of meeting the MDG targets of 70% case detection rate and 80% treatment success rate. Hence, there is still need to put more effort toward achieving the said goals. However, from the records of DOTs treatment in this centre, it was found that out of the 439 patients diagnosed with pulmonary TB, 261(59.5%) patients were tested for AFB in their sputum, while the remaining 178(40.5%) patients were not tested. This definitely would affect the overall prevalence obtained in this study. It also underscores some attitude of our DOTs treatment centres of not adhering strictly to the National Tuberculosis and Leprosy Control Programme (NTBLCP) guidelines and poor data generation for accurate assessment of TB prevalence.

Majority of the patients were young which suggests that TB and TB/HIV are infections that commonly occur among the active age group of the society.¹³ This is in line with findings of other studies performed in Nigeria, as well as other parts of the world.^{4,6,14-17} The reason could be that this active age group is at higher risk of interaction with TB and TB/HIV infected persons.⁶

Differences were also observed between the sexes: higher among male, though not significant statistically, unlike the findings of previous study in this centre by Zailani *et al.*⁴ as well as that by Yusuph *et al.*⁶ in Nguru and Gopi *et al.*¹⁵ in India, who found significant difference between the sexes. These observations, however, could not be explained, as there are as yet no identifiable causes of disparity of sputum smear positive rate between males and females.⁶

CONCLUSION

There is significant improvement in detection of sputum smear positive pulmonary TB of 41.4% vs. 12.8% within 5 years in UMTH, although it is still far short of the MDG goal. The vigilance and supervision of staff working at UMTH/DOTs centre is questionable because of significant number of PTB patients whose sputum were not tested as well as poor record keeping. Routine HIV screening of pulmonary TB patients will help and should be incorporated in DOTs programme of NTBLCP.

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