SPUTUM AFB POSITIVITY OF SUSPECTED TUBERCULOSIS PATIENTS IN A TERTIARY HOSPITAL IN BENIN CITY NIGERIA

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Background: Tuberculosis ranks as the second leading cause of death from infectious diseases worldwide only next to HIV. It is a chronic debilitating condition caused by a bacterium of the genus Mycobacterium, mainly mycobacterium hominis.

Aim: To determine the prevalence of AFB positivity among patients attending University of Benin Teaching Hospital.

Material and Methods: A retrospective record review was done by extracting relevant data from the records of patients screened for PTB using sputum AFB in UBTH over a 1-year period. Analysis was done using SPSS Version 20.0.

Result: Of the 895 patients results reviewed, 123 (13.7%) were positive, 772 (84.2%) were negative. Of the 123 that were positive 47 (37.6%) were females and 76 (62.4%) were males. Of the negatives, 432 (56.0%) were females and 340 (44.0%) were males. The difference between the male and female positivity was statistically significant with a p value of 0.0001. The highest number of positive cases were seen in the age range 30 39 years (30: 18.6%). Of those that had positive sputum samples, 6 (4.9%) were children age less than 18 years.

Conclusion: The prevalence of positivity in the study area is relatively high compared to other regions, there is therefore need for concerted efforts at all levels of government to put in place programmes that will encourage poverty reduction and overcrowding while at the same time encouraging immunisation.

Keywords: *Tuberculosis, prevalence, chronic disease, sputum positivity*

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INTRODUCTION

Tuberculosis (TB) remains a major global health problem, causing chronic disease in millions of people each year.[1,2] TB ranks as the second leading cause of death from infectious diseases worldwide only next to HIV.[1-3] Tuberculosis is a chronic debilitating disease caused by a bacteria of the genus Mycobacterium.[1-6] Two main species are important to man, the hominis or tuberculosis and the bovis (from infected cow products). Tuberculosis can infect several organs or tissues of the human body, the commonest being the lungs.[2-4] It is very difficult to make a diagnosis of tuberculosis clinically, since it mimics many other chronic conditions especially in the lungs.[4-6]

Following the introduction of BCG immunization and improvement in the standards of living especially good housing in several parts of the world, including Nigeria, the prevalence of the disease especially the severe forms had experienced a downward trend.[1,3,4,7-9] However, from clinical observations and reports, there appears to be a resurgence of cases of PTB in different parts of the world especially in the developing world where the economic downturn and the rising rate of poverty due to corruption and bad government (coupled with rising cases of internal and external displacement due to war and natural disasters) have all connived with the HIV pandemic to push up the numbers of new cases

of PTB in these poor communities.[2,4,5,8-11] The gory picture painted above, is the case of many poverty striking countries of Asia and sub-Saharan Africa.[2,4,8-12] The latest estimate by WHO (2014 report) showed that there are 9.0 million new cases of PTB in 2013 globally (range 8.6 9.4 million) equivalent to 126 cases per 100 million people.[1] Fifty-six percent of this occurred in Asia and African region 29%,[8-12] whereas the European region have only 4% and America 3%. The six countries that stood out as having the largest number of incidence of new cases in 2013 are India (2.0 2.3 million), China (0.9 1.1 million), Nigeria (340 880 thousand), Pakistan (370 650 thousand), Indonesia (410 520 thousand), and South Africa (410 520 thousand). There was a total of 1.5 million PTB deaths in 2013, out of which 1.1 million was among HIV negative people and 0.5 million HIV positive people. Of the 9.0 million new cases in 2013, estimated 550 thousand were children and 3.3 million (3.2 3.5 million) occurred among women.[1,8-10,12-14]

In the countries worst hit by the PTB resurgence, there is decimation of the workforce since PTB affects mainly the middle-age group (15 45 years) which provides the workforce of a country.[3-5,8,9,13-15] Children are not only infected by the adults, but are also affected by PTB in adults, since children whose parents develop PTB will eventually loose their source of livelihood and end up with malnutrition and many will drop out of school. Those that are eventually orphaned by PTB may even suffer worse fate.[1,3,4,8,13]

In the control of PTB, identification of cases i.e. case detection and treatment is an integral part of the National Leprosy and Tuberculosis Control Programme (NLPTBCP).[1,3,4,13-19] This is vital because microscopy is central to the diagnosis and treatment of PTB in the DOTs strategy for the prevention of this condition.[13,18-20] Despite recent advances in the diagnosis of PTB with novel techniques like Gene expert using the PCR principles and automated liquid culture method using radioactive carbon impregnation,[21-24] many resource poor countries still rely completely on sputum positivity to make diagnosis.[1-6,8-13] For sputum microscopy to be reasonably effective in diagnosing PTB if the rate of positivity is low, there may be need to augment the sputum test with other methods.[24-27] Furthermore, it is also a reflection of the prevalence of PTB in an area since the more endemic PTB is in an area, the more sputum positivity we are likely to get. In the control of PTB, identification of cases i.e. case detection and treatment is an integral part of the National Leprosy and Tuberculosis Control Programme (NLPTBCP) in Nigeria and worldwide.[1,3,4,13-19] Therefore, microscopy is central to the diagnosis and treatment of PTB in the DOTs strategy for the prevention of this condition.

It is important to emphasise standard laboratory procedure in handling of samples. Concentration of sputum, use of fluorescent microscopy and other internal/external control methods are employed to increase the positivity of sputum test.[3,4,9,28] The International Union Against Tuberculosis and Diseases (IUATLD) recommends screening an average of 10 suspects to identify one smear-positive case (IUATLD, 1978).[29] In a study in Ibadan Nigeria by different teams of workers in 1975 by Onedeko *et al* and Kolawole *et al* in 1975, both teams reported sputum positivity rate of 30 and 57% respectively,[15,30] but the rate in Benin City remains unknown. Therefore this study was carried out to determine the prevalence of sputum positivity using microscopy in a resource poor country like Nigeria where culture and gene expert is not routinely done (with a minimum recommended positivity rate of 10% and previously reported 30 and 57% respectively in Ibadan at the back of our mind).[15,29,30]

The last countrywide survey was done in 2012 in Nigeria, there is also therefore the need for repeated regional surveys.

Methods

A retrospective record review was done by looking at records (PTB register) of patients screened for PTB using sputum AFB in UBTH for all patients with clinically suspected PTB and who submitted sputum for examination at the

central PTB laboratory over a 1-year period. Referrals were from virtually every part of the hospital. Therefore the register is the central record of all the PTB patients screened in UBTH. University of Benin Teaching Hospital is a 700 bedded hospital in the South South Geopolitical Zone of Nigeria (Edo State), serving up to about 5 states namely; Edo, Delta, Ondo, Kogi and Anambra. The study involved the review of PTB register and collation of relevant data concerning age, sex, and sputum positivity.

The PTB laboratory conduct sputum smear microscopy by ZN method according to WHO recommendation protocol.[8,31] The primary stain was done using carbolfuchsin which was heated along with the sputum on a slide, then decolouration was done with either 3% hydrochloric acid or 25% sulphuric acid for 1 minute then following by addition of 98% alcohol. Counter staining was done with methylene blue for 1 minute, the slide was read under the microscope using oil immersion.[8,31]

Case definition of Sputum Positivity

It is important to note that 3 samples were collected for the AFB staining. Out of these 3 samples, a single positive result or more out of the three was taken as positive, secondly, all those that had two or three positive samples were also taken as positive.[6,7,32] Negative results were recorded when all the 3 samples were negative. Also, patients that submitted only one or two samples and one of or the only sample was positive, such patient was taken as positive. But if a patient submitted one or two samples and they were negative, such a patient was classified as incomplete since there was a possibility that the missing sample could have been positive.[6,7,32] Analysis of sample was done using SPSS Version 20.0.

Results

General Characteristics of Subjects

Total number of subjects 895, 478 (53.4%) males and 417 (46.6%) females. The mean age of all respondents is 38.24 yrs (±13.31), while the mean age for males was 54.43 yrs (±28.8) and for females 56.02 yrs (±26.6). The difference between the mean age for males and females was statistically significant with a p value of 0.0001. Of the 895, 123 (13.7%) were positive, 772 (84.2%) were negative. Of the 123 that were positive 47 (37.6%) were females and 76 (62.4%) were males. Of the negatives, 432 (56.0%) were females and 340 (44.0%) were males. The difference between the male and female positivity was statistically significant with a p value of 0.0001.

Table I: General Characteristics of Subjects

Variable	Sex		Total	χ^2	P value
	Male	Female	All Subjects		
Total number of patients	478	417	895		
Mean age (age ± SD) yrs	54.43(28.8)	56.02 (26.6)	38.24 (13.3)		0.0001
Age range					
0 – 9	13 (61.9)	8 (38.1)	21 (100)		
10 – 19	38 (60.3)	25 (39.7)	63 (100)		
20 – 29	54 (45.0)	66 (55.0)	120 (100)		
30 – 39	76 (46.6)	87 (53.4)	163 (100)		
40 – 49	28 (42.2)	38 (57.8)	66 (100)	10.39	0.169
50 – 59	28 (38.9)	44 (61.1)	72 (100)		
60 – 69	37 (52.9)	33 (47.1)	70 (100)		
>70	16 (51.6)	15 (48.4)	31 (100)		
Missing data	289		32.3		
Sputum AFB Positivity					
Positive	47 (38.2)	76 (61.8)	123 (100)		
Negative	340 (44.0)	432 (56.0)	772 (100)	14.017	0.0001
Total			895 (100)		

As shown in **Table I**, the age range 30 39 had the highest number of respondents 163 (18.2%). The paediatric age group 0 9 had 21 (2.3%) the smallest number of respondents.

Sputum Positivity and Age

Of the 895 respondents, 289 had incomplete data. Of the 606 with correct data, sixty (9.9%) were children below 18 years, the remaining 547 (90.1%) were adults. Out of the 123 positive cases found in this study, 6 (4.88%) were children 18 years and below, the remaining 117 (95.12%) were adults, and the difference in positivity between the proportion of adult and children positive was statistically significant (P=0.04), these are shown in **Table II**.

Table II: Proportion of AFB Positive who are Peadiatric

Variable		Positive of AFB		Total	X^2	P
		Positive	**Negative**			
Age Range	Paediatric age group	6 (4.9%)	54 (11.2%)	60	4.101	0.043
	Adult age group	117 (95.1%)	429 (88.8%)	546		
Total		**123 (100%)**	**483 (100%)**	**606**		

Table III: Age and Sputum AFB Positivity

Variable		Sputum AFB Result		Total	X^2	P
		Positive	**Negative**			
Age Range	0 – 9	1 (0.8%)	20 (4.1%)	21	13.264	0.066
	10 – 19	8 (6.5%)	55 (11.4%)	63		
	20 – 29	25 (20.3%)	95 (19.7%)	120		
	30 – 39	38 (30.9%)	125 (25.9%)	163		
	40 – 49	16 (13.0%)	50 (10.4%)	66		
	50 – 59	14 (11.4%)	58 (12.0%)	72		
	60 – 69	12 (9.8%)	58 (12.0%)	70		
	>70	9 (7.3%)	22 (4.6%)	31		
Total		**123 (100%)**	**483 (100%)**	**606**		

Table IV: Source of Referral of Respondents

Variable	Frequency	Percent (%)
A/E	25	2.8
CHER	4	0.4
CLINIC	227	25.4
DOT	223	24.9
WARD	416	46.5
Total	895	100

Table III shows the sputum positivity. The age range 30 39 had the highest number of positivity i.e. 38 (30.9%) of the 123 positive patient. The positivity of 0 9 was the lowest which is 1 (0.8%).

Source of Patients

Out of the 895 patients, 416 (46.5%) were from the ward, various specialist clinic contributed 227 (25.4%), DOTs contributed 223 (24.9%) as shown in **Table IV**.

Discussion

Sputum smear still remains a major tool for the diagnosis of PTB in Nigeria. In this study, the sputum positivity rate was 13.7%, which compares well with values from different part of the world that reported values between 12 to 20%.[6,18,32,33] In a study in Rwanda by Muvunyi *et al*[6], a rate of 17.3% was reported, which is comparable to the 13.7% gotten in the current study. Importantly the IUATLD recommendation of 10% minimum[29] shows that our 13.7% is well above the recommended minimum and as such results of sputum test from such a centre could be seen as effective in detecting sputum positivity.

Previous studies in Ibadan Nigeria had reported higher values of 30 and 57% in two separate studies.[15,30] In another study from Eastern Nigeria by Nwadike *et al*,[32] out of the 379 suspected PTB cases that had sputum AFB done, 195 (51.5%) were sputum positive. This value is also higher than the value from the recent value despite the fact that the method of sample collection, handling and staining are similar. The study from Eastern Nigeria was hospital-based with a smaller sample size compared to the Benin study, which had a remarkably higher sample size. More so, the study from Eastern Nigeria only studied children older than 10 years. Therefore, the inclusion of those children from 0 18 years in the Benin study may have accounted for a reduction in the positivity rate. Importantly, the contribution of HIV/AIDs to the pattern of PTB may also have affected the sputum positivity,[34,35] since the rate of sputum positivity is likely to be higher in the presence of HIV.

Also in agreement with various other co-workers[8,13,32,36], more males in this study was positive when compared to females with a p value of 0.0001, which was highly significant. This may be due to the fact that males more than females engage in different activities that bring them in contact with this organisms, while females are meant to stay at home and in some cultures, females are meant to remain indoors for most part of the day.

The age range 30 39 years had the highest number of respondents and also had the highest number of sputum positivity of 38 (30.9%) of the 123 positives. When the group 20 49 are merged, the picture agrees well with the finding of highest positivity from the group 15 44 years.[15,30,32] This is mainly the group that is very active and always on the move, thereby providing the workforce of the nation, and as such they are more likely to come in contact with the organism due to their wide interaction.

The study from Rwanda[6] and Eastern Nigeria[32] were conducted in the chest units, but that from Benin is a combination of the patients in the entire hospital. This may have contributed to the high rates in the Enugu value which was conducted in the chest unit.

It is important to monitor the procedure of specimen collection and health educate patient on the need for production of a good specimen from deep seated cough rather than saliva and the need for prompt transportation.[37,38] These may affect the rate of positivity if not addressed.[37,38]

Conclusion

The sputum microscopy is a reliable means of detecting and diagnosing pulmonary tuberculosis in the study area. The prevalence and burden of PTB in the study area is relatively higher than other regions in Nigeria. There is therefore the need for concerted effort to reduce the prevalence of PTB in the region. This should not be left for government alone, since malnutrition, overcrowding and personal/environmental hygiene may not completely be within the purview of the government alone.

Recommendations

There is need for routine evaluation and monitoring of the sputum positivity rate from our laboratory, to ensure that the case detection rate of the sputum microscopy is within the acceptable minimum prescribed.

Limitations

This study was a retrospective study and as such

many of the respondents did not record their biodata fully, leading to a lot of incomplete data.

Contribution by authors

The study was conceptualised by both authors. The data collection was done by both authors and both authors also contributed to writing the paper.

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Declaration of interest

None to be declared.

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