Epidemiology of Pulmonary Tuberculosis in the University of Port-Harcourt Teaching Hospital: Gender Related Disparaties

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Abstract: This study investigated the gender based disparities in the prevalence of pulmonary Tuberculosis in the Port-Harcourt metropolis of Rivers-State, Nigeria. A total of 1038 sputum samples were collected from in and out patients of the University of Port- Harcourt Teaching Hospital for a period of one year. Three (3) deep cough samples were collected per patient over a period of three days. The samples were examined macroscopically and microscopically. The Ziehl-Neelsen technique for the detection of Mycobacterium tuberculosis in sputum was carried out. The sputum samples were also cultured using MacConkey, Chocolate and Blood agar. Biochemical tests were used for identification. Of the 1038 samples collected, 348(33.5%) tested positive and 690(66.5%) were negative for acid fast bacilli (AFB). Of the 348 positive AFB samples, 149(23.7%) were males and 199(48.5%) were females showing a higher prevalence in females than males. The study showed a significant difference in TB infection between male and female subjects (23.7% vs. 48.5%, $P<0.05$). It also showed no significant difference between overall positive and negative female subjects at 5% and 10% ($P>0.05$). In conclusion, there seems to be a gender difference in the inception, progression and outcome of TB infection. Continued research on gender and tuberculosis need to be geared in the direction of ascertaining the magnitude of gender disparities in tuberculosis, from contracting the disease to successful recovery and rehabilitation.

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1. Introduction

Among communicable diseases, Tuberculosis (TB) is the second leading cause of death worldwide killing nearly 2million people per annum (Frieden et al., 2003). The World Health Organization (WHO) estimates that one-third of the World's population is infected with Mycobacterium tuberculosis, resulting in an estimated 8 million new cases of tuberculosis and nearly 2 million deaths each year (Small et al., 1996). In Nigeria, Tuberculosis is common; a prevalence rate of 9.2% has been reported in one study and a case fatality rate of 12% in another (Salami and Oluboye, 2003).

Tuberculosis can either be acute and short lived or chronic and long term. Ninety percent of patients who harbor Mycobacterium tuberculosis do not develop symptoms or physical evidence of the disease and their x-ray remain negative. Tuberculosis affects many organs and tissues in the body, but the lung is the major site of disease. Pulmonary tuberculosis is tuberculosis that affects the lung, and represents about 85% of new cases diagnosed. This occurs when the primary infection does not heal completely and there is continued multiplication or reactivation of organisms in the lung, several months or years later due to a number of reasons e.g. poor health, malnutrition or defective immune system. The clinical manifestation of pulmonary tuberculosis is: productive cough, oral thrush, weight loss, night sweats, fever, chest pain and herpes zoster (Ahidjo et al., 2005).

TB caused by the bacterium *M. tuberculosis,* is believed to enhance the progression of the HIV disease (Haskins et al., 2009; Okonko et al., 2012). This enhancement of the virus has been suggested to be a result of the generalized immune activation seen in tuberculosis patients (Paton et al., 2005; Okonko et al., 2012). The TB epidemic is on the rise in most countries, including Nigeria (Okonko et al., 2012). This problem is further compounded by HIV co-infection, since one-third of HIV and AIDS-related deaths results from TB (Vihrova et al., 2007). Over the past decade, tuberculosis incidence has increased in several countries in Africa. Available data suggest that this increase is mainly as a result of the burden of HIV infection in those countries (Okonko et al., 2012). The epidemic of *M. tuberculosis* has infected about one-third of the world's population creating an adverse impact socially and economically in developing countries (Malen et al., 2006; Okonko et al., 2012).

Presently, the prevalence of pulmonary tuberculosis has been on the increase. This might among other factors be related to the co-infection of HIV and TB. Risk factors associated with the spread of Tuberculosis include, history of TB in the family, occupation, unfavourable living conditions, number of people in the family, HIV status, work related migration phenomenon, as well as age and gender related disparities. This study is designed to investigate the activities of Tuberculosis in our locality as it relates to gender.

2. MATERIALS AND METHODS

2.1. Study population

A total of 1038 sputum samples were collected from in- and out- patients of the University of Port-Harcourt Teaching Hospital (UPTH) for a period of 1year, January, 2007 to January, 2008. The patients had productive cough, consistently for a period of 3weeks and had gone to the D.O.T. clinic. They were examined and referred to the UPTH. They consisted of 628males and 410 females of ages 1-80 years and were all reporting for the first time so there were no exclusion factors.

2.2. Sample collections

Three samples were collected per patient after a deep cough over a period of 3 days according to Guidelines of the National Tuberculosis Control Programme. Two samples at least must be positive for Acid Fast Bacilli (AFB) in order to confirm a diagnosis of sputum, positive for pulmonary diagnosis. Examination of the specimens was done at the UPTH, Microbiology Department Laboratory. Ethical consent was sought for and was received.

2.3. Bacteriological analysis

The sputum samples were examined macroscopically and described and identified according to their appearance. The sputum was also examined microscopically after Gramm staining. The Ziehl-Neelsen smear method of detecting Acid Fast Bacilli was also used. Cultivation and sensitivity testing for *M. tuberculosis* was performed on MacConkey agar, Chocolate agar as well as Blood agar as described by Cheesbrough (2006). The organism isolated was identified using an array of tests as described by Cheesbrough (2006).

2.4. Data Analysis

Data generated in these studies were analyzed using the Chi-square and Student t-test. The differences were considered significant where p-value was less than 0.05.

3. RESULTS ANALYSIS

A total of 1,038 subjects were sampled for Acid Fast Bacilli (x3) using their sputum samples, from January 2007 to January, 2008. The number and percentage of female subjects tested was 410 (39.5%) and the male subjects were 628 (60.5%). This is shown in Table 1. Table 1 also shows the number and percentage of pulmonary tuberculosis in relation to sex. It showed higher number of positive smears among females 199(48.5%) than males 149(23.7%) as shown in Table 1. The study showed a significant difference in TB infection between male and female subjects (23.7% vs. 48.5%, $P<0.05$).

TABLE 1: DISTRIBUTION OF SUBJECTS FOR PULMONARY TUBERCULOSIS SCREENING

SEX	No. Tested (%)	No. Positive (%)
Males	628(60.5)	149(23.7)*
Females	410(39.5)	199(48.5)*
Total	**1,038(100.0)**	**348(33.5)**

Key: * = Significant

Table 2 shows the total number and percentage of males and females that were negative for acid bacilli (x3). It showed that 57.2% of the female subjects tested had no acid bacilli (x3) while 42.8% of their male counterparts were also negative for acid bacilli (x3). The P-value for both positive and negative female subjects was 0.847. Since the calculated t-value (2.028) is less than the critical t-value (2.132) it is concluded that there is no significant difference between overall positive and negative (control) female subjects at 5% and 10% ($P>0.05$). Since the calculated t-value = 2.028 is less than the critical t-value = 2.132, we therefore conclude that there is no significant difference between overall positive and negative female subjects at 5% and 10% ($P>0.05$).

TABLE 2: PERCENTAGE OF NEGATIVE SMEARS AMONG MALE AND FEMALE SUBJECTS

SEX	No. Tested (%)	No. Negative (%)
Males	628(60.5)	479(76.3)
Females	410(39.5)	211(51.5)
Total	**1,038(100.0)**	**690(66.5)**

4. DISCUSSION

Infections caused by *Mycobacterium tuberculosis* are among the commonest in our hospitals, especially found in patients with suppressed immune system activity as a result of HIV. TB is a leading cause of morbidity and mortality among people living with HIV (PLWHIV). The WHO estimated that TB accounted for 30% of AIDS death in 1999 (WHO, 1999). HIV is also dramatically fuelling the tuberculosis epidemics in Nigeria. In this study, the prevalence and pattern of pulmonary tuberculosis showed the highest level of infection among

women. This is consistent with other studies suggesting that responses to TB differed between men and women and that barrier to early detection and treatment of TB may be greater for women than men (Holmes et al., 1998). Male subjects in this age group had a higher prevalence rate of TB than other age groups. This is similar to the studies of Romero et al. (2007). It however, disagrees with the Bruchfeld et al. (2002), Mota et al. (2006), Akpaka et al. (2006) and Okonko et al. (2012) who reported that TB infection was more in males than females. Obiora et al. (2004) reported no significant difference in the prevalence of TB and HIV-PTB infection rate in Benin and Irrua when sex and occupation of the subjects are considered. Obiora et al. (2004) also reported higher infection rate for TB among males in Benin and Irrua, Nigeria. Nnorom et al. (1996) reported higher infection rate for TB among males in urban and rural communities in Nigeria.

A 10 year study performed among Ethiopian Jews who immigrated to Israel found that women had an incidence rate of TB that was twice that of men (Greene et al., 1992). In addition, studies have suggested that progression from TB infection to disease maybe faster in women of reproductive age than men of the same age (Murray, 1991). Biologically, there may be differences in immune responses to TB between males and females. It has been suggested that the immune response in TB may be directly related to differences between females and males in type and concentration of non-sex steroid secreted (Diwan and Thotson, 1999). The reason for this response difference is however, unclear.

Cell mediated immune responses are depressed by protein-calorie malnutrition (Fikree et al., 1993) and this could account for differences in the response to TB in males and females since females have significantly lower body mass indices. Nonetheless there is an estimated 2:1 male to female ratio in the number of TB cases notified to public health authorities (Kumaresan, 1996) indicating that any increase in the risk of development of tuberculosis that reproductive stress may confer upon women is transient. Despite this disparity in case notifications, mortality from TB is similar among young males and females in Africa (WHO, 1999).

In most settings, TB incidence rates are higher for males at all ages except in childhood when it was higher in females. Studies show that sex differentials in prevalence rates begin to appear between 10 to 16years of age and remain higher for males than females, thereafter. Data indicating higher TB rates for men particularly were obtained from developing countries (Belgun, et al, 2001) and are controversial. This can be attributed to gender based differences in access to health care (Upleakar et al., 2001).

5. CONCLUSION

In a study by Jimenez-Corona et al. (2006), they observed that men not only had higher rates of pulmonary TB, but also had more severe clinical symptoms when diagnosed with TB. The higher rates among men were also attributed to the local transmission dynamics particularly in crowded, poorly ventilated or nosocomial settings. According to Jimenez-Corona et al. (2006), men are more likely to report risk factors associated with exposure to TB. In conclusion, there seems to be a gender difference in the inception, progression and outcome of TB infection. In the locality in which this study was done, the prevalence is higher in females than males. Continued research on gender and tuberculosis need to be geared in the direction of ascertaining the magnitude of gender disparities in tuberculosis, from contracting the disease to successful recovery and rehabilitation, starting with 1) ensuring that all current data on progress of global control of tuberculosis is sex disaggregated, 2) re-examining sex disaggregated data from surveys and data maintained by tuberculosis programmes, and 3) examining the causes underlying any sex or gender disparities, to understand the extent to which these are biological, social/cultural or operational, through comparative studies in disease settings.

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