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A RETROSPECTIVE STUDY OF PULMONARY TUBERCULOSIS (PTB) PREVALENCE AMONGST PATIENTS ATTENDING INFECTIOUS DISEASES HOSPITAL (IDH) IN KANO, NIGERIA

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ABSTRACT
A retrospective study aimed at ascertaining the prevalence of Pulmonary TB amongst patients attending Infectious Diseases Hospital, Kano was conducted between January, 2006 and July, 2008. Sputum samples were obtained from three thousand six hundred and seventy nine (3679) patients. Samples were smeared on glass slides, stained using Ziehl Neelsen Stain and later observed under light (oil immersion) microscopy. The results showed that were positive for tuberculosis had prevalence of 541 (14.7%) out of 3679 subjects. The age group 30-43 years had the highest prevalence of 145 (17.0%) out of 858 of PTB positive subjects. There was no significant difference between age groups and sex of subjects with PTB positivity {X^2: 11.07 at P= 0.05 and X^2=15.09 at P=0.01}; similarly, the difference between prevalence of PTB in male and female subjects between the three year period{X^2=14.07 at P= 0.05 and $X^{2=}$18.48 at P=0.01} was not significant. It is noteworthy that PTB is still a serious disease in this part of the world, thus, there is need for stepping up TB awareness, treatment and control program.

Key words: Retrospective study, Pulmonary Tuberculosis, prevalence, Mycobacterium tuberculosis

INTRODUCTION

Tuberculosis which is also referred to as 'phthisis pulmonalis' is among the leading infectious diseases, which causes death in humans among adults and youth (WHO, 2000). One third of world's population are infected with *Mycobacterium tuberculosis.* WHO estimates that active cases of TB afflict seven to eight million people annually leading up to three million deaths per year (WHO, 2000).

M. tuberculosis is a slow- replicating bacterium, resistant to most conventional anti-microbial agents partly due to its impermeable cell wall. It may persist in a dormant or latent form, unsusceptible to agents targeting growing bacteria (Murray, 2000).

HIV infected persons are ten times more likely to develop TB than HIV negative individuals, because HIV accelerates the rise in TB case rates. Despite these, there is no novel anti- TB drug development in over twenty five years (FDA, 1998).

According to the World Health Organization (WHO, 2008), nearly 2 billion people, one- third of the world's population, have TB. Almost 95% of TB cases are found in the developing world. Currently, WHO promotes 5 component Directly Observed Treatment, Short-course (DOTS) strategy as best approach toward therapy and global control (Hudson, *et al*., 2003). A major determinant for the burden of disease is poverty. The gap between the world's 20% poorest population groups and the 20% richest in terms of death is wide (Hudson *et al.*, 2003).

Nigeria has been ranked as the third tuberculosis (TB) afflicted nation in the world. Of all the cases of TB recorded worldwide, 80 per cent occurred in 22 countries of which Nigeria ranked third (World TB Day, 2008). TB was declared an emergency in Nigeria in 2006. Lagos State has 8.4 per cent of the national TB burden with an estimated patient load of 21,000. This is attributable to the high population density of the state (World TB Day, 2008).

In a case study conducted in Infectious Diseases hospital, Kano, the result showed that, out of 80 patients sampled, 52 were diagnosed to be Acid fast bacilli positive and 28 were Acid-fast bacilli negative. 61.5% and 38.5% prevalence were found in males and female patients respectively, with age group 31- 40 years having the highest prevalence of 28.8% (Taura, Sale and Mohammed, 2008).

More people are infected with the disease today than at any other time in history. The World Health Organization (WHO, 2008), has estimated that 8 to 10 million people catch the disease every year, with 3 million dying from it. It causes more deaths worldwide than AIDS and malaria combined, and it is the world's biggest killer of women. TB 'blackspots' include Eastern Europe, with 250,000 cases a year, South East Asia, with 3 million cases a year, and sub-Saharan Africa, with 2 million cases a year. The WHO predicts that if left unchecked TB will kill 35 million people in the world by 2025. In March 2006 it announced a strategy to both reduce the incidence of and death due to TB by 2015 by 50 per cent relative to 1990, and to eliminate TB as a public health problem by 2050 (WHO, 2008).

Transmission from children aged <10 years is unusual, although it has been reported in association with the presence of pulmonary forms of disease typically reported in adults (Lawrence, 1996).

A Kolin (Czechoslovakia) survey was undertaken on tuberculin reaction in children between those vaccinated with BCG and without, and the result showed a slight rise in the prevalence among the unvaccinated group in the 7 years and 14 years of age: 3.89 and 5.49 as against 4.00 and 6.14 respectively (Styblo, 1967).

Risk factors for tuberculosis are factors that do not seem to be a direct cause of the disease, but seem to be associated in some way. Having a high risk factor for tuberculosis makes the chances of getting a condition higher but does not always lead to tuberculosis. Also, the absence of any risk factors or having a protective factor does not necessarily guard against getting tuberculosis (Huntley, 2008).

Risk factors for tuberculosis include: Latent TB infection, Aging, Elderly, Young children, HIV, Diabetes mellitus, Alcoholism and smoking, Overcrowding, Migrants, Prisons, Airborne droplet transmission, coughing etc. (Huntley, 2008).

In England 42 was the mean age of patients hospitalised for tuberculosis. 69% of hospitalizations for TB were for 15- 59 year olds in England. While 10% was for over 75 year olds (Hospital Episode Statistics, 2003).

In a study carried out among refugees in Minnesota, 49% had tuberculin test > 10mm indurations, indicating positivity, with a higher prevalence in males (54%) and refugees >18 years of age (63%)(Alan et al., 2002).

Study in China has shown that cure rate as high as 95% can be achieved through DOTS implementation. But, treatment is labour intensive and complicated making it difficult to deliver in developing countries. If DOTS is not adhered to properly, there is risk of Multi-Drug Resistance (MDR) increases (Murray, 2000).

As more MDR strains of *M. tuberculosis* are transmitted across population, drugs currently used will become impotent for effective treatment and control. Re-emerging diseases—those making a comeback after a period of disappearance either because of drug-resistant strains of bacteria, continued decline in public health, or lowered immunity (often due to AIDS) in the victims—include TB. Other factors such as overcrowding, greater population mobility and resettlement, social collapse, intercontinental travel, and climate changes have all increased the spread of TB in both the developing and developed world. Equally important has been a decline in public health measures in parts of the developed world, such as lack of access to childhood vaccination programmes, and the withdrawal of funds for research into diseases like TB (Newell, 2007; WHO, 2008).

This study is a retrospective study aimed at ascertaining the prevalence of pulmonary tuberculosis amongst patients attending the Infectious Diseases Hospitals in Kano.

MATERIALS AND METHODS

Study Area

Infectious Diseases Hospital, Kano is a government owned specialized secondary health facility serving a population of about 1.5 million and having a patronage of about 300/day. It is a referral centre located along France road in Kano metropolis. The state capital is located on latitude 12.000N and longitude 8.300E. It is within the semi-arid Sudan savannah zone of West Africa about 840 kilometres from the edge of the Sahara desert. Kano has a mean height of about 472.45m above sea level. The hospital caters for all infectious diseases cases such as HIV, gastroenteritis, cholera, TB, e.t.c.

Target Groups, Sample Size and Sample Collection.

Four age groups were selected for this study, which were 0-14, 15-29, 30-43, and 44- above years of age respectively. A total of three thousand six hundred and seventy nine (3679) patients cutting across age groups and of both sex were surveyed. Three sputum samples of early morning spot were collected from each patient. Patients were told to cough deeply into a sterile container at a well ventilated environment and away from people. The obtained sputum samples after firmly closing the lid, were registered immediately after collection; the side and cap of the container were labelled accordingly, and stored in a cool, dry and dark place (WHO, 2000). The period of sampling was between January, 2006 and July, 2008.

Preparation of Smear and Ziehl Neelsen Staining

A clean slide free from grease was labelled reflecting the identity of the patients. Using a sterile wire loop, a smear was made by systematic sweeps across the glass slides. Smear was spread evenly in appropriate area.

The smear was heat- fixed with flame after complete air drying. Carbol fuchsin was applied onto the slides and heated gently for 5 minutes, then washed and drained. Later decolorized for three minutes, washed thoroughly, and covered with methylene blue for one minute. The slides were then washed, drained and ready for microscopy after drying (WHO, 2000).

Microscopy for Identification of Acid Fast Bacilli (AFB)

The stained and dried smear was viewed under oil immersion using electric light microscope. AFB is seen as a fine red rod against blue background. Interpretation of results was done using WHO guidelines (WHO, 2000)

Statistical Analysis

Data obtained were analysed using SPSS Statistic Base 17.0, where descriptive analyses such as sum, percent distribution, and mean e.t.c. were computed. While Chi- Squared Goodness of Fit was employed in order to statistically determine if any significance between variables such as age groups, sex of subjects, AFB positivity and prevalence existed.

RESULTS

Results of the retrospective study has shown PTB prevalence of 541 (14.7%) out of 3679 subjects, with highest prevalence of 348 (17.4%) out of 2006 amongst male subjects. Highest prevalence of 145 (17.0%) out of 858 was obtained from 30-43 age group (Table 2).

Table 1 described demographic characteristics of the sampled population, in which age group 15-29 years had the highest percent distribution of 2061 (56%) out of 3679 subjects; male subjects recorded the highest percent distribution of 2006 (54.53%) out of 3679 total population. Figure 1 and 2 graphically shows prevalence of PTB amongst male and female subjects respectively within three years (2006-2008).

There was no significant difference between age group and sex of subjects with PTB positivity { X^2= 11.07 at P=0.05 and X^2= 15.09 at 0.01}. Likewise, there was no significant difference between male and female subjects within three years of study with *M. tuberculosis* positivity{X^2= 14.07 at P= 0.05 and X^2= 18.48 at 0.01}.

Table 1: Demographic Characteristics of Sampled Subjects.

Variables	**Percent**	**Distribution (%)**	
Age groups(Years)	**Male**	**Female**	**N**
0-14	59.4(173)	40.6(118)	8(291)
15-29	55.60(1146)	44.4(915)	56(2061)
30-43	50.0(429)	50.0(429)	23(858)
44- Above	55.0(258)	45.0(211)	12(469)
N	**54.53(2006)**	**45.47(1673)**	**100(3679)**

Key : Numbers in parenthesis are sum of subjects sampled
N=number of total subjects sampled

Table 2: Prevalence of pulmonary tuberculosis amongst patients attending Infectious Hospital, Kano (Jan. 2006 – July, 2008)

	Prevalence (%)			
Age groups (Years)	**Male**	**Female**	**n**	**N**
0-14	6.4 (11)	10 (12)	8 (23)	291
15-29	19.3 (221)	10.5 (96)	15.4 (317)	2061
30-43	20.5 (88)	13.3 (57)	17 (145)	858
44- Above	10.9 (28)	13.3 (28)	12 (56)	469
Prevalence (%)	17.4	12.0	14.7	
N	**348***	**193***	**541***	**3679**

*There is No Significant Difference between Age groups and Sex of Subject with AFB positivity at P=0.05 and 0.01.
Key : N=total sum of subjects
n=sum of subjects AFB positive

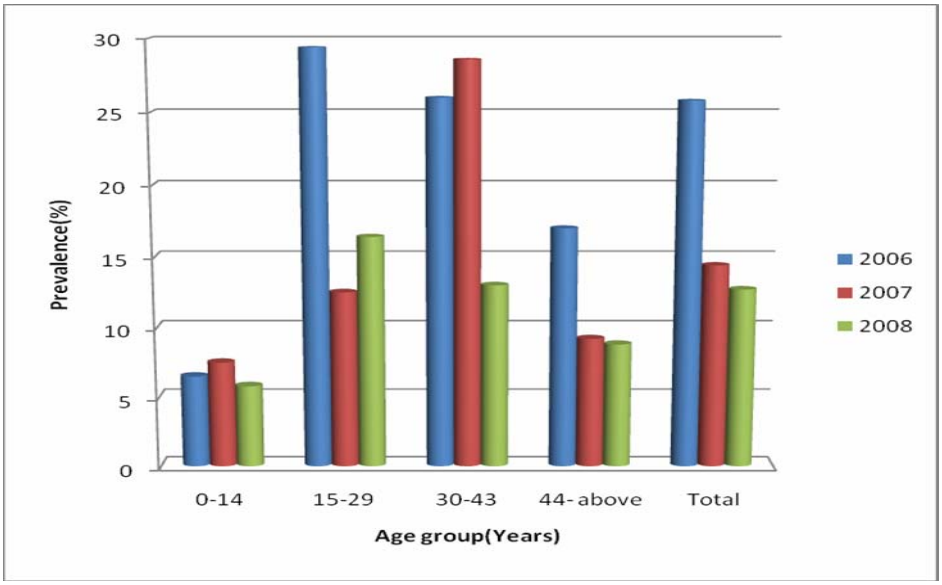

Figure 1:Prevalence of PTB among Male Subjects (from Januuary, 2006- July, 2008).

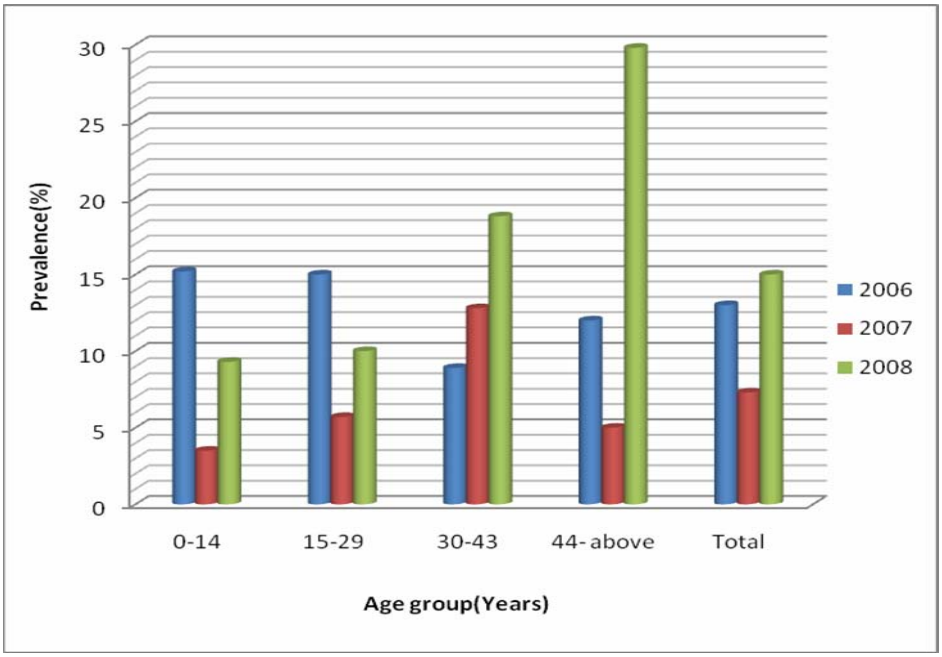

Figure 2: Prevalence of PTB among Female Subjects (from January, 2006- July, 2008).

DISCUSSION

Demographic characteristic analysis showed 15-29 age group having the highest percent distribution of 2061 (56%) out of 3679, and male subjects had the higher distribution among the sexes 2006(54.53%) out of 3679 subjects (Table 1). The results of the current study showed PTB prevalence of 541 (14.7%) out of 3679 subjects within the period of the study (i.e. January, 2006- July, 2008) (Table 2). Highest prevalence of 145(17.0%) out of 858 AFB positive subjects was obtained from 30-43 age group (table 2). With male subjects having the higher prevalence of PTB among the sexes 348(17.4%) out of 541. This has vividly shown that male subjects were more infected than the rest of the population. This is in concordance with the work of Taura, Sale and Mohammed (2008). Where male subjects had prevalence of 61.5% as against 38.5% prevalence in the females.

This disparity could be due to the fact that male subjects are more exposed to risk factors of TB infection such as smoking, etc. which can make them more susceptible (Table 1 and Figure 1). This result is re-enforced with the fact that male subjects had PTB prevalence of 348 (7.4%) out of 541, which was higher than that of female subjects (Table 2, Figures 1 and 2).

This is in agreement with the other findings of study carried out among refugees in Minnesota, where 49% had tuberculin test > 10mm indurations, indicating positivity, with a higher prevalence in males (54%) and refugees >18 years of age (63%)(Alan *et al.,* 2002).

The prevalence in the sampled population is 541(14.7%) out of 3679 (Table 2). Despite the fact that it appears low, the risk of infecting other people is great due to the fact that PTB is transmitted through aerosol, more especially in densely populated area like the study area (i.e. Kano metropolis) of which is also a risk factor for tuberculosis infection(Huntley, 2008). Although the WHO recommended regimen for TB treatment and control is free i.e. Directly Observed Treatment, Short-course (DOTS), non adherence leads to re-emergence of TB, because of the production of multi-drug resistant strains, that are more virulent (Murray, 2000) and thus, explains why prevalence is still in double digits (Figures 1 and 2).

The result is worrisome because Nigeria has been ranked as the third tuberculosis (TB) afflicted nation in the world. Of all the cases of TB recorded worldwide, 80 per cent occurred in 22 countries of which Nigeria ranked third. This is despite the fact that TB was declared an emergency in Nigeria in 2006(World TB Day, 2008).

The incidence and prevalence of tuberculosis (TB) in children are increasing and becoming a particular problem in countries that are also affected by the HIV epidemic (WHO, 2008). This is highlighted in the current survey of which children of 0-14 year age group had prevalence of 23 (7.0%) out of 291 (Table 2, Figure 1 and 2). Reason to such prevalence could be deduced from a Kolin (Czechoslovakia) survey undertaken on tuberculin reaction in children between those vaccinated with BCG and without, and the result showed a slight rise in the prevalence among the unvaccinated group in the 7 years and 14 years of age: 3.89 and 5.49 as against 4.00 and 6.14 respectively (Styblo, 1967). Although transmission from children aged <10 years is unusual, it has been reported in association with the presence of pulmonary forms of disease typically reported in adults (Lawrence, 1996). This underscores the need for scaling up TB surveillance program (Table 2; Figures 1 and 2).

The retrospective study among male subjects within the three year period indicated a steady decrease in prevalence of PTB, with 2006 having the highest figure of 26%, while 2008 had relatively least prevalence of 13%(figure 1). Although there was a phenomenally high prevalence among 30-43 year age group 145(17%) 858 (Table 2, Figure 1). Explanation to this can be obtained from the survey conducted in England in which 42 was the mean age of patients hospitalised for tuberculosis. 69% of hospitalizations for TB were for 15- 59 year olds in England. While 10% was for over 75 year olds (Hospital Episode Statistics, 2003). Prevalence of PTB among female subject is relatively lower than that obtained from the males 193(12%) out of 1673(Table 2).

But the result from figure 2 showed an increase in prevalence of PTB, 12% in 2007 as against 14% in 2008. This is in contrast with the result obtained from the male subjects where steady decline in prevalence of PTB through three year (2006-2008) period was observed. This sprout of prevalence in the female group could be attributed to multifarious factors such as gender issues, poverty, ignorance, pregnancy and other risk factors for TB infection peculiar to female subjects(Huntley, 208; WHO, 2000; WHO, 2008).

It is interesting also to note that there was steady increase in prevalence of PTB among female with increase in age group in 2008: 9%, 9.5%,17% and 29% in 0-14, 15-29, 30-43, and 44-above respectively (figure 2). This result should serve as a warning to the change in paradigm, in which although there was significant decline in prevalence of PTB among the male subjects, the reverse is the case among their counterpart i.e. the females (Figures 1 and 2).

This is could be due to re-emergence of TB infections—those making a comeback after a period of disappearance either because of drug-resistant strains of bacteria, continued decline in public health, or lowered immunity (often due to AIDS) in the victims(Newell,2007).

Other factors such as overcrowding, greater population mobility and resettlement, social collapse, intercontinental travel, and climate changes have all increased the spread of TB in both the developing and developed world. Equally important has been a decline in public health measures in parts of the developed world, such as lack of access to childhood vaccination programmes, inadequate ante-natal care in pregnancy, and the withdrawal of funds for research into diseases like TB (Newell, 2007; WHO, 2008).

CONCLUSION

Pulmonary tuberculosis has proven to be a hard nut to crack, because its prevalence continues to be interpreted in double digits as indicated in the current study and previous reports. Despite the step up in the management, control and prevention of PTB through WHO recommended DOTS program, TB is re-emerging in the country like a 'malevolent genie' once uncorked will not be easy to be contained. This could be due to other risk factors such as increased incidence of HIV/AIDS, increasing poverty level and urban explosion as a result of urban- rural migration. Result like the one obtained in this current study is relevant because Infectious Diseases Hospital (IDH) is a referral centre of which TB prevalence there reflect a trend of spread in the general populace around Kano, and its environs, as well as Katsina and Jigawa states.

Recommendations

It is pertinent at this juncture to proffer the following recommendations:

- ✓ Early reporting of new cases and prompt triage (i.e. identification, isolation and/or referral of suspected or confirmed infectious TB disease must be effected at government level.
- ✓ Scaling-up of TB awareness and knowledge dissemination should be done by the government so as to curtail indiscriminate spread of TB infection in the community, as the result of female subjects shows an increase in prevalence.
- ✓ Improved housing conditions such as building of well ventilated rooms with less congestion and environmental sanitation should by emphasized by both the government and the community.
- ✓ BCG vaccination for children must be included in mass immunization program, unlike the current situation where it is available only in the health centres, since there is still prevalence of PTB among the paediatrics.
- ✓ Health care workers should routinely be tested for AFB, this will reduce cases of nosocomical infections (hospital acquired infections).
- ✓ Researches need to be conducted on what doses should be used safely and effectively on the neonates, bearing in mind that children are continuously infected either through infected mother or member of the house and /or community.

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