Full Length Research Paper

Kinetics and demographic studies of tuberculosis among patients attending National Tuberculosis and Leprosy Control Programme, Owo Centre, Ondo State, Nigeria

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The question of whether we are winning the age-long war against *Mycobacterium tuberculosis* disease still remains. Thus, a retrospective study was carried-out to determine the occurrence of new cases of infection and the kinetic factors that may precipitate the infection in the society. Retrospective review of program data was done using a pro formal to retrieve data of patients' that attended National Tuberculosis and Leprosy Control Programme, Owo Centre, between January 2008 and December 2012. There were 342 new cases within the period on focus, 178 (54.9%) were males and 156 (46.2%) were females, there was no significant difference (given α_1 = 01.3, P = 0.022). The vulnerable age group was 35 - 44 years followed by 25 - 34 years. The occurrence of new cases of Tuberculosis was higher in 2012 than the previous years. Category (CAT) 1 regimen was more efficient than category (CAT) 2 regimen. The record revealed that 63.7% were cured, 11.7% were dead and 24.6% defaulted or transferred out to other centres. The trend could be as a result of marked surge in population of the community that is growing toward urbanization, socio-economic status of the community, malnutrition as result of poverty and low level of living standard. There is therefore the need to step-up enlightenment campaigns to educate the masses on the need to report cases of suspected pulmonary tuberculosis (PTB) infection and also adhere to treatment regimen as prescribed by clinicians; non-compliance to treatment may be responsible for the persistence of this age-long infection in the society.

Key words: Treatment outcome, age distribution, new cases, pulmonary tuberculosis.

INTRODUCTION

Tuberculosis (TB) is a common, and in many cases highly infectious disease caused by various strains of Mycobacteria usually *Mycobacterium tuberculosis* (Kumar et al., 2007). Pulmonary TB typically affects the

lungs, but can also affect other parts of the body. It is spread through the air when people who have an active TB infection cough, sneeze, or otherwise transmit respiratory fluids through the air (Konstantinos, 2010). Most infections are asymptomatic and latent, but about one in ten latent infections eventually progresses to active infection (Nigeria Tuberculosis Fact Sheet 2012). However, if primary infections are not treated, it may deteriorate and lead to death. The clinical signs of TB infection include chronic cough with blood-tinged sputum, fever, night sweats and weight loss (the latter giving rise to the formerly prevalent term "consumption"). Infection of other organs causes a wide range of symptoms.

Tuberculosis is the oldest documented infectious disease and it remains an important global health problem (Stylbo and Rouillon, 1981). Tuberculosis of the spine has been discovered in Egyptian mummies (Lawn and Zumla, 2011). During the industrial revolution and the period of related urbanization in the seventeenth and eighteenth centuries, TB became a problem of epidemic proportions in Europe causing at least 20% of all deaths in England and Wales in 1650 (Raviglione, 1995). Robert Koch discovered the etiologic agent- tubercle bacillus in 1882 thus paving way for introduction of anti-mycobacterial drugs in the middle of nineteenth century (Nobel Foundation, 2006).

World Health Organization (WHO) declared TB a global emergency in 1993 and it remains as one of the world's major causes of illness and death (World Health Organization, 2000). One third of the world's population carries the TB bacteria (Nigeria Tuberculosis Fact Sheet, 2012). More than nine million of these become sick each year with active TB infection that can be spread to others, though, latent TB disease cannot be spread (Nigeria Tuberculosis Fact Sheet, 2012). In 2011 alone, about 5.8 million newly diagnosed cases were notified to national TB control programmes (NTPs). This is still only two-thirds of the estimated total of 8.6 million people who fell ill with TB in 2011 (Nigeria Tuberculosis Fact Sheet, 2012). TB disproportionately affects people in resource-poor settings, particularly in Africa and Asia. Nigeria is ranked 10th among 22 high-burden TB countries of the world. TB occurs in every part of the world. In 2012, the largest number of new TB cases occurred in Asia, accounting for 60% of new cases globally. However, sub-Saharan Africa carried the greatest proportion of new cases per population with over 255 cases per 100 000 population in 2012 (World Health Organization, 2014). WHO estimates that 210,000 new cases of all forms of TB occurred in the country in 2010, equivalent 328/100,000 population (Nigeria Tuberculosis Fact Sheet, 2012).

Multi-drug resistant (MDR-TB) is resistant to any of the first-line drugs, specifically Rifampicin and Isoniazid (Raviglione, 1995). MDR-TB results from either infection with organisms which are already drug-resistant or may develop in the course of a patient's treatment and once TB organism acquire resistance gene, they can spread from person to person in the same way as drug-sensitive TB. Either drug sensitive TB and MDR-TB pose threat to life, nonetheless, if re-infection is not effectively addressed, it may wipe out the achievements of previous efforts in controlling TB (Wang et al., 2007).

MATERIALS AND METHODS

Study location

The retrospective study on demographic pattern of *Mycobacterium tuberculosis* was carried out in sub-urban area of Owo Local Government Area of Ondo State and its' environs in South Western Nigeria. The community is located at longitude 7° 11' 0" North, latitude 5° 35' 0" East of the equator with an estimated population of 222,262 according to fact and figure on Ondo State (Fact and Figure about Ondo State, 2010).

Study population

Patients attending the National Tuberculosis and Leprosy Control Programme (NTBLCP), Owo centre located at Owo Local Government Area for the treatment of tuberculosis between January 2008 and December 2012 constituted the sample population.

Selection and description of participants

Only new cases of pulmonary tuberculosis that attended the National Tuberculosis and Leprosy Control Programme Owo centre within the five years, that is, between January 2008 and December 2012 were retrieved for this study

Study instrument and variables

New cases of pulmonary TB infection between January 2008 and December 2012, variables such as bio-data and date of registration, diagnosis, and standard regimen of treatment (pretest, 2 month, 5 month, 8 month, 12 month and above 12 month) were obtained from the centre register. Other information including rainfall pattern, temperature, humidity, housing designs and planning, population and family size of the host community were noted.

Sputum smear microscopy

The diagnosis were carried out by laboratory staff in the centre, using Ziehl Neelsen (ZN) technique on triplicate sputum samples of early morning spot collected under standard bio-safety procedures. Result interpretation was according to World Health Organization (WHO) standard.

Data analysis

The data obtained from the study were statistically analyzed by the use of SPSS Version 17.0. Descriptive statistics were presented as means, frequencies, etc. Chi square test was used to compare variables and statistical significant differences were inferred at 95% confidence ($P < 0.05$).

Table 1. The gender, treatment regimen, diagnosis and treatment outcome of new cases of PTB in NTBLCP, Owo centre between January 2008 and December 2012.

Year	Gender		Treatment regimen		Diagnosis		Treatment outcome			
	Male	Female	Regimen 1	Regimen 2	Positive	Negative	Cured	Dead	Defaulted	Total
2008	32	24	44	12	39	17	30	12	14	56
2009	14	23	35	2	22	15	27	6	4	37
2010	26	24	40	10	30	20	38	5	7	50
2011	23	16	34	5	24	15	24	2	13	39
2012	89	71	133	27	95	65	99	15	46	160
Total	184	158	286	56	210	132	218	40	84	342
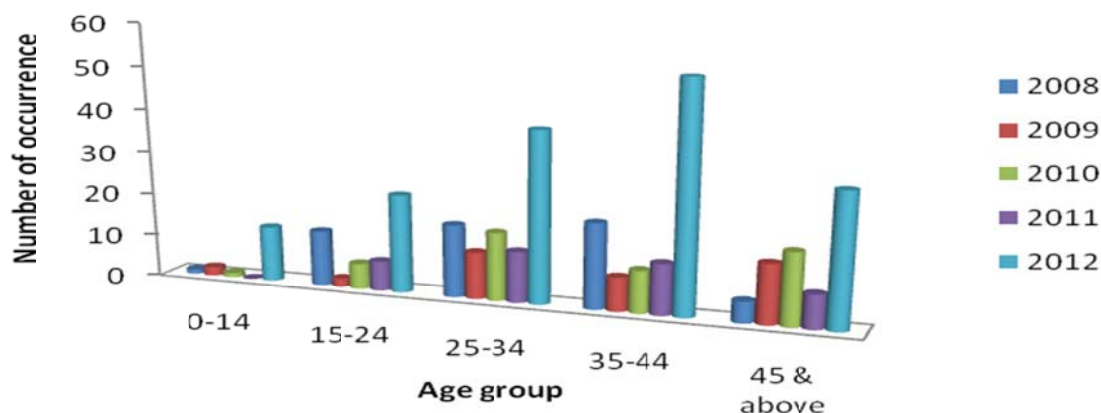
Figure 1. Age distribution of *Mycobacterium tuberculosis* infection between January 2008 and December 2012 at National Tuberculosis and Leprosy Control Programme (NTBLCP), Owo centre, Ondo State, Nigeria.

RESULTS

The gender, treatment regimen, diagnosis and treatment outcome of new cases of pulmonary tuberculosis (PTB) in NTBLCP, Owo centre between January 2008 and December 2012 is shown in Table 1. Among 342 new cases recorded during the period on focus, 184 (53.8%) were males and 158 (46.2%) were females. In 2012, the incidence was higher than the previous years, males recorded 89 (55.6%) and females were 71 (44.4%). The patients' that used treatment regimen 1 were 286 (83.6%) and those that used treatment regimen 2 was 56 (16.4%). Positive sputum diagnosis was 210 (61.4%) using ZN techniques. Treatment outcome showed that 218 (63.7%) were cured, 40 (11.7%) were dead and 84 (24.6%) defaulted in the recorded attendance.

The frequency of age distribution of new cases of PTB from 2008 to 2012 in Owo NTBLCP centre is shown in Figure 1. The result shows the age distribution of PTB and age group of patients' that were encountered during the study. Age group 34 - 44 recorded the highest occurrence followed by age group of 25 - 34 in 2012. The occurrence was least among children and teenagers

within the age of 0 - 14.

The incident of new cases of *M. tuberculosis* between January 2008 and December 2012 is shown in Figure 2. In 2012, the occurrence was higher throughout the year, unlike the records of the previous years. The increase in 2012 was over 50% higher than the previous years. The cause of this surge in 2012 could not be immediately determined and the difference was statistically significant at P < 0.05.

DISCUSSION

This age long infectious disease had been a subject of discussion in recent times and the question of whether we are winning the war against the PTB still remain. It is a fact; this airborne infectious disease can affect anyone who breathes in contaminated air. If the rate of infection is not properly monitored, it may spread like wildfire. The inhabitants of study area calls TB infection "*iko-ife*". They believe TB is an infection that cannot be cured and perceive TB infection to be of supernatural blight and the victim should be avoided in order not to be infected. TB
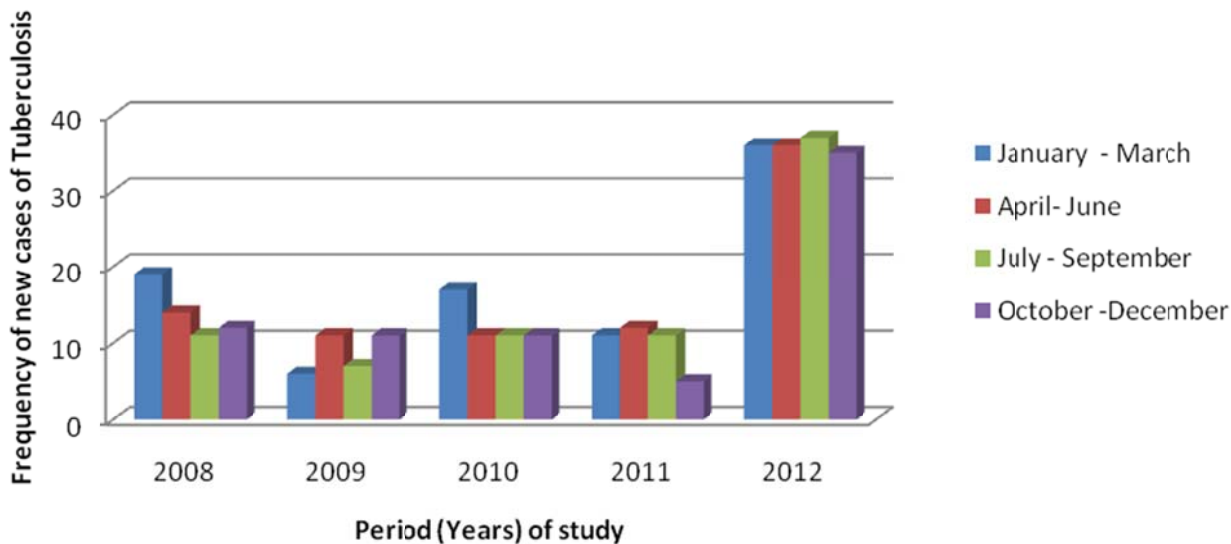
Figure 2. Occurrence of new cases of *Mycobacterium tuberculosis* infection between January 2008 and December 2012 at National Tuberculosis and Leprosy Control Programme (NTBLCP), Owo centre, Ondo State, Nigeria.

patients are often referred to traditional healers for management with herbs. Traditional healers rarely refer them to orthodox health care facility because of the confidence in their ability to handle such cases. Recently, it was gathered that the traditional healers have been educated to make prompt referral of cases to Directly Observed Short-course Therapy clinics for prompt treatment. This approach brought about the register in the local government and other designated centers'.

This study reveals a fluctuations pattern in the area, the increase in number of new cases in 2012 is worrisome. The observed pattern falls under the prediction of the experts; our finding is in agreement with the report of World Health Organization that reported an upward trend in sub- Sahara Africa (World Health Organization, 2000, 2014). This increase in trend could have been as a result of a surge in population in the community that is growing toward urbanization. Socio-economic status of the community, malnutrition as result of poverty and low level of living standard may be responsible for the observed trend.

Adequate nutrition of high protein content is needful for stimulation of antibody and cell-mediated immunity in the management of TB cases, especially during the course of treatment regimen, this obviously are lacked by the poor. Other factors likely to precipitate the continue spread of the infection in the community and its' environ are poor building plans, houses are built without proper planning, poor ventilation, houses are usually overcrowded. The building patterns of the community, especially the indigenous part of the community have low standard houses that are not well-ventilated and inadequate spacing. This may also increase the risk of transmission the infection within populace.

The highly resistant nature of the causative organism, which is airborne and possesses mycolic acid in the cell wall, might contribute to their extra pulmonary survival and could be spread as aerosol. This study reveals that occurrence was higher between January - March of the years which is usually around the dry season and windy. This finding is analogous with the reports of early researchers who from 11 countries around the world: South western Cameroon, South Africa India, Hongkong, Japan, Kwait, Spain, United Kingdom, Ireland, Russia and Mongolian, reported that occurrence of PTB is higher during the late winter and early spring than other part of the year. They also corroborate the fact that, indoor activities, seasonal change (weather), environmental and social factors such as temperature, humidity, over-crowding, as well as person-to-person contact, particularly during this period of the year, could increase number of occurrence of TB infection either as primary infection or secondary re-infection (Raviglione, 1995; Lambert, 2003).

It was also observed, that the occurrences of PTB during the studied period was higher in males than females. The vulnerable age group was 35 - 44, among which males had the highest distribution. Similarly, Imam and Oyeyi (2008) in a related study conducted in Kano, North Western Nigeria, stated that males have higher prevalence of PTB than females. This may not be unconnected to the fact that, the male folks are more exposed to identified risk factors such as smoking, alcoholism, etc., as identified by van Zyl Smit et al. (2010). This age group represents the work-force and bread winners of most family in Nigeria. The trends pose a big threat to the economy, since this is the most productive age group of any nation (Moller and Hoal, 2010).

It is interesting also to note that there was steady increase in prevalence of PTB among female in 2009. This observation should serve as a warning to the changing face of PTB. However, this ugly development may not be unconnected to some factors such as gender issues, poverty, ignorance, pregnancy and inadequate ante-natal care in pregnancy and other risk factors for TB infection peculiar to female subjects. Huntley (2008) also indicated a paradigm shift in his earlier report and linked it to predisposing factors. Meanwhile, cases of false negative sputum test are possible due to limitations of specimen collection, transportation and processing according to WHO-Recommended Diagnostic Tools. With the current insufficient evidence in such cases, it has earlier been suggested that diagnosis may be supplemented with clinical and radiographic findings although it could be argued that cases of false negative smear result will be rare because of the resilience of mycobacterium tuberculi.

Conclusion and recommendation

The data recorded from this retrospective study revealed an upward trend of TB in Southwestern Nigeria in spite of the step-up in the management, prevention and control of PTB through World Health Organization and donor agencies recommended DOTS program. There should be more awareness and enlightenment campaign programs on: the cause, kinetic factors precipitating PTB, the prevention and management of TB. Also, patients undergoing anti TB regimen should be educated on the benefits of compliance with treatment and the effect of non-compliance.

Conflict of interests

The authors did not declare any conflict of interest.

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