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Full Length Research Paper

Pattern of default among tuberculosis patients on directly observed therapy in rural primary health care centres in Ogun State, Nigeria

Amoran O. E.[1]*, Osiyale O. O.[2] and Lawal K. M.[3]

[1]Department of Community Medicine and Primary Care, College of Health Sciences, Olabisi Onabanjo University Teaching Hospital, Sagamu, Nigeria.
[2]General Hospital, Ijebu-Igbo, Ogun State, Nigeria.
[3]Disease Control and Primary Health Care, Ogun State Ministry of Health Abeokuta, Ogun State, Nigeria.

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This study was designed to identify risk factors associated with defaulting during TB treatment and indicate specific adjustments to be made. This study is a retrospective, cohort study. Information on all TB patients attending clinic for treatment from 1st April 2004 to 30th June 2007 was collected using a data collection form. A total sample of 938 patients was reviewed. The overall default rate among the TB patients was 14.4% and was about half (44.3%) of the entire negative outcome. 743 (79.2%) of cases were cured or completed treatment and 9 (1.0%) of cases were transferred out. Factors associated with default were return after default (p = 0.000), presentation with extra-pulmonary TB (p = 0.000) and defaulting in the first two months of treatment (p = 0.00). There was no statistically significant difference in the rate of default between HIV positive and HIV negative TB patients (22.8% vs 10.5%, X2 = 0.15, p = 0.699) and distance of domicile from PHC centres (p = 0.91). This study suggest that National TB control programmes should pay a closer attention to the issue of home visit and monitoring especially among patients with smear-negative PTB or EPTB and those returning after default in African population.

Key words: Tuberculosis,default rate,primary health care,directly observed theraphy.

INTRODUCTION

In Nigeria, tuberculosis (TB) is a serious public health problem. The WHO estimated 380,000 (9293/100,000 population) new tuberculosis cases annually with 60% annual risk of infection for TB. Many tuberculosis (TB) epidemiologists regard obtaining high compliance levels in the population under treatment as even more important to a community's welfare than finding new cases (World Health Organization WHO Tuberculosis Programme, 1994). Poor compliance with treatment (default) is thus a major impediment to effective tuberculosis (TB) chemotherapy worldwide and is one of the major causes of prolonged infectivity, poor outcomes for example, treatment failure and drug resistance (Grzybowski and Enarson, 1978). A rule of thumb is a national TB program that has a default rate of greater than 15% must emphasize achieving greater compliance over finding new cases. It is very important in tuberculosis (TB) control to detect the disease as early as possible and to ensure that those diagnosed complete their treatment and get cured. The World Health Organization (WHO) target for treatment success is 85% of all detected smear-positive cases (Grzybowski and Enarson, 1978). *Mycobacterium tuberculosis* has shown a propensity to mutate toward drug resistance, and defaulting patients have delayed sputum conversion and almost invariably relapse, often with a drug resistant strain, thus increasing the cost of treatment and may eventually lead to death (Romanus et al., 2000).

Retreatment requires more expensive drugs producing a greater financial burden on either the patient or public health delivery system. Moreover, defaulting patients remain infectious and constitute a danger to their families

*Corresponding author. E-mail- drfamoran@yahoo.com.

and the community, a situation that is exacerbated by the organism being resistant to first line drugs (Farah, 2005). An effective reporting system enables a determination of the overall effectiveness of tuberculosis control programme at the local, national and global levels; resource needs, the true distribution and dynamics of the disease within the population as a whole not just the population served by the government tuberculosis control programme. Detection and treatment of new cases in directly observed treatment short course chemotherapy (DOTS) programmes is believed to be the most valuable strategy for TB control (World Health Organization, 1992). However even though free medication may be available, many patients may not be successfully treated (Zellweger and Coulon, 1998; Steyn, 1997; Shargie and Lindtjørn, 2005). Main reasons for non-success are death while on treatment or before start of treatment and loss to follow-up. Nevertheless, well motivated health providers can improve the compliance rate of certain patients to treatment by focusing upon patient satisfaction and by increasing the degree of supervision and patient support throughout the duration of treatment, together with health education, counselling from a specially trained nurse and patients education booklets (Chaulet, 1990; Kilpatrick, 1987; Datiko et al., 2008). It is important to note, however, that non-compliance with TB treatment is underestimated by surveillance data. Many DOTS experiences in developing countries have been reported (El-Sony et al., 2002; Kassu et al., 2007; Federal Ministry of Health, 2005).

This study was designed to identify risk factors associated with defaulting during TB treatment. Reporting on the default pattern and other treatment outcome within the NTBLCP programme (as in this study) may highlight programmatic weakness, assess the overall effectiveness of the tuberculosis control program and indicate specific adjustments to be made.

MATERIALS AND METHODS

Study design

The present study was a retrospective, cohort study. The information was collected from the facility record using a data collection form. A cohort of all TB patients attending clinic for treatment from 1st April 2004 to 30th June 2007 was used.

Study location

There are 20 local government areas (LGAs) in Ogun State with each LGA having a TB and leprosy supervisor and one central register for each LGA. This study was carried out at the primary health care (PHC) units in the Ijebu North Local Government Area of Ogun State. The biggest town is Ijebu-Igbo town which is a semi-urban settlement. All other towns in the area where the PHC were located are rural settlements with an estimated population of 207, 969 people (projections from 1991 National population census). It occupies an area of 969 square kilometres with an average density of 215 persons per square kilometre. The predominant tribe is Yoruba with Ijebu people in the majority. The major occupations of the people are trading and farming. There are nine tuberculosis and leprosy control clinics in the LGA located at Obada PHC, Ago Iwoye/Ibipe PHC, Ago Iwoye /Oke-Odo PHC, Oke Agbo PHC, Oru/Awa/Ilaporu PHC, OOU Health Centre, Oru Refugee Camp, Apoje PHC, with a leprosy settlement centre located at Oke Eriwo. A central register for all the PHC units is kept at the Obada PHC unit. The Tuberculosis and Leprosy Supervisor for the Local Government coordinates activities of all the TBL centres. The German Leprosy and TB relief association (GLRA) is responsible for the provision of free drugs for the programme.

Sampling method

A total sample of all patients diagnosed with and receiving treatment within the PHC units of the national tuberculosis and leprosy control programme (NTBLCP) programme in Ijebu North LGA between 1st April, 2003 and June 2007, including those transferred in from other LGA were enrolled in the study.

Diagnosis of tuberculosis

Persons suspected of having TB are referred to TB clinics at district health centres or to the TB clinic at the general hospital for a standardized evaluation, including history and physical examination, examination of three sputum specimens for acid fast bacilli (AFB), and, if AFB smear-negative, chest radiography. TB diagnosis and classification follow standard WHO definitions (World Health Organisation, 2003). All persons diagnosed with TB in these facilities undergo HIV counselling and testing if available in the centre. A rapid serological test is performed in the TB clinic. HIV testing in the laboratory is by enzyme-linked immunosorbent assay followed by two different HIV ELISA tests if the first is positive. The tests kits used varied over the time of this project. In addition to routine clinical records and standardized TB registers, TB clinics also maintain a separate register of HIV-infected TB patients. Patients who have a positive retroviral screening test result are sent to the nearest teaching hospital. The Olabisi Onabanjo University Teaching Hospital for a confirmatory test and commencement of anti-retroviral Therapy (ARV), if required.

Data collection

We retrospectively reviewed TB, HIV and TB/HIV registers and clinical records to collect data about all HIV-infected TB patients aged ≥15 years diagnosed in Ijebu North LGA between 1st April, 2003 and June 2007, including those transferred in from other LGA. The support and assistance of the NTBLCP programme officer for Ogun state was enlisted through an advocacy visit to his office, who in turn linked up with the TBL supervisor for the Ijebu North LGA to ensure an unfettered access to patient register. Data were abstracted from these records using a standardized form that included questions about personal and demographic history; HIV risk factors, conditions, and treatment; TB diagnostic studies, treatment history and treatment outcomes. Public health staffs were trained to complete the abstraction form, and forms were checked for completeness and accuracy by a data collection supervisor.

Definition of data for analysis

We used standard WHO definitions for TB disease classification, registration and treatment outcome categories (World Health Organisation, 2003; International Union Against Tuberculosis and Lung Disease, 1996). TB registration status was divided into “new,

treatment after relapse, treatment after failure, treatment after default or "transfer in." Final TB treatment outcome was divided into "successful, failure, death, or default or transferred out. A successful treatment outcome included cured or completed.

Inclusion criteria

1). Patients were included in this study if they belonged to a cohort of patient who were diagnosed with tuberculosis and received treatment within the framework of the NTBLCP in Ijebu North LGA between 1st April 2003 and 30th June, 2007 irrespective of the treatment outcome.
2). Patients who completed their treatment within the periods of study.
3). Also, all patient who were transferred into the TB programme of the LGA from PHC units in other LGAs of the state or from another state are included with an accurate recording of their initial registration data from the primary PHC (referral) units.
4). The study included all PTB patients (whether sputum smears positive or sputum smear negative) and also all extra-pulmonary TB cases diagnosed clinically for example, chronic cough, chest X-ray etc still had sputum smear examinations and were labelled based on their sputum smear status.
5). Extra-pulmonary cases are clinically diagnosed and recommended for treatment by a clinician.

Data analysis

To describe patient characteristics, we calculated proportions and medians. For categorical variables, we compared proportions using chi-square tests and when appropriate, Fisher's exact test. For continuous variables, we compared medians using the Wilcoxon Rank-Sum Test and evaluated trends using chi-squared test for trend. In bivariate analysis, we analyzed risk factors for mortality by age, sex, HIV infection, residence in a rural district, adverse event during TB treatment, TB smear status, disease location, TB types and registration status. Chi-square was used to determine association between categorical variables and a p value of less than 0.05 was considered significant. Data was presented in a tabular form.

Ethical considerations

Ethical clearance

It was obtained from the Olabisi Onabanjo Teaching Hospital Ethics Board. Confidentiality on candidate's information was maintained. Permission of the State Ministry of Health, NTBLCP programme officer for Ogun state and TBL supervisor for the Ijebu North LGA were obtained before the commencement of the study.

RESULTS

A total sample of 938 patients diagnosed with and receiving treatment within the PHC units of the NTBLCP programme in Ijebu North LGA between 1st April, 2003 and June 2007, were included in the study. Of these, 464 (49.5%) were males. The age ranged from 1 to 83 years, (mean 36.67 ± 16.4 years). The weight range at presentation was between 9 to 98 kg (mean 48.5 = 12.1 kg). Default was highest (42/135) among the youths 16 to 30 years with a default rate of 13.9% followed by reproductive age group 31 to 45 years (36/135) and default rate of 16.5%. This was not statistically significant (p = 0.859). The overall default rate among the TB patients was 14.4%. There was no significant difference in default rate between male and female patients (15.3% vs 13.5%, p = 0.432). Table 1 shows the default rate and their distribution by sex and age-groups. The default rate was about half (44.3%) of the entire negative outcome in the management of TB patient using the DOTS strategies in this Nigeria population. Table 2 presents the final outcomes of therapy, where it may be noted that 743 (79.3%) of cases were cured or completed treatment. It is estimated that 135 (14.4%) defaulted, and 9 (1.0%) of cases were transferred out. The TB/HIV Collaborative project whereby tuberculosis patients were simultaneously offered VCCT for HIV was commenced in the last quarter of the study. 777 (82.8%) of the subjects were not offered the services. Of the 161 patients who were offered such services 42 (26.1%) were HIV positive.

Rate of default was significantly higher among those who were returning to continue their treatment after they have previously defaulted (33.8%) and those who had a relapse of the disease after previous treatment (17.9%) when compared with other categories of patients on treatment such as new patients (11.4%), and those with treatment failure (27.0%) (X^2 = 36.4, p = 0.0001). There was no statistically significant difference in the rate of default between HIV positive and HIV negative TB patients (24.4% vs 21.4%, X^2= 0.15, p=0.699). However distance from PHC centre was not significantly associated with default rate (14.7 for those living within 0 to 5 km vs 13.7 for those living within 6 to 10 km and 16.7 km for those living more than 10 km radius, p = 0.91). Those who presented with extra-pulmonary leisions (69.2%) defaulted significantly when compared with those that presented with pulmonary leisions alone (126/925). Furthermore, those who presented with negative pre-treatment sputum (23.2%) were significantly associated with default among the TB patient in this study (P = 0.00) (Table 2). Significant majority (95.6%, X^2 for trend = 205.822, p = 0.00) of the patient that defaulted did so within the first 2 months (intensive phase of therapy) of presentation at the PHC centres.

DISCUSSION AND CONCLUSION

This study shows an overall default rate among the TB patients of 14.4%. This is much higher than the WHO recommended rate of 3% (World Health Organization WHO Tuberculosis Programme,1994; International Union Against Tuberculosis and Lung Disease, 1996). Several studies have reported similarly high default rate in African population (Dodor and Afenyadu, 2005; Singh et al., 2002; Tabarsi et al., 2009). This indicates that much health education still need to be done at the PHC

Table 1. Default rate and socio-demographic characteristics.

Socio-demographic characteristics	Total {No (%)}	Default rate {No (%)}	P value
Age			
0-15 years	114 (12.2)	14 (12.3)	
16-30 years	303 (32.3)	42 (13.9)	0.859
31-45 years	218 (23.2)	36 (16.5)	
46-60 years	130 (13.9)	19 (14.6)	
>60 years	173 (18.4)	24 (13.9)	
Total	938 (100.0)	135 (14.4)	
Sex			
Male	464 (49.5)	71 (15.3)	0.432
Female	474 (50.5)	64 (13.5)	
Location of domicile			
0-5 km radius	626 (66.7)	92 (14.7)	
6-10 km radius	306 (32.6)	42 (13.7)	
>10 km radius	6 (0.6)	1 (16.7)	0.91

Table 2. Factors associated with default rate.

Factors	Total {No (%)}	Default rate {No (%)}	P value
Categories of patient			
New patients	743 (79.3)	85 (11.4)	
Relapse	84 (9.0)	15 (17.9)	
Return after default	80 (8.5)	27 (33.8)	
Had treatment failure	22 (2.3)	6 (27.3)	0.000
Transferred-in	9 (1.0)	2 (22.2)	
HIV status			
Negative	119 (73.9)	29 (24.4)	
Positive	42 (26.1)	9 (21.4)	0.699
Pre-Treatment sputum status			
Sputum positive	908 (96.8)	122 (13.0)	
Sputum negative	17 (1.8)	4 (23.5)	
Extra-pulmonary	13 (1.4)	9 (69.2)	0.000
Month of treatment before default			
0- 2 months	938 (100.0)	118 (12.6)	0.000
3-4 months	715 (100.0)	15 (2.1)	
5-6 months	666 (100.0)	2 (0.3)	
>6 months	642 (100.0)	0 (0.0)	

centres and the community to sensitize the community members on the need for treatment adherence in the management of TB and other chronic illnesses. Health education should be targeted at cultural practices on health that do not encourage adherence to treatment in African population (Chaulet, 1990; Kilpatrick, 1987; Datiko et al., 2008; Barn et al., 2006). Default rate was higher among the reproductive age group (16.5%). Some studies have consistently reported high default rate with the younger age group (Barn et al 2006; Dodor, 2004; Glynn et al., 1998). This may indicate that the myth around TB is gradually fading away in this African population leaving the level of knowledge of the younger generation about TB inadequate to ensure appropriate

health care seeking behaviour. However the fact that sex was not significantly associated with default rate shows that compliance with anti- TB drugs does not depend on sexual behaviours and roles in the society.

Rate of default was high among patients with extra-pulmonary TB, followed by patients with pulmonary TB and negative pre-treatment sputum smear microscopy in this study. This is similar to some studies which demonstrated similarly higher default rate in these two groups compared to the group with PTB and smear positive microscopy (Barn et al., 2006). However, patients with smear-positive PTB are more likely to complete treatment, possibly because their illness is more severe and symptomatic (Tekle et al., 2002; Santha et al., 2002). The EPTB group also recorded a relatively high default rate with the majority defaulting within the first 2 months (intensive phase of therapy) of presentation at the PHC centres. The high prevalence of default among the EPTB group could be partially due to cases of death at home, especially in cases that occur after the intensive phase of treatment. This may indicate that most of these patients had returned back home with little hope and possible death without being noticed. Most extra-pulmonary TB and PTB presenting at the later stages of the disease are usually fatal (Michael et al., 2004). This study suggests that National TB control programmes should pay a closer attention to the issue of home visit and monitoring especially among patients with smear-negative PTB or EPTB. Those who were returning after default and those with relapse who presented at these primary health centres still have problem of compliance. Few researchers have reported similar experiences (Michael et al., 2004; Dooley et al., 2001). Patients who defaulted from tuberculosis treatment are at especially high risk of retreatment failure and default. Strategies to address risk factors for initial treatment default and to identify patients at risk for failure should be put in place (Yumo et al., 2001; Getahun and Maher, 2000). To reduce default rates stricter monitoring is required for patients who are returning after default. This will reduce the gap in knowledge which will encourage adherence.

HIV test was not required for TB cases in Ijebu North LGA until October 2006 when VCCT was introduced into the management of TB. The period of about one year used to monitor HIV shows that HIV was not a major factor in TB default. However, some studies have shown that compared with HIV-uninfected TB patients, HIV-infected TB patients have substantially higher case fatality rates and default rate (Mukadi et al, 2001; Dheda et al., 2004; Dean et al., 2002; Wiktor et al., 1999). The emergencies of more interaction of TB with human immunodeficiency virus (HIV) infection might be one of the ways HIV has contributed to a global resurgence of tuberculosis (Corbett et al., 2003). This indicates that those with HIV infection actually come out to access treatment and were not affected by the discrimination in the society. This may be so because these were the early stages of VCCT in this rural environment. Distance from PHC centre was not significantly associated with default in this study, however some studies have found it to be important (Castelnuovo, 2010). This may be because the DOTS strategy adopted by the Nation specifies that patient is selected for treatment based on location of residence from the PHC. This makes it easier for patients to attend health facilities and be observed at the intensive phase of therapy. This shows that the selection criterion is convenient and accessing treatment at a distant hospital is not an issue in this study population. This may indicate that stigma associated with TB is fast fading off in these communities. This study has several major limitations. It was retrospective and based only on data that was available in clinical and public health records. We could not independently verify the accuracy of these records, nor could we collect additional data needed to confirm or refute our findings. This impacts variables such as those measuring the presence of an adverse event. We have no detail information of every patient in this study. However, this is beyond our control. Also, because of the difficulty of contacting the defaulters, our study could not address some of the other factors leading to default.

Further studies to explore the various factors involved in irregular TB treatment are needed. Nevertheless, our findings are applicable to the current situation of TB control in Nigeria and African population, and may draw attention to major factors influencing default in the management and control of TB.

REFERENCES

Barn TS, Gunreberg C, Chamroonsawasdi K, Bam DS, Aslberg O, Kasland O, Shiyalap K, Srisorrachatr S (2006). Factors affecting patient adherence to Dots in urban Kathmaradu. Int J. Tubarching Dis., 10(3): 270-276.

Castelnuovo B (2010). A review of compliance to anti tuberculosis treatment and risk factors for defaulting treatment in Sub Saharan Africa. Afr. Health Sci., 10(4): 320-324.

Chaulet P (1990). Compliance with chemotherapy for tuberculosis. Responsibilities of the Health Ministry and of physicians. Bull. Int. Union Tuberc. Lung Dis., 66: 33–35.

Corbett EL, Watt CJ, Walker N, Maher D, Williams BG (2003). The growing burden of tuberculosis: Global trends and interaction with the HIV epidemic. Arch. Int. Med., 163: 1009–1021.

Datiko DG, Yassin MA, Chekol LT, Kabeto LE, Lindtjørn B (2008). The rate of TB-HIV co-infection depends on the prevalence of HIV infection in a community. BMC Public Health, 8: 266. doi: 10.1186/1471-2458-8-266.

Dean GL, Edwards SG, Ives NJ, Matthews G, Fox EF (2002). Treatment of tuberculosis in HIV-infected persons in the era of highly active anti-retroviral therapy. AIDS, 16: 75–83.

Dheda K, Lampe FC, Johnson MA, Lipman MC (2004). Outcome of HIV-associated tuberculosis in the era of highly active anti-retroviral therapy. J. Infect. Dis., 190: 1670–1676.

Dodor EA (2004). Tuberculosis treatment default at the communicable diseases unit of Effia Nkwanta Regional Hospital: A 2yrs experience Int. J. Tuberc. Lung Dis., 8(ii): 1337-1341.

Dodor EA, Afenyadu GY (2005). Factors associated with TB treatment default and completion at the Effia- Nkwanta Regional Hospital in Ghana Trans. R. Soc. Trop. Med. Hyg., 99(11): 827-832.

Dooley KE, Lahlou O, Ghali I, Knudsen J, Elmessaoudi MD, Cherkaoui

I, El Aouad R (2011). Risk factors for tuberculosis treatment failure, default, or relapse and outcomes of retreatment in Morocco. BMC Public Health, 28(11): 140.
El-Sony AI, Khamis AH, Enarson DA, Baraka O, Mustafa SA, Bjune G (2002). Treatment results of DOTS in 1797 Sudanese tuberculosis patients with or without HIV co-infection. Int. J. Tuberc. Lung Dis., 6: 1058–1066.
Farah MG, Tverdal A, Steen TW, Heldal E, Brantsaeter AB, Bjune G (2005). Treatment outcome of new culture positive pulmonary tuberculosis in Norway. BMC Public Health, 5: 14. doi: 10.1186/1471-2458-5-14.
Federal Ministry of Health (2005). National Tuberculosis and Leprosy Control Programme. 2006-2010 Strategic Plan for Tuberculosis Control Programme in Nigeria.
Getahun H, Maher D (2000). Contribution of 'TB clubs' to tuberculosis control in a rural district in Ethiopia. Int. J. Tuberc. Lung Dis., 4: 174–178.
Glynn TR Warndorff DK, Fine PE, Munthali MM Sichone W, Ponnigheus JM (1998). Measurement and determinants of tuberculosis outcome in Karonga District, Malawi. Bull. World Health Organ., 76(3): 295-305.
Grzybowski S, Enarson DA (1978). The fate of cases of tuberculosis under various treatment programmes. Bull. Int. Union Tuberc., 53: 70–75.
International Union Against Tuberculosis and Lung Disease (1996). Tuberculosis guide for low income countries. 4. Pairs, IUATLD.
Kassu A, Mengistu G, Ayele B, Diro E, Mekonnen F, Ketema D, Moges F, Mesfin T, Getachew A, Ergicho B, Elias D, Wondmikun Y, Aseffa A, Ota F (2007). HIV and intestinal parasites in adult TB patients in a Teaching Hospital in Northwest Ethiopia. Trop. Doct., 37: 222–224. doi: 10.1258/004947507782333026.
Kilpatrick GS (1987). Compliance in relation to tuberculosis. Tubercle, 68: 31–32.
Michael KW, Belachew T, Jira C (2004). Tuberculosis defaulters from the "dots" regimen in Jimma zone, southwest Ethiopia. Ethiop. Med. J., 42: 247–253.
Mukadi YD, Maher D, Harries A (2001). Tuberculosis case fatality rates in high HIV prevalence populations in sub-Saharan Africa. AIDS, 15: 143–152.
Romanus V, Julander I, Blom-Bulow B, Larsson LO, Normann B, Boman G (2000). Shortages in Swedish tuberculosis care. Good results only in 71 percent of cases after 12-month treatment as shown in a current study. Lakartidningen, 97: 5613–5616.
Santha T, Garg R, Frieden TR, Chandrasekaran V, Subramani R, Gopi PG, Selvakumar N, Ganapathy S, Charles N, Rajamma J, Narayanan PR (2002). Risk factors associated with default, failure and death among tuberculosis patients treated in a DOTS programme in Tiruvallur District, South India, 2000. Int. J. Tuberc. Lung Dis., 6: 780–788.
Shargie EB, Lindtjørn B (2005). DOTS improves treatment outcomes and service coverage for tuberculosis in South Ethiopia: A retrospective trend analysis. BMC Public Health, 5: 62. doi: 10.1186/1471-2458-5-62.
Singh V, Jaiswal A, Porter JD, Qgden JA, Sarin R, Sharma PP, Arora Vic Jain Rc (2002). TB control, poverty and Vulnerability in Delhi, India. Trop. Med. Int. Health, 7(8): 693–700.
Srinath S, Sharath B, Santosha K, Chadha SS, Roopa S, Chander K, Wares F, Chauhan LS, Wilson NC, Harries AD (2011).Tuberculosis 'retreatment others': Profile and treatment outcomes in the state of Andhra Pradesh, India. Int. J. Tuberc. Lung Dis., 15(1): 105-109.
Steyn M, van der Merwe N, Dick J, Borcherds R, Wilding RJ (1997). Communication with TB patients; A neglected dimension of effective treatment? Curationis, 20: 53–56.
Tabarsi P, Chistsaz E, Moradi A, Baghaei P, Farnia P, Marjani M, Irannejad P, Mansouri D, Masjedi M (2009). First line TB drug resistance prevalence and its pattern among HW infected patients in the National referred TB Centre in Iran. Int, J. STD AIDS, 20(8): 566-570.
Tekle B, Mariam DH, Ali A (2002). Defaulting from DOTS and its determinants in three districts of Arsi Zone in Ethiopia. Int. J. Tuberc. Lung Dis., 6: 573–579.
Wiktor SZ, Sassan-Morokro M, Grant AD, Abouya L, Karon JM (1999). Efficacy of trimethoprim-sulphamethoxazole prophylaxis to decrease morbidity and mortality in HIV-1-infected patients with tuberculosis in Abidjan, Côte d'Ivoire: A randomised controlled trial. Lancet., 353: 1469–1475.
World Health Organisation (2003). Treatment of tuberculosis: Guidelines for National Programmes. Geneva, Switzerland: World Health Organization. Available at http://whqlibdoc.who.int/hq/2003/WHO_CDS_TB_2003.313_.
World Health Organization (1992). Secular trend of tuberculosis in Western Europe. Epidemiological situation in countries. WHO/TB/1992, Geneva.
World Health Organization WHO Tuberculosis Programme(1994). Framework for Effective Tuberculosis Control. Geneva, Switzerland, WHO/TB/94. 179.
Yumo HA, Mbanya D, Kuaban C, Neuhann F (2011). Outcome assessment of a Global Fund grant for tuberculosis control at the district level in rural Cameroon. Int. J. Tuberc. Lung Dis., 15(3): 352-357.
Zellweger JP, Coulon P (1998). Outcome of patients treated for tuberculosis in Vaud County, Switzerland. Int. J. Tuberc. Lung Dis., 2: 372–377.