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Patent biochemical analysis of characteristics of TB patients- A survey on clinical and demographic features

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ABSTRACT

Epidemiological investigation by means of an observational, retrospective, descriptive study based on the medical charts of patients diagnosed with tuberculosis between 2003 and 2010 was done and there were 2404 patients diagnosed with tuberculosis during the period evaluated. Of those, 683 (28%) were females, 1721 (71%) were males; 35% were smokers and 12% suffered from alcoholism. 53% had received an elementary school education, and 22% had an incomplete elementary school education or were illiterate. The most common occupation was farm worker (12.81% of the patients), and 64% of the patients were unoccupied, classified as house wife, unemployed or irregular employer. The most common clinical form of the disease was the pulmonary form (in 81%) followed by pleural tuberculosis in 12% of the cases. The prevalence of tuberculosis exposure was 26%. The rate of new cases was 88%, the ratio of relapsed tuberculosis was %11 and 1.2% of patients admitted after irregular treatment. The most common symptoms during admission were cough, weight loss, fatigue, sputum and night sweating respectively. Diabetes mellitus was the most frequent comorbidity with an incidence of 7.9%. Sputum examination ratio in pulmonary tuberculosis was 82.9% and reported positively in direct microscopic examination as 62% and positively in Lowenstein-Jensen culture as 70.7%. Multidrug resistance was 3.9%. The results in this paper show that tuberculosis is a frequent regional burden among in low educated, unemployed, lower income population, with male predominance. Marked pulmonary involvement, notably initial exposure to tuberculosis and low rate of bacteriological confirmation are our prominent results.

KEYWORDS

Tuberculosis;
Demography;
Epidemiology;
Analysis and Comorbidity.

INTRODUCTION

With 9.4 million new cases estimated in 2009 by the World Health Organization (WHO), tuberculosis (TB) is a worldwide epidemic[24]. The regions most affected by TB are in low-income and middle-income countries within Asia and sub-Saharan Africa[19]. In industrialized countries, even though a decline in TB inci-

Regular Paper

dence rates has been shown over the last century, an increase in immigration of people from high TB incidence areas has recently contributed to reverse this downward trend and to the re-emergence of TB as a matter of public health concern[11]. TB surveillance in Europe is co-ordinated by EuroTB, which is a network of national institutions in charge of TB surveillance in the 53 countries of the WHO European Region[15]. The WHO European Region is divided into three geographic regions by EuroTB. The Western European region includes countries in the European Union, as well as seven other closely related countries (Andorra, Iceland, Israel, Monaco, Norway, San Marino and Switzerland). Eastern Europe is predominantly made up of countries of the former Soviet Union, with a large proportion of the population from the Russian Federation. Central Europe incorporates the eight countries in between these two regions (Albania, Bosnia and Herzegovina, Bulgaria, Croatia, Macedonia, Romania, Serbia and Montenegro, and Turkey). The overall EuroTB case notifications reveal alarming disparities in the rates of TB between countries in Western Europe and those in Eastern Europe, comprising mostly states of the former Soviet Union[15].

Tuberculosis is a common disease in Turkey as well as in the rest of the developing world. The 2009 WHO Tuberculosis Report estimated that the incidence of smear-positive tuberculosis cases in Turkey was 13/100,000 (˜10,000 cases) in 2007[24]. A few of the most important factors which affect TB control in Turkey are the high population increase, migration patterns and social and cultural differences among the regions[3]. Aim of the current study was to describe the demographic and clinical characteristics of patients with tuberculosis diagnosed in Hospitals, located in the city of Kisumu, Kenya.

MATERIALS AND METHODS

This was an epidemiological investigation carried out as an observational, retrospective, descriptive study of patients with tuberculosis diagnosed between 2003 and 2010, based on the collection of data from the medical charts of the patients. The study was approved by the Institutional Review Board and conducted in accordance with the guidelines of the Ministry of Public Health.

The following variables were subjected to descriptive analyses: gender, age, marital status, level of education, occupation, monthly income, employment status and health insurance status at the time of admission. In addition, we reviewed TB disease characteristics for each case such as clinical, radiological and microbiological features, diagnostic criteria, TB type (“new case”, where a first time TB diagnosis is made and reported, or “re-treated cases”), site of disease (pulmonary, extra pulmonary or disseminated) and risk factors for TB; both behavioral risk factors, contact history; alcoholism; smoking; number of households and clinical risk factors such as presence of co-morbidities.

A fluorometric BACTEC technique (BACTEC MGIT 960 system; Becton–Dickinson Diagnostic Instrument Systems) was used for routine testing of susceptibility to first line anti-TB drugs, including isoniazid, rifampin, ethambutol, and streptomycin. The incidence of drug-induced hepatotoxicity in the study group was noted. Patients were followed up either in the hospital or in the TB dispensary for treatment outcome.

RESULTS

The analysis of the epidemiological data showed that, the total number of patients with tuberculosis diagnosed during the study period was 2404. Of those, 683 (28%) were females, 1721 (71%) were males. The mean age for the study group was 42.6 (range 15 to 89) years. Regarding marital status, 731 (30.4%) patients were single, separated or widowed. With regard to the level of education, 520 (21.6%) had an incomplete elementary school education or were illiterate, 1277 (53.1%) had received an elementary school education, 327 (13.6%) completed secondary schooling, 324 (13.5%) had a high school certificate and 119 (4.95%) were graduated from university.35% were smokers and 12% suffered from alcoholism. 68.7% of the patients self-reported monthly income of less than $300. The most common occupation was farm worker (12.8% of the patients), and 63.5% of the patients were unoccupied, classified as house wife, unemployed or irregular employer. Almost all of the patients (87.1%) had health insurance of some type. Number of households was 1 to 2 in 332 (13.8%) patients; 3 to 4 in 641

TABLE 1 : Predisposing factors for tuberculosis.

Risk factors	Number of patients (%)
Diabetes mellitus	191 (7.94%)
Chronic obstructive pulmonary disease	114 (5.17%)
Anemia	42 (1.9%)
Chronic renal failure	28 (1.27%)
Lung cancer	20 (0.9%)
Other malignancies	15 (0.68%)
Epilepsy	11 (0.49%)
Mental retardation	8 (0.36%)
Drug addiction	7 (0.31%)
Schizophrenia	7 (0.31%)
Bronchiectasis	6 (0.27%)
Pregnancy	5 (0.22%)
Down's syndrome	3 (0.13%)
Human immunodeficiency virus infection	2 (0.09%)
Silicosis	1 (0.04%)

TABLE 2 : Clinical presentation of tuberculosis in the study group.

Clinical presentation	Number of patients (%)
Pulmonary	1939 (80.65%)
Pleural accompanying pulmonary	83 (3.45%)
Extrapulmonary	382 (%15.89)
İsolated pleural	294 (12.2%)
Tuberculous lymphadenopathy	46 (1.9%)
Gastrointestinal tract	10 (0.4%)
Genitourinary tract	8 (0.3%)
Pericardium	7 (0.29%)
Disseminated tuberculosis (miliary)	6 (0.25%)
Vertebral	5 (0.2%)
Larynx	2 (0.08%)
Chest wall	1 (0.04%)
Pancreas	1 (0.04%)
Tongue	1 (0.04%)
Palatine tonsil	1 (0.04%)

(26.7%) patients; 5 to 6 in 764 (31.8%) patients and above 7 in 767 (31.9%) patients.

Predisposing factors for TB were identified in 411 (19.17%) patients (TABLE-1). Diabetes mellitus was the most frequent co-morbidity with an incidence of 7.9%. Other risk factors identified were chronic obstructive pulmonary disease, anemia, chronic renal failure, lung cancer, epilepsy, mental retardation, schizophrenia, drug addiction, bronchiectasis, pregnancy, Down's syndrome, human immunodeficiency virus (HIV) infection, and silicosis. Intrathoracic and extrathoracic tuberculous lymphadenitis were identified in 46 (1.91%) of the patients. The prevalence of tuberculosis exposure was 25.8% (19.7% within the household, 6.1% outside home).

The most common clinical form of the disease was the isolated pulmonary form in 1940 (80.7%) patients. Pleural TB was accompanying pulmonary TB in 84 (3.5%) patients. Common extra pulmonary sites included the pleura and the peripheral lymph nodes, which were affected in 12.2%, and 1.9% of all tuberculosis cases reported, respectively. Less frequent incidents were the gastrointestinal tract in 10 (0.4%), genitourinary tract in 8 (0.33%), pericardium in 7 (0.29%), disseminated tuberculosis (miliary) in 6 (0.25%), vertebral in 5 (0.2%), larynx in 2 (0.08%), and chest wall, pancreas, tongue, palatine tonsil in 1 (0.04%) patient each (TABLE-2). A total of 2113 (87.9%) were classified as "new cases", 262 (10.9%) as "recurrence cases", either failure or relapses, and 1.2% of patients admitted after irregular treatment.

The most common symptoms during admission in pulmonary TB were cough, weight loss, fatigue, expectorate and night sweating respectively (TABLE-3). The most common patterns observed in the chest X-ray were lung field infiltrates (48.8%) followed by cavitation (28.9%), pleurisy (11.6%), and nodularity (7.6%),

TABLE 3 : Symptoms during admission in pulmonary tuberculosis.

Symptoms during admission	Number of patients (%)
Cough	1922 (79.95%)
Weight loss	1513 (62.93%)
Fatigue	1385 (57.61%)
Expectorate	1332 (55.40%)
Night sweating	1297 (53.95%)
Dyspnea	813 (33.81%)
Chest pain / side pain	729 (30.32%)
Back pain	686 (28.53%)
Hemoptysis	450 (18.71%)
Weakness	311 (12.93%)
Fever	231 (9.60%)
Arthralgia	21 (0.87%)

Regular Paper

respectively. In pulmonary tuberculosis, sputum examination was performed in 82.9% of the patients and reported positively in direct microscopic examination as 62%. Löwenstein- Jensen culture was used as the gold standard and positive in 70.7% of the study group. The diagnostic method of TB was detection of *Mycobacterium tuberculosis* in the sputum on 1353 (56.3%) of patients, diagnosis by means of clinical and radiological findings on 346 (14.4%) of patients, histological confirmation on biopsy specimen on 13.6% subjects, diagnosis by bronchoscopy on 327 (7.9%) of patients, and other diagnostic methods on 186 (7.7%) of patients.

Drug resistance for at least one first line anti-TB drug was 15.7%. The rates of resistance to streptomycin, isoniazid, rifampin, and ethambutol were 6.8%, 17.2%, 5.3%, and 4.1%, respectively. Multi-drug-resistant tuberculosis (MDR-TB) (ie, resistance to at least isoniazid and rifampin) was 3.9%. Drug-induced hepatotoxicity was identified in 41 (1.7%) of the patients.

DISCUSSION

To gain a better understanding of the epidemiology of TB in Kenya, we analyzed demographic, and clinical characteristics of 2404 TB patients diagnosed in Nyanza province, Kenya between January 1st, 2003 and December 31st, 2010. Precise epidemiological data on TB are important for the success of treatment and control of TB.

It has been widely accepted that tuberculosis and poverty have been closely linked since the scientific study of the disease began[9]. With the rapidly increasing world population and the wider disparity of income, more and more people are falling into poverty, whichever way it is defined. Studies in the developed world show that the close association between tuberculosis and poverty remains[4]. The data regarding level of education, occupation and employment status characterize the social situation of the population of patients in our study, since most of them (74.7%) had a low level of education, low income (self-reported daily income of less than $10) were farm workers (12.8%) or unemployed upon hospitalization (63.5%), and were living in crowded houses (above 7 households in 31.9% of the patients) showing how tuberculosis jeopardizes the livelihood of these individuals, who should be economically active. These data show that low level of education, low income and tuberculosis are associated, confirming the secular trend of this disease to preferably affect the poor.

In developing countries and countries in which the prevalence of HIV is high, pulmonary TB patients are younger, reported mean ages ranging from 28.7 to 37.7 years[13, 21]. However, the mean ages reported for TB patients treated in such countries, mainly in reports from Asian countries, range from 45 to 63.9 years[2, 7]. Two studies conducted in Turkey reported similar mean ages: 37 years in a sample of 4433 adult male patients with pulmonary TB[1] and ˜37 years in a sample of 835 male patients, including children, with pulmonary TB or extrapulmonary TB[10]. The mean age for our study group was 42.6 (range 15 to 89) years. Therefore, the mean age of tuberculosis patients in Kisumu appears to fall between that reported for other developing countries and countries in which the prevalence of HIV is high and that reported for relatively developed countries.

On the chest X-rays of adult patients with pulmonary tuberculosis (PTB), infiltrates, cavities, and fibrosis are common findings. The lesions are typically seen in the apical and posterior segments of the upper lobes, as well as in the superior segments of the inferior lobes[2]. In our study, the most common patterns observed in the chest X-ray were lung field infiltrates followed by cavitation, pleurisy, and nodularity, respectively. Among patients with reactivation tuberculosis, cavitary lesions are reported to occur in 28-82%, the mean being 40-50%[7, 21]. Kartaloglu et al.[6] observed cavitary lesions in 131 (60.6%) of 216 patients with pulmonary TB[6]. Patients with cavitary TB have higher bacterial loads than do those with non-cavitary TB or other forms of tuberculosis[14]. Although sputum smear and culture are the main tools for the diagnosis and follow-up of PTB, clinicians frequently use chest X-ray in the differential diagnosis and the assessment of treatment responses. We found that the number of positive results for sputum smear microscopy upon hospitalization was 62% and consistent with the literature, since the sensitivity of this test is expected to be approximately 60%[8]. However, when hospitalization is recommended, it is based not only on positive sputum smear microscopy but also on

other clinical criteria that confirm the diagnosis of tuberculosis, such as expectoration, fever, sweating, weight loss and persistent cough, as well as other presumptive tests, such as X-rays, which can reveal features consistent with the disease.

The most common comorbidity was alcoholism (12%), which is in accordance with the findings of other studies that showed a strong association between tuberculosis and alcoholism[17]. The most common underlying disease was diabetes mellitus. This is understandable, alcoholism and diabetes mellitus both predispose individuals to a low immunity condition. The predominant clinical form of the disease (in 80.7%) was pulmonary tuberculosis through person-to-person transmission, mainly affecting immunocompetent patients, which characterizes the typical profile of tuberculosis.

The median prevalence of global primary and secondary resistance to at least one anti-TB drug were 10.2 and 18.4%, respectively, compared to 1.1 and 7% for MDR-TB[23]. Although drug resistance surveillance has not been performed at the national level in Turkey, MDR TB reportedly varied in a range from 1.3 to 4.8% for initial drug resistance and from 4.4 to 16.6% for acquired drug resistance in local studies[5, 20]. Globally, any drug resistance and MDR rates ranged from 16 to 24% and from 4.8 to 7.3%, respectively[12, 18]. The frequencies of primary and secondary resistance to a single drug varied from 18 to 26.6% and from 28 to 53.4%, respectively[22]. The reported resistance rates in our study were 6.8% for streptomycin, 17.2% for isoniazid, 5.3% for rifampin, and 4.1% for ethambutol.

There are some limitations in our study. The major limitation of the present study is its retrospective design. Certain exclusion criteria based on the differential diagnoses further limited the power of the study. For technical reasons, chest X-ray represents another limitation. Chest X-ray findings were not investigated by age group. Symptoms indicative of tuberculosis were not correlated with chest X-ray findings. The number and size of cavities were not taken into account, although they might be related to the total bacterial load. Because we could not obtain the registries of all cases in our city, our results are not representative of the region as a whole. However, this study provides a guide to understand the epidemiological data on TB which are important for the success of treatment and control of TB.

CONCLUSION

Through the analysis of the predominant profile of the patients with tuberculosis hospitalized during the study period, we found that hospitals in Nyanza province,Kenya plays a relevant social role in the treatment and counseling of these patients.

REFERENCES

[1] S.Aktogu, A.Yorgancioglu, K.Cirak, T.Kose, S.M.Dereli; Eur.Respir.J., **9(10)**, 2031-2035 **(1996)**.

[2] J.A.Al-Tawfiq, B.M.Saadeh; Int.J.Tuberc.Lung Dis., **13(3)**, 367-370 **(2009)**.

[3] H.Bozkurt, M.H.Turkkaný, S.Musaombasýoglu, U.Gullu, F.Baykal, H.C.Hasanoglu, S.Ozkara; The National Tuberculosis Report's, Ankara, Turkish Republic, Ministry of Health, **(2009)**.

[4] J.Creswell, E.Jaramillo, K.Lonnroth, D.Weil, M.Raviglione; Int.J.Tuberc.Lung Dis., **15(4)**, 431-432 **(2011)**.

[5] R.Durmaz, I.H.Ozerol, B.Durmaz, S.Gunal, A.Senoglu, E.Evliyaoglu; Microbial Drug Resist., **9**, 361-366 **(2003)**.

[6] Z.Kartaloglu, O.Okutan, E.Kunter, F.Ciftci, A.Ilvan, H.Bilgic; Gulhane Med.J., **47**, 110-113 **(2005)**.

[7] Y.Kobashi, K.Mouri, S.Yagi, Y.Obase, N.Miyashita, N.Okimoto et al.; J.Infect.Chemother., **13(6)**, 405-410 **(2007)**.

[8] S.D.Lawn, A.I.Zumla; Tuberculosis.Lancet., **378(9785)**, 57-72 **(2011)**.

[9] B.G.Link, J.Phelan; J.Health Soc.Behav., Extra Issue, 80-84 **(1995)**.

[10] N.Nur, S.Arslan, S.L.Ozsahin, H.Sumer; Healthmed, 3(4), 352-8 **(2009)**.

[11] A.Odone, M.Ricco, M.Morandi, B.M.Borrini, C.Pasquarella, C.Signorelli; BMC Public Health, **11**, 376 **(2011)**.

[12] C.E.Ozturk, O.A.Balbay, D.Kaya, I.Ceyhan, I.Bulut, I.Sahin; Jpn.J.Infect.Dis., **58**, 47-49 **(2005)**.

[13] P.D.Picon, M.L.Caramori, S.L.Bassanesi, S.Jungblut, M.Folgierini, S.Porto Nda et al.; J.Bras.Pneumol., **33(4)**, 429-436 **(2007)**.

[14] G.Rathman, J.Sillah, P.C.Hill, J.F.Murray, R.Adegbola, T.Corrah et al.; Int.J.Tuberc.Lung Dis., **7(10)**, 942-947 **(2003)**.

Regular Paper

[15] A.Sandgren, V.Hollo, C.Quinten, D.Manissero; Euro Surveill, Available Online: http://www.eurosurveillance.org/ViewArticle.aspx?ArticleId=19825, **16(12)**, 19825 **(2011)**.

[16] G.Senol, B.Komurcuoglu, A.Komurcuoglu; J.Infect., **50**, 306-311 **(2005)**.

[17] M.Suhadev, B.E.Thomas, Raja M.Sakthivel, P.Murugesan, V.Chandrasekaran, N.Charles, R.Durga, M.Auxilia, T.A.Mathew, F.Wares; PLoS One, **6(5)**, e19485 **(2011)**.

[18] S.Surucuoglu, N.Ozkutuk, P.Celik, H.Gazi, G.Dinc, S.Kurutepe, G.Koroglu, Y.Havlucu, G.Tuncay; Ann.Saudi.Med., **25**, 313-318 **(2005)**.

[19] E.Svensson, J.Millet, A.Lindqvist, M.Olsson, M.Ridell, N.Rastogi; Clin.Microbiol.Infect., **17(6)**, 881-887 **(2011)**.

[20] K.Tahaoglu, O.Kizkin, T.Karagoz, M.Tor, M.Partal, T.Sadoglu; Tuberc.Lung Dis., **75**, 324-328 **(1994)**.

[21] A.Thorson, N.H.Long, L.O.Larsson; Scand.J.Infect.Dis., **39(1)**, 33-37 **(2007)**.

[22] N.G.Yolsal, R.Malat, M.Dicsci Orkun, Z.Kýlýcaslan; J.Klimik., **1**, 6-9 **(1998)**.

[23] World Health Organization, Anti-Tuberculosis Drug Resistance in the World, Report No. 3, Prevalence and Trends, World Health Organization, Geneva, Switzerland, **(2004)**.

[24] World Health Organization, Global Tuberculosis Control, WHO Report, World Health Organization Geneva, Switzerland, **(2010)**.