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Contents lists available at ScienceDirect

Asian Pacific Journal of Tropical Biomedicine

journal homepage: www.elsevier.com/locate/apjtb

Epidemiological investigation http://dx.doi.org/10.1016/j.apjtb.2015.02.004

Epidemiology of extra pulmonary tuberculosis in Eastern Sudan

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ARTICLE INFO

Article history:
Received 14 Jan 2015
Received in revised form 19 Jan 2015
Accepted 22 Feb 2015
Available online 27 May 2015

Keywords:
Extra pulmonary
Tuberculosis
Epidemiology
Sudan

ABSTRACT

Objective: To investigate the epidemiological factors associated with extra pulmonary tuberculosis (EPTB) in Kassala, Eastern Sudan.

Methods: Patients infected with TB (pulmonary and extra-pulmonary) documented at the hospital were interviewed with a structured questionnaire used to gather socio-demographic information. The diagnosis of EPTB cases was based on presence of tuberculous granulomas in the histological samples, positive PCR to DNA of mycobacterium tuberculosis, radiological findings and fluid analysis suggestive of EPTB and clinical diagnosis with adequate response to anti-tuberculous therapy.

Results: A total of 985 patients with TB were enrolled in the study, including 761 (77.3%) with PTB and 224 (22.7%) with EPTB. The mean age (SD) of patients with PTB and EPTB was 33.2 (15.4) and 34.7 (14.6) years respectively. The prevalence of EPTB was at (22.7%), with TB lymphadenitis 79 (35.3%), marking the frequent form of EPTB followed by peritoneal TB 27 (12.05%). While residence and occupation were not associated with EPTB, those with lower level of education (OR = 0.3; confidence intervals (*CI*) = 0.2–0.5; $P < 0.001$), female (OR = 8.7, *CI* = 4.9–15.1, $P < 0.001$), non vaccination (OR = 70.3, *CI* = 34.2–144.3, $P < 0.001$), and non smoker (OR = 0.1; *CI* = 0.06–0.20; $P < 0.001$), were associated with high prevalence of EPTB.

Conclusions: Around one quarter of patients with TB in this study were more likely to have EPTB. Therefore, effective strategic plans regarding diagnostic procedures and control measures are needed to reduce the burden of the disease in Sudan.

1. Introduction

Tuberculosis (TB) is a major health problem worldwide. It has been estimated that there are eight million disease episodes and three million deaths each year [1], with underdeveloped countries accounting for 95% of reported TB nationwide cases [2]. The global estimate of extra pulmonary TB (EPTB) ranges from 17% to 52% of all cases of TB [3]. Although the number of TB cases has significantly decreased, the proportions of EPTB cases remained constant. Furthermore, EPTB accounts for 21% and 50% of total TB cases and HIV positive cases respectively [4,5]. Sudan has high prevalence of TB with the incidence rate of 114 cases per 100 000 of the population cases during 2012 [6]. The country accounts for 15% of the TB burden in the World Health Organization Eastern Mediterranean Region [7]. We recently observed that 26.6%

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Peer review under responsibility of Hainan Medical University.

of patients with TB in the same study area had EPTB [8]. In spite of this, there is little published data regarding EPTB [9]. Investigating the incidence rate and the factors associated with the occurrence of EPTB is fundamental to provide care givers and health planners with the basic data necessary for the preventive and treatment measures. Hence, the present study aimed to investigate the epidemiological factors associated with EPTB in Kassala, Eastern Sudan.

2. Materials and methods

This was a cross-sectional hospital-based study conducted at Kassala Teaching Hospital in Eastern Sudan between January 2011 and June 2012 to investigate the epidemiological factors of EPTB in Kassala Town of Eastern Sudan. Kassala was located nearly 600 km from Khartoum, the capital city, covering an area of 42 282 km^2 inhabited by 1.8 million people. Kassala Teaching Hospital was a tertiary hospital which provided services for all patients referred from health centers and rural hospitals. After singing an informed consent, all patients infected with TB (pulmonary and extra-pulmonary) documented at the hospital were interviewed with a structured questionnaire used to gather socio-demographic information (age, sex, education, residence, employment, history of contact with TB patients and vaccination with Bacillus Chalmette-Guerin). Cases of EPTB were defined according to the criteria set by the World Health Organization [10] by presence of TB outside the lung such as pleura, lymph nodes, abdomen, genitourinary tract, pericardium, meningitis, skin, joints and bones. The diagnosis of EPTB cases was based on presence of tuberculous granulomas in the histological samples, positive PCR to DNA of mycobacterium tuberculosis, radiological findings and fluid analysis suggestive of EPTB and clinical diagnosis with adequate response to anti-tuberculous therapy. Those patients were followed up for two months during the intensive phase. Smear for alcohol acid fast bacilli and chest radiograph were performed for all patients with PTB and for patients with miliary TB while tuberculin skin test and culture were not available in the study area. Cases with concurrent PTB-EPTB were excluded from the study. All TB patients were offered free TB medical care including diagnosis (for alcohol acid fast bacilli) and treatment as per the National Tuberculosis Control Program guidelines for Sudan, and had an access to treatment and follow up in the TB referral clinic which was open twice per week from 8:00 a.m. to 3:00 p.m.

2.1. Statistical analysis

Data was entered into a computer database and double-checked before analysis. SPSS software (SPSS Inc., Chicago, IL, USA, version 16.0) was used. Means and proportions for the socio-demographic characteristics were compared between the groups of the study using *t* and *Chi*-square tests, respectively. Univariate and multivariate analyses were performed. EPTB was the dependent variable and the socio-demographic characteristics were independent variables. Confidence intervals (*CI*) of 95% were calculated and $P < 0.05$ was considered significant. In case of discrepancy between the results of *t* and *Chi*-square tests and the results of multivariate analyses, the latter was taken as final.

2.2. Ethical approval

This study received ethical approval from the Research Committee at the Ministry of Health of Kassala State.

3. Results

3.1. Patients' characteristics

During the study period, a total of 985 patients diagnosed with TB (pulmonary and extra pulmonary) were recruited in this study. Of the 985 TB patients, PTB was found in 761 patients (77.3%). The mean age (SD) of patients with PTB and EPTB were 33.2 (15.4) and 34.7 (14.6) years respectively. The majority of these patients were male [612 (62.1%)], illiterates [528 (53.6%)], rural residents [652 (66.2%)] and unemployed [422 (42.8%)] (Table 1). Cough was found in 805 (81.7%), fever in 961 (97.5%), weight loss in 774 (78.5%), and contact with patient with TB was found in 591 (60%) patients.

Table 1
Demographic characteristic(s) of TB patients in Kassala, Eastern Sudan.

Variable	Total TB patients (N = 985)	PTB patients (N = 761)	EPTB patients (N = 224)	P
Age ≤30 years	474 (48.2%)	345 (45.4%)	129 (57.6%)	<0.001
Gender: Female	373 (37.9%)	192 (25.2%)	181 (80.8%)	<0.001
Rural residence	652 (66.2%)	485 (63.7%)	167 (74.6%)	0.003
Illiterate	528 (53.6%)	375 (49.3%)	153 (68.3%)	<0.001
Non employees	422 (42.8%)	331 (43.6%)	91 (43.6%)	0.241
Non vaccination	372 (37.8%)	160 (21.0%)	212 (94.6%)	<0.001
Nonsmoker	447 (45.4%)	253 (34.0%)	194 (86.6%)	<0.001

3.2. EPTB involvement

EPTB was detected in 224 (22.7%) patients, of these TB lymphadenitis was the predominant manifestation [79 (35.3%)], followed by TB peritonitis in 27 (12.05%) patients, female genital TB in 25 (11.2%), tubercular pleural effusion in 15 (6.7%) and military TB in 15 (6.7%) (Figure 1).

3.3. Diagnosis of EPTB

The diagnosis of extra pulmonary was confirmed by the presence of tuberculous granulomas in histological samples in 102 (45.54%) patients, by positive PCR for *Mycobacterium tuberculosis* DNA in 43 (19.20%) patients, by clinical diagnosis and adequate response to anti-tuberculous therapy in 60 (26.79%) patients, by presence of miliary nodules in chest radiographs in 11 (4.9%) patients, and by spinal magnetic resonance imaging and cerebrospinal fluid analysis in 8 (3.57%) patients with Pott's disease of the spine. In the logistic regression model, while residence and occupation were not associated with EPTB, lower level of education (OR = 0.3; CI = 0.2–0.5; $P < 0.001$), female (OR = 8.7, CI = 4.9–15.1, $P < 0.001$), non vaccination (OR = 70.3, CI = 34.2–144.3, $P < 0.001$), and nonsmoker (OR = 0.1; CI = 0.06–0.20; $P < 0.001$), were associated with high prevalence rate of EPTB (Table 2).