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The Current Epidemiologic Profile of Pulmonary Tuberculosis in Saudi Arabia and the Most Appropriate Antitubercular Antibiotics

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Abstract

Indirect sensitivity test done for 135 strains of M. tuberculosis isolated patients suffering from primary pulmonary tuberculosis proved that the most effective antitubercular drugs are: rifampin, P-nitrobenzoic acid and thiosemicarbazone; the least are Kanamycin, ethambutol and cycloserine. The disease is not uncommon in Saudi Arabia, both native and foreigners are affected, the productive age group is the most vulnerable group, females are also affected but to a lesser extent than males.

Introduction

TUBERCULOSIS is an ancient disease. Its infectious nature was suspected by Fracastorius in the early part of the sixteenth century [1]. After 4 centuries from this clever observation the disease still among the main public health priorities in developing countries. The estimated global tuberculosis is: 150 million persons infected with tubercle bacilli, 20 million sputum positive capable of disseminating the disease, 3-5 million new cases each year and 600,00 deaths per year [2,3,4]. The resistant strains are on rise throughout the world [5] and current treatment regimens include two lines for treatment and many give the drug empirically [6].

In spite the steepy "high tech" in diagnosis of M. tuberculosis such as radiometry [7]; sophisticated apparatus like the BACTEC system [8] and polymerase chain reaction (PCR), yet the traditional methods of confirming the diagnosis are still definitive tools [4].

In this study we tried to outline the profile of pulmonary tuberculosis in Saudi Arabia and to assess "in vitro" the efficacy of antitubercular antibiotics.

Patients and Methods

Patients:

135 patients were included in the study 93 males and 42 females, age range 17-55 years (mean 33+/-4.8 years), the ethnic group included 64 Saudi patients and 75 cases of other nationalities. The sputum

specimens were delivered to the regional ministry laboratory.

Samples were collected from 3 areas at the Western area of Saudi Arabia: Jeddah, Makkah and Taif, from patients admitted to chest hospitals as quiry primary pulmonary tuberculosis and did not receive any previous anti-tubercular treatment.

Microbiology:

Three successive morning sputum samples were processed by film and culture on L-J medium after concentration with Petroffs method [9]. Culture positive with or without smear positive samples were subjected to the susceptibility tests.

Indirect drug susceptibility test was performed according to CDC protocol [10,11], briefly inocula grown on L-J media were homogenized in Tween-albumin, after settling of large particles the density of the supernatants were adjusted against MacFarlane No. 1 with sterile saline. 3 drops were cultured on the antibiotic medium and the control. Percent resistance is calculated from the formula:

$$\frac{\text{No. of colonies on the drug}}{\text{No. of colonies on the control}} \times 100 = \% \text{ resistance}$$

Ready made media (Difco) supplemented with 11 selected Antituberculosis drugs were used, sycloserine and PAS were supplied on 7H-10 medium, remaining antibiotics on L-J medium.

Isoniazid (INH) (1.0 μg/ml), Para aminosalicylic acid (AS) (8 μg/ml), Streptomycin (SM) (8 μg/ml), Ethionamide (THA) (8 μg/ml), Ethambutol (EMB) (8 μg/ml), P-nitrobenzoic acid (PNB) (1 μg/ml), Thiosemicarbazone (THI) (1 μg/ml), Cycloserine (CS) (16 μg/ml) Rifampin (RF) (1 μg/ml).

Results

The ethnically diverse group included 93 males (68.9%) and 42 females (31.1%) with mean age 33+/1 4.8 years, various smoking habits and BCG vaccination are summarized in table 1, nationalities in Fig. 1, occupations in table 2.

Percent resistance to various antibiotics assessed are shown in table 3 and Fig. 2, 68 patients (50.4%) out of the 135 studied cases were illiterate and 67 cases (49.6%) were of simple or secondary education, 55.6% were of low socioeconomics levels.

Eleven isolates (8.1%) showed resistance to 2 antibiotics and 2 isolates (1.5%) were resistant to 3 antibiotics and none to more.

Table (1): Smoking Habits and BCG.

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	No	%	No	%
Smoking	49	36.3	86	36.7
BCG	14	10.4	121	89.6

n = 135

Table (2): Occupations.

Serial	Occupation	No.	%
1	Housewives	36	26.7
2	Unemployed	25	18.5
3	Laborers	21	15.6
4	Technicians	9	6.7
5	Farmers	8	6.0
6	Small business men	7	5.1
7	Drivers	6	4.4
8	House maids	6	4.4
9	Students	6	4.4
10	Policemen	6	4.4
11	Employees	5	3.7
Total		135	100%

Table (3): Resistance.

Antibiotics	% Resistance	+/- SD
1- RFP	1.7	8.5
2- PNB	6.7	7.8
3- TH	11.1	8.9
4- SM	15.1	5.4
5- INH	15.2	8.3
6- THA	18.4	7.3
7- PAS	19.1	9.8
8- CAP	27.1	8.2
9- KM	27.2	8.3
10- EMB	34.2	11.8
11- CS	34.5	10.6

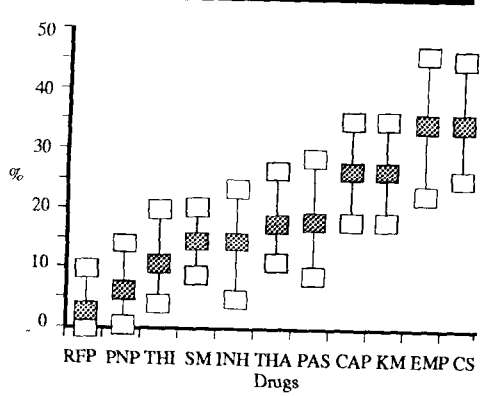
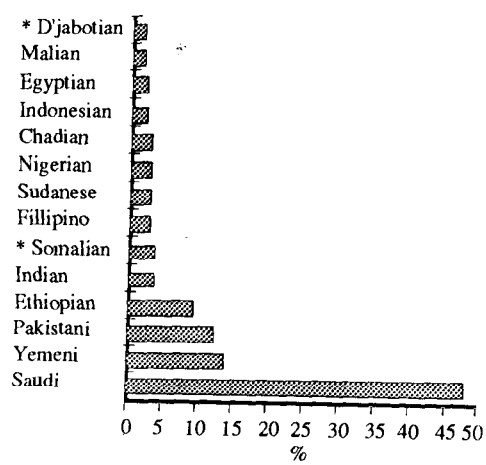


Fig. (2): Percent resistance to different antitubercular drugs.



* Same ethnic group

Fig. (1): Nationalities.

Discussion

Pulmonary tuberculosis is not uncommon in Saudi Arabia, both native and foreigners are affected, a good proportion of foreigners (37%) contracted the disease in the country, the remaining are hometown infection. The disease affects the productive age group (mean 33 years). Males (69%) are more prone to the infection than females (31%); the closed women community let the females less liable to infection than males.

RFP, PNB and THI are on the top of the hierarchy while KM, EMB, CS are at its bottom. The other assessed antibiotics occupy and "in between" level. Van-Der-Werf et al. [12] in a study done at Ghana claimed that the INH resistance is alarmingly high (27%) and for Thiacetazone and SM the resistance is 29% and 23% respectively, also he was unable to observe primary drug resistance to RFP and EMB. In managing 1ry pulmonary tuberculosis Dutt and his colleagues [13] reported a 95% efficiency of the combination of both RFP and INH. Other investigators also reported such successful drug combination [6,14]. The efficacy of RFP is also confirmed by an in vivo experiment by treating mice infected by SM dependent M. tuberculosis strain with RFP; complete cure was achieved [15].

We can conclude that the most efficient antibiotics for treatment of 1ry pulmonary tuberculosis are RFP, PNB, THI, stress should be made for BCG vaccination in developing countries. In vitro antibiograms together with serum antibiotics assays offer the best tools for patient sake, keeping an eye for drug intolerance is a must. Resistant tubercle bacilli will be spread in an exponential manner, for such patient aggressive chemotherapy coupled with surgery in case of localized disease is the best hope for cure [5,6].

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