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Characteristics of drug resistance pulmonary tuberculosis among patients attending consultant clinic for chest and respiratory diseases in Kirkuk City

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Abstract

Background: Tuberculosis (TB) is an international public health problem. Drug resistant tuberculosis is a considerable global health risk, leading the ongoing TB epidemic and increasing the morbidity and mortality of TB worldwide. Incomplete and insufficient therapeutic regimens can result in antimicrobial resistance.

Aim: is to identify the characteristics of patients with drug resistance pulmonary tuberculosis.

Patients and Methods: A cross sectional study, including 103 patients with pulmonary tuberculosis, who attended Consultant Clinic for Chest and Respiratory Diseases in Kirkuk in the period from November 2022 to March 2023. The patients were divided in two groups: drug susceptible group, includes 50 new patients who never receive antituberculosis treatment previously (no drug resistance) and drug resistance group, includes 53 patients received antituberculosis treatment previously for at least 4 weeks with sputum smear positive and had positive GeneXpert MTB/RIF assay.

Results: The mean age of patients in drug susceptible group and drug resistance group was (45.5 vs. 55.5) years with a significant difference between them and age group >65 years was significantly higher in drug resistance group as 32.08%. Moreover, smoking history and primary school education were more frequent in drug resistance group as 60.38% and 58.49% respectively than drug susceptible group. Diabetes mellitus was more frequent in drug-resistance group (32.08%) than drug-susceptible group (20%). The most common symptoms of pulmonary TB in drug susceptible group and drug resistance group were cough (100% vs. 92.45%) fever (74% vs. 81.13%) and sputum production (82% vs. 50.94%) respectively. Furthermore, the most common radiological findings in drug susceptible group and drug resistance group were non-homogenous opacity (56% vs. 52.83%), cavity lesion (48% vs. 58.49%) and consolidation (60% vs. 49.06%) respectively.

Conclusions: Smoking, low level of education, old age and diabetes mellitus are risk factors of drug resistance pulmonary TB. There are no radiological differences between drug-susceptible and drug-resistance pulmonary TB patients.

Keywords: Drug resistance TB, GeneXpert MTB/RIF, Tikrit University, Kirkuk city

Introduction

Tuberculosis (TB) is an international public health problem, with high morbidity and mortality in humans. Until the COVID-19 pandemic, TB was yet the leading cause of death from a unique infectious agent, ranking above HIV/acquired immune deficiency syndrome. Approximately 10.6 million people became infected with tuberculosis in 2021, in comparison to 10.1 million in 2020, and diminished access to TB diagnosis and treatment has resulted in a rise in tuberculosis deaths^[1, 2]. The burden of TB in Iraq in 2019 was estimated by the World Health Organization (WHO) at 16,000 incident cases (including relapses), with an incidence of 41 new TB cases per 100,000 population^[3, 4].

Drug resistant TB is a considerable global health risk, leading the ongoing TB epidemic and increasing the morbidity and mortality of TB worldwide. Incomplete and insufficient therapeutic regimens can result in antimicrobial resistance. Earlier detection needs access to care and immediate diagnostic tools, which may be restricted in many areas. Once multidrug resistant TB (MDR-TB) treatment is begun adherence and tolerability may be a challenge^[5].

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Drug resistant TB can be categorized further depending on sensitivity to antimicrobials. TB may be only rifampicin resistant (RR-TB), MDR-TB meaning resistance to both isoniazid and rifampicin. MDR-TB may extend further resistance to any fluoroquinolone, classified as pre-extensively drug-resistant TB (pre- XDR-TB). Moreover, extensively drug resistant TB (XDR- TB) is the most difficult to treat and has resistant to rifampicin, in addition to any fluoroquinolone and one further priority drug (bedaquiline or linezolid). These highly resistant infections are more troublesome to eradicate and carry a worse outcome for those infected [6].

The aim of this study is to identify the characteristics of patients with drug resistance pulmonary tuberculosis attending Consultant Clinic for Chest and Respiratory Diseases in Kirkuk.

Patients and Methods

Patients: A cross sectional study, including 103 patients with pulmonary tuberculosis, who attended Consultant Clinic for Chest and Respiratory Diseases in Kirkuk in the period from November 2022 to March 2023. All patients in this study were sputum smear positive for AFB and they were divided in two groups:

- Drug susceptible group: includes 50 new patients who never receive antituberculosis treatment previously (no drug resistance).
- Drug resistance group: includes 53 patients received antituberculosis treatment previously for at least 4 weeks with sputum smear positive and had positive GeneXpert MTB/RIF assay.

Diagnosis of pulmonary TB: The patients were subjected to detailed history taking, clinical evaluation and number of investigations that included:

- Direct sputum smears examination for acid fast bacillus (AFB) by using Ziehl- Neelsen stain.
- Chest X ray (CXR): full size chest X ray film (posteroanterior view) was taken for each patient enrolled in this study.
- HIV testing (Rapid test): which was negative in all studied patients
- The GeneXpert MTB/RIF (Cepheid /USA) assay:

consists of a single use multi- chamber plastic cartridge with liquid buffers and lyophilized reagent beads required for sample processing and DNA extraction, and real-time polymerase chain reaction interference. It is a fully-automated diagnostic molecular test used just for patients suspected of MTB/RIF -TB [7, 8].

Data collection: The information that obtained from the history including demographic characteristic of patients, risk factors and the results of investigations are recorded in data collection sheet for each patient.

The study was accepted by ethical committee of College of Medicine, Tikrit University and Kirkuk directorate of health. All patients were informed about the study and their agreements were taken.

Statistical analysis: The collected data was organized, tabulated, and statistically analyzed using Minitab ver. 19.0 statistic program. The values were reported as mean and frequencies expressed as percent. Chi (χ^2) square test and T-test were used to compare the statistical difference among of variables according to correlation to probability (P) value. P value of ≤ 0.05 was regarded as statistically significant.

Results

Table 1 shows the demographic features of pulmonary tuberculosis in two studied groups: drug- susceptible and drug-resistant. Notably, drug- resistant patients were older (mean age 55.5 years) than drug-susceptible patients (mean age 45.5 years), with a statistically significant difference (P-value = 0.001). Smoking prevalence differed significantly, with 60.38% of drug- resistant patients being smokers compared to 36% of drug- susceptible patients (P-value of 0.001). Furthermore, regarding educational level reveals that primary school education present in 58.49% of patients of drug- resistance group while 62% of drug- susceptible group were secondary school and above education, with significant differences between them. Diabetes mellitus was more frequent in the drug- resistance group (32.08%) compared to the drug- susceptible group (20%), and the difference is statistically significant (P-value of 0.032). Other factors, such as sex, marital status, and family income and COPD did not show statistically significant differences.

Table 1: Demographic features of pulmonary tuberculosis in the two studied groups

General characteristics		Studied patients				P-value
		Drug- susceptible		Drug- resistance		
		No.	%	No	%	
Age (Mean) year		45.5±1.3		55.5±1.4		0.001
Sex	Male	31	62	38	71.70	0.13
	Female	19	38	15	28.30	
	Total	50	100	53	100	
Smoking	Yes	18	36	32	60.38	0.001
	No	32	64	21	39.62	
BMI		25.4±1.3		26.2±1.3		0.015
Marital Status	Married	35	70	40	75.47	0.17
	Unmarried	15	30	13	24.53	
Family income	≤100 \$	37	74	34	64.15	0.13
	>100\$	13	26	19	35.85	
Educational level	Illiterate	1	2	6	11.32	0.001
	Primary	19	38	31	58.49	
	Secondary and above	31	62	16	30.19	
Diabetes mellitus		10	20	17	32.08	0.032
COPD		12	24	19	35.85	0.11

Table 2 reveals that the age group equal or more than 65 years was more frequent in drug-resistance group as 32.08%. while age group (55-64) years was more frequent in drug susceptible group as 30%, with statistically significant association between age and antibiotic resistance (P-value of 0.037).

Table 2: Distribution of patients pulmonary TB according to age in the two studied groups

Age groups (years)	Drug susceptible group		Drug resistance group	
	No.	%	No.	%
≤24	4	8	9	16.98
25-34	8	16	3	5.66
35-44	7	14	7	13.21
45-54	5	10	6	11.32
55-64	15	30	11	20.75
≥65	11	22	17	32.08
Total	50	100	53	100

P-value: 0.037

The common clinical features in drug- susceptible group and drug- resistance group were cough (100% vs. 92.45%), fever (74% vs. 81.13%), sputum production (82% vs 50.94%), hemoptysis (84.5 vs. 75.47%) and pleuritic chest pain (72% vs. 58.49%) respectively. Sputum production was significantly higher in drug- susceptible group, while anorexia was significantly higher in drug- resistance group, as shown table 3.

Table 3: Frequency of the clinical features of pulmonary tuberculosis in two studied groups

Clinical features	Drug susceptible group		Drug resistance group		P-value
	No.	%	No.	%	
Cough	50	100	49	92.45	0.15
Fever	37	74	43	81.13	0.14
Sputum	41	82	27	50.94	0.004
Weight loss	27	54	25	47.17	0.18
Sweating	24	48	23	43.40	0.22
Anorexia	28	56	36	67.92	0.041
Hemoptysis	42	84	40	75.47	0.11
Dyspnea	30	60	24	45.28	0.042
Pleuritic chest pain	36	72	31	58.49	0.18

Moreover, the common radiological findings in drug-susceptible group and drug- resistance group were non-homogenous opacity (56% vs. 52.83%), cavity lesion (48% vs 58.49%) and consolidation (60% vs 49.06%) respectively without significant differences between them, as shown in table 4.

Table 4: Frequency of radiological findings of pulmonary tuberculosis in two studied groups

Radiological findings	Drug susceptible group		Drug resistance group		P value
	No.	%	No.	%	
Non-homogenous opacity	28	56	28	52.83	0.17
Cavity	24	48	31	58.49	0.11
Pleural effusion	7	14	4	7.55	0.16
Miliary TB	3	6	1	1.89	0.13
Consolidation	30	60	26	49.06	0.17
Nodule	1	2	1	1.89	0.83

Discussion

Tuberculosis remains a significant public health concern in Iraq [9]. Iraq is among the developing nations where antibiotics are readily accessible without a doctor's prescription, being sold over-the-counter [10].

The study revealed a statistically significant association between age and drug- resistance, suggesting that older age groups may be more liable to drug resistant tuberculosis (TB). An *Q et al* study, found that the elderly (≥ 60 years) drug resistant TB patients accounted for about 34.50% of the total TB patients, which may be related to that old age patients have a lower rate of treatment completion and are less health aware than younger patients. In addition to that older individuals might have weaker immune systems or be more likely to have been exposed to TB in the past, making them more prone to developing resistance to antibiotics used for TB treatment [11].

In the current study, about 60.38% of drug- resistance patients being smokers compared to 36% of drug-susceptible patients. Active smoking was considered as a risk factor for TB recurrence and increased mortality [12, 13]. In addition, previous studies indicated that TB patients who are smokers are less likely to complete anti-TB treatment, which may lead to poor treatment outcome [14, 15]. Smoking leads to ciliary dysfunction, also weakens the immune system's ability to defend against infections. The immune cells in the lungs become less effective in recognizing and fighting off TB bacteria, allowing the infection to progress more easily [12].

Moreover, in this study anorexia is significantly higher in drug- resistance group. Drug- resistant TB can be more challenging to treat and may require more prolonged and complex treatment regimens compared to drug- susceptible TB. The severity of the disease and the associated inflammation can lead to a loss of appetite. In addition, the second- line drugs used to treat drug- resistant TB can have more adverse effects compared to the standard first- line drugs [16, 17].

The common radiological findings in drug- susceptible group and drug- resistance group in this study are non-homogenous opacity, cavity lesion and consolidation without significant differences between them. However, previous study reported by Li CH *et al* shown that cavity was more frequently observed in MDR- pulmonary TB than in drug- susceptible pulmonary TB. Furthermore, he indicated that multiple cavities (≥3 in number) with thick-walled status were the most favourable imaging sign for identifying MDR- pulmonary TB [18].

This study concluded that drug resistance pulmonary tuberculosis is a growing problem in our community. Smoking, low level of education, old age and diabetes mellitus are risk factors of drug- resistance pulmonary TB. Anorexia is significantly higher in drug- resistant pulmonary TB. There are no radiological differences between drug-susceptible and drug- resistance pulmonary TB patients.

Conflict of Interest

Not available

Financial Support

Not available

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