

Effect of Gender on Mortality and Treatment Outcomes in Pulmonary Tuberculosis: A Retrospective Study

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Abstract

Background and objective: Tuberculosis regarded as a major cause of death world wide despite WHO trials to eradicate it. The aim of this study was to determine the effect of gender difference in treatment outcome and mortality.

Methods: In this retrospective study on pulmonary tuberculosis at the Chest and Respiratory Disease Center in Erbil city. A total 430 patients with pulmonary tuberculosis were studied from January 1st, 2016 to December 31st, 2019 at the Chest and Respiratory Disease Center in Erbil city. The patients were divided in to two category groups; category one, includes severe extra pulmonary tuberculosis, Smear negative or positive seriously infected pulmonary disease, and category two: includes failure of treatment, relapses, and default. The recorded files of 430 patients with TB registered at Chest and Respiratory Disease Center in Erbil city as follows 103 (24%), 107 (24.9%), 109 (25.3%), and 111 (25.8%) patients since 2016, 2017, 2018, and 2019 were analyzed respectively.

Results: The median age \pm SD of the patients was 44.03 ± 21.57 years (ranged from 1-93 years) and the female to male to ratio was 1: 1.26. The mortality rate among male patients was 9.5%, while 4.2% among female patients and there was statistically significant ($P < 0.001$) association between gender and treatment outcome. The majority of patients were Category I (83.2% of the males versus 76.7% for females) and there was no statistically significant association between gender and patient categories ($P = 0.062$). The mortality rate in Category I was 4.1%, while in Category II was 15.9% and there was statistically significant association between patient categories and treatment outcome ($P < 0.001$).

Conclusion: The study concluded that poor prognostic factors that are associated with higher mortality are male gender and patient category two (failure of treatment, relapses, and default).

Keywords: Pulmonary; Tuberculosis; Relapse; Category.

Introduction

Tuberculosis (TB) is an infectious disease caused by *Mycobacterium tuberculosis*, regarded as a major cause of death world wide.¹ TB is defined as a preventable and curable disease.² TB mainly involving the lungs through inhalation of microorganism but also can affect any part of the body.³ The TB origins exactly are not well known. About 73 000 years ago the *Mycobacterium tuberculosis* supposed to

be originated in Africa, according to genomic study which is done on >250 strains of *mycobacterium tuberculosis*.⁴ About 25 % of the world's population has history of previous exposure to *M. tuberculosis* and they have risk of reactivation of disease.⁵ TB is a disease of poverty mainly present in developing countries and it is one of the top ten causes of death globally.⁶ Pulmonary tuberculosis case detection rate in Iraq is

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54%, but incidence is 42 per hundred thousand population.^{7,8} One of the Eastern Mediterranean Region countries with seven highest tuberculosis burden is Iraq.⁹ Tuberculosis is an endemic infectious disease in Iraq affecting both males and females. Gender difference has its own effect on treatment outcome and mortality due to cultural, economic and social factors, aim of our study was to determine the impact of gender difference on treatment outcome and mortality for improving diagnostic and treatment approach.

Methods

A retrospective study was conducted at the Chest and Respiratory Disease Center (CRDC) in Erbil city. The recorded files of 430 patients with pulmonary TB [103 (24%), 107 (24.9%), 109 (25.3%), and 111 (25.8%) patients since 2016, 2017, 2018, and 2019, respectively] were examined and analyzed.

Data of all diagnosed pulmonary tuberculosis patients in Erbil CRDC during the study periods were included in this study. Pulmonary tuberculosis was diagnosed when the disease affecting the tracheobronchial tree or lung parenchyma after clinical, radiological and bacteriological confirmation (sputum acid-fast bacillus by direct microscopy, Gene Xpert test, and/or bacterial culture). Because of lung parenchymal involvement, miliary TB also regarded as pulmonary tuberculosis.¹⁰

Demographic data, dates of diagnosis and treatment outcome were retrieved from patients' records. Case definition was done according to TB treatment history to new case (who received treatment or never treated for TB, relapse (reactivation of disease after cure), treatment failure (persistent positive smear after 5 months of treatment), and treatment defaulter (stopping medication ≥ 2 months during the treatment regimen), smear-positive PTB (early morning sputum direct smear positivity in two or more occasions),

smear-negative PTB (clinical features and radiological findings are typical of active pulmonary tuberculosis but the direct smear is negative). Regarding treatment outcome, patients who completed treatment and cured regarded as treatment success, interruption of treatment termed default, failure of cure after completion of treatment course regarded as treatment failure whereas death during period of treatment recorded as death.¹¹

The patients were divided into two category groups; category one, includes severe extra pulmonary T.B, Smear negative or positive seriously infected pulmonary disease, and category two (CAT II) includes failure of treatment, relapses, and default. Any patient who is diagnosed as pulmonary tuberculosis based on radiological and clinical findings was included in the study.¹¹

The study was approved by the research ethics committee of the College of Medicine, Hawler Medical University according to document meeting number 5, registration number 4, dated 20-2-2022.

Statistical Package for the Social Sciences version 26 (SPSS 26, IBM Company, Chicago, USA) was used for statistical analysis. In cross tables, the Chi-square test was used while Fisher's exact test was used when the Chi-square test was inappropriate. P -value ≤ 0.05 was regarded as a statistical level of significance.

Results

The mean age \pm SD of the patients was 44.03 ± 21.57 years (ranged from 1-93 years) and the proportion of female patients was 55.8% with a female to male ratio of 1.26:1 (Figure 1).

The results revealed that 84.2% of the male patients were completely cured while this proportion among females was 76.7%. Proportion of death among male was 9.5% which was higher than in female patients (4.2%) and there was statistically significant ($P < 0.001$) association between gender and treatment outcome.

The majority (83.2%) of the male patients

was in category one and the proportion of category one among female patients was 76.7%, but there was no statically

significant association between gender and patient categories ($P = 0.062$). These findings are shown in Table 1.

Table 1 Description of the sample.

Characteristics	Male (N =190) No. (%)	Female (N = 240) No. (%)	P-value
Duration of symptom before diagnosis			
Less than one month	74 (38.9)	76 (31.7)	0.071
One month and more	116 (61.1)	164 (68.3)	
Treatment outcome			
Cure and complete	160 (84.2)	184 (76.7)	< 0.001
Failure	4 (2.1)	8 (3.3)	
Default	8 (4.2)	38 (15.8)	
Death	18 (9.5)	10 (4.2)	
Type of patients			
New	158 (83.2)	184 (76.7)	0.206
Default	4 (2.1)	10 (4.1)	
Relapse	28 (14.7)	46 (19.2)	
Treatment category			
CAT I	158 (83.2)	184 (76.7)	0.062
CAT II	32 (16.8)	56 (23.3)	
Diagnostic tool			
Sputum positive and clinical	6 (3.2)	8 (3.4)	0.851
Sputum positive, clinical and radiological	130 (68.4)	158 (65.8)	
Clinical and radiological	54 (28.4)	74 (30.8)	

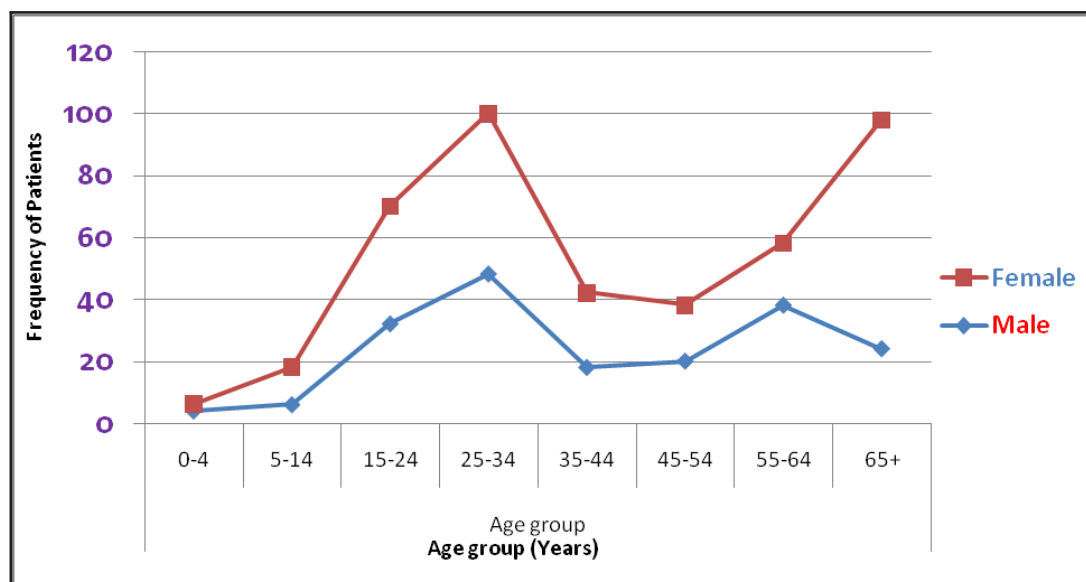


Figure 1 Distribution of patients according to age groups among male and female patients.

Table 2 shows that the majority (86.5) of the patients with CAT I were completely cured and 4.1% were dying, while in CAT II these proportions were 54.6% and 15.9%, respectively and there is statistically significant ($P < 0.001$) association between patient categories and treatment outcome. Most (84.1%) of the patients with CAT II were relapse cases, while all of the patients with CAT I were new cases and there is statistically significant ($P < 0.001$) association between type of patients and patient categories.

Discussion

Despite WHO trials to eradication by 2020 through yearly decline by 4%-5% still pulmonary tuberculosis is a big health problem.⁷

According to WHO reports there are differences between sex ratio globally between different countries in which tuberculosis was more common in females than males (M:F ratio = 1.6:1),² but in Iraq females are mostly diagnosed by tuberculosis more than males, according to WHO Global tuberculosis report 2015,¹² also inside Iraq in most provinces the pulmonary tuberculosis is more common in females like in Baghdad¹³ and Sulaimaniyah with female to male ratio is 1.01:1 and 1.02:1 respectively¹⁴ while in Duhok province the male cases were predominant with male to female ratio is 1.24:1.¹⁵

In this study the mortality from pulmonary tuberculosis were significant about 6.5%, which near to total mortality in Iraq¹⁶ and

other provinces like Sulaimaniyah is about 7%¹⁴ and Duhok which is about 6.7%.¹⁵

In our study the mortality was more common in males than females, which is 9.5% and 4.2%, respectively which is similar to WHO global report in 2020.²

Although the majority of patients in category one were males (83.2%) and more than females (76.7%) but still statistically not significant.

Regarding effect of patients category on mortality, there were statistically significant difference between category one (4.1%) and category two (15.9%), category two had higher mortality because it include mostly relapsed cases (84.1%) which may have extensive disease or may resist to medication. In a study in India the overall mortality for category 2 was 5.4% at the end of five years, which is quite lower than our mortality.¹⁷

Conclusion

The study concluded that poor prognostic factors that are associated with higher mortality are male gender and patient category two (failure of treatment, relapses, and default). Further studies are necessary to confirm or refute the effect of gender on mortality in pulmonary tuberculosis.

Funding

Not applicable.

Competing interests

The authors declare that they have no competing interests.

Table 2 Association between patient categories and treatment outcome.

Characteristics	CAT I (N=342)	CAT II (N=88)	P-value
	No. (%)	No. (%)	
Treatment outcome			
Cure and complete	296 (86.5)	48 (54.6)	< 0.001
Failure	6 (1.8)	6 (6.8)	
Default	26 (7.6)	20 (22.7)	
Death	14 (4.1)	14 (15.9)	

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