

Clinical, Socio-Demographic Characteristics and Gender Disparity in Patients with Tuberculosis Infection in Pakistan

Shameem Behram Khan, Raafia Ijaz, Naseem Salahuddin, Rabeea Shah, Samreen Sarfaraz, Aneela Hussain

The Indus Hospital, Karachi Pakistan

ABSTRACT

Objectives: To assess the clinical, environmental, and socio-demographic characteristics leading to gender disparity in tuberculosis in Pakistan.

Study Design: Prospective Comparative study.

Study Setting and Duration: The Indus Hospital, Karachi Pakistan, from Jul 2020 to Dec 2020.

Methodology: A sample of 200 patients with diagnosed tuberculosis (detected on an acid-fast bacillus (AFB) smear with radiographic abnormalities) irrespective of gender, sensitivity, or site of tuberculosis, were included in the study. Data of gender, personal history, substance abuse history, and dietary habits was documented.

Results: Pulmonary tuberculosis was significantly more common in female patients than in males ($p < 0.001$). The mean age of male patients was 30.16 ± 9.47 years. Male patients were significantly older than their female counterparts ($p = 0.003$). The diabetes mellitus in male patients was significantly higher than in female patients with TB ($p = 0.01$). Similarly, substance abuse history was more frequently positive in male patients as compared to female patients, 28 (40.60%) vs 9 (6.70%); p -value < 0.001 . There was no significant difference in the occurrence of drug-resistance tuberculosis between the two genders. However, pulmonary tuberculosis was significantly more common in female patients than in males ($p < 0.001$).

Conclusion: We reported some distinctive differences between male and female tuberculosis patients. Young females had more predilections toward tuberculosis as compared to men. Diabetes mellitus and substance abuse history were more common in male tuberculosis patients than in females.

Keywords: Acid-fast bacillus (AFB) smears, Female, Gender, Pulmonary tuberculosis, Tuberculosis.

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INTRODUCTION

Tuberculosis is one of the most dreadful causes of mortality worldwide, especially in developing countries like Pakistan, Afghanistan and India.¹ According to a study conducted in 2018, out of 10 million cases globally, TB was most commonly diagnosed in men, followed by women and the prevalence in children was the least.² According to WHO, Pakistan has an estimated burden of 562,000 new cases annually, of which 30,000 are drug-resistant TB, with a gender distribution of 45% men, 42% women and 13% children.²

Globally, twice as many men as women are reported to acquire TB, as reported in the WHO global report 2019 of 30 highest-burden countries, with the ratio of males to the female being 2:1 annually. It is internationally reported that more males than females are screened and diagnosed with tuberculosis in the developing and developed world, and a male-female ratio (MFR) of 1.96 ± 0.6 has been reported around the globe. This gender discrepancy is so pronounced that the male gender was reported as a risk factor for

tuberculosis.^{3,4,5}

However, in some settings, such as Afghanistan, parts of Pakistan bordering Afghanistan and Iran, more women than men are detected with TB, though more males seek medical treatment as compared to women.^{6,7}

Multiple elements, such as biological factors, can cause hindrance in the acquisition of medical facilities and thus lead to notifications or late diagnosis in women.⁸ Cultural norms, family responsibilities, pregnancies, social stigma, and lack of good nutritional status may be responsible for the higher female preponderance observed in Pakistan.⁹ Women usually tend to be sick persons with TB within their families. Hence they may be more easily exposed to the disease.¹⁰ Hence, we can expect that the rate of TB in women in developing countries such as ours would be higher than their male counterparts.

In short, the current study hypothesized that TB in Pakistani women, as indicated by several studies, is higher than in males. However, the factors responsible for the gender discrepancies remain unexplored. Therefore, the goal of the present study was to assess

Correspondence: Dr Shameem Behram Khan, The Indus Hospital, Karachi, Pakistan

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the clinical, environmental, and socio-demographic characteristics of tuberculosis patients for gender.

METHODOLOGY

This prospective comparative study was conducted at the Indus Hospital, Tuberculosis facility, a free of cost tertiary care facility in Pakistan. After obtaining the ethical approval from the Institutional Review Committee (IRB) (ReferenceNo. IRD_IRB_2020_03_009), the study was carried out from July 2020 to December 2020. The sample size was calculated using WHO sample size determination software through hypothesis testing of two population proportions-two sided with the following assumptions.¹¹ Power of the test was set to 80%, the prevalence of females with tuberculosis was 57%, and the prevalence of men was 43%. The acquired sample size was 180. A non-probability convenience sampling technique was employed.

Inclusion Criteria: All patients with diagnosed tuberculosis (detected on acid-fast bacillus smear with radiographic abnormalities) irrespective of gender, sensitivity, or site of tuberculosis, were included in the study.

Exclusion Criteria: Patients aged over 50 years and those >18 years were excluded from the study. Informed verbal and written consent were obtained prior to the study. All the eligible patients were enrolled in the study through the Outpatient Department.

Data of patients' age, gender, occupation, level of education, height, weight, BMI, treatment regimen, and duration of treatment was documented on a pre-designed proforma. Clinical and socio-demographic characteristics of the study population for gender distribution were documented.

The data regarding sex, personal history (previous TB, nicotine and alcohol addiction), relationship status, immunosuppression and diet was also recorded. The assessment of socio-economic status was done by considering the size of the house, the number of inhabitants, abidance to hygiene, and the number of pets.

Statistical Package for Social Sciences (SPSS) version 23.0 was used for the data analysis. Mean \pm SD or median (IQR) were computed as appropriate for all the quantitative variables like age, BMI, duration of treatment, years of education and current salary. All the categorical variables, e.g. gender, type of TB, site of TB, treatment phase, occupation, comorbidity, and history of addiction, were presented as frequency and percentages. To compare the different clinical and sociodemographic characteristics between the gender, chi-square and independent sample t-tests as appropriate were applied to check for statistical significance. The *p*-value of ≤ 0.05 was considered statistically significant.

RESULTS

A total of 203 patients with tuberculosis were enrolled in the study. The mean age of male patients was 30.16 ± 9.47 years. Male patients were significantly older than their female counterparts ($p=0.003$). The majority of the patients were urban dwellers. Almost one-half were married. The diabetes mellitus in male patients was significantly higher than in female patients with TB ($p=0.01$). Similarly, substance abuse history was more frequently positive in male patients than female patients 28 (40.60%) vs 9 (6.70%); p -value <0.001 as shown in the Table-I.

Table-I: Socio-demographic characteristics of Study Population (n=203).

Parameters	Male	Female	<i>p</i> -value
Age (Mean \pm SD)	30.16 \pm 9.47	26.24 \pm 8.42	0.003
Body Mass Index (Mean \pm SD)	18.81 \pm 3.76	18.91 \pm 5.17	0.869
Urban Residence n (%)	65 (92.90%)	119 (89.50%)	0.613
Rural Residence n (%)	5 (7.10%)	14 (10.50%)	
Married n (%)	35 (50.00%)	75 (56.40%)	0.459
Unmarried n (%)	35 (50.00%)	58 (43.60%)	
Attended school n (%)	23 (33.30%)	39 (29.30%)	0.630
Did not attend school n (%)	46 (66.67%)	94 (70.70%)	
Years of Education (Mean \pm SD)	9.20 \pm 2.73	8.76 \pm 3.13	0.395
Diabetes Mellitus n (%)	8 (11.40%)	4 (3.00%)	0.020
No Diabetes Mellitus n (%)	62 (88.60%)	129 (97.00%)	
Human Immunodeficiency Virus n (%)	3 (4.30%)	1 (0.70%)	0.119
No Human Immunodeficiency Virus n (%)	67 (95.70%)	132 (99.20%)	
Substance Abuse n(%)	28 (40.00%)	9 (6.80%)	<0.001
No Substance Abuse n(%)	42 (60.00%)	124 (93.20%)	
Working n(%)	45 (64.30%)	17 (12.80%)	<0.001
Not Working n(%)	25 (35.70%)	116 (87.20%)	

There was no significant difference in the occurrence of drug-resistance tuberculosis between the two genders. However, pulmonary tuberculosis was significantly more common in female patients than in males ($p < 0.001$). In 47 (68.10%) male patients and 83 (61.90%) females, TB contact was positive. 25 (36.8%) males and 63 (47%) females with TB confessed that they had delayed visiting the doctor for more than three months since the onset of symptoms. The reasons for delayed treatment-seeking behaviour were explored. The majority claimed they were mis-diagnosed, had poor access to health care setup, or were seeking other methods of care for their symptoms (Table-II).

explored the clinical, environmental, and social factors responsible for the gender discrepancies. We reported that the male patients were significantly older than the female patients ($p = 0.003$). There were significantly more male patients with diabetes mellitus than females and those with substance abuse history ($p < 0.05$). Mean persons living per house in the male population was significantly higher than females ($p = 0.009$). In males, the majority did not have complete knowledge about tuberculosis, albeit the difference was insignificant.

Chandir *et al*, reported an incidence rate of extra-pulmonary tuberculosis in females to be 75%. However, the study did not explore the risk factors associa-

Table-II: Clinical Characteristics and Reasons for Delay in Seeking Treatment for Tuberculosis with respect to Gender.

Parameters	Male	Female	p-value
Drug resistance Tuberculosis	23 (32.90%)	36 (27.10%)	0.418
Drug sensitive Tuberculosis	47 (67.10%)	97 (72.90%)	
History of Tuberculosis	49 (71.00%)	101 (76.50%)	0.399
No History of Tuberculosis	20 (29.00%)	31 (23.50%)	
Family members affected	22 (31.40%)	50 (37.60%)	0.238
No Family members affected	1.27 ± 0.46	1.53 ± 0.78	
How many family members	1.27 ± 0.46	1.53 ± 0.78	0.085
Do you live in the same household as any of these people while they are sick?	2 (2.90%)	5 (3.80%)	1.000
You don't live in the same household as any of these people while they are sick?	68 (97.10%)	128 (96.20%)	
Reason for more than 3 months' Time interval between symptoms and presentation to doctor.			
Financial	2 (8.00%)	6 (9.50%)	0.413
Poor medical access	7 (28.00%)	7 (11.10%)	
Non supportive family	0 (0.00%)	1 (1.60%)	
Alternative care	5 (20.00%)	8 (12.70%)	
Wrong diagnosis	8 (32.00%)	26 (41.30%)	
Denial of symptoms	1 (4.00%)	3 (4.80%)	
Other	2 (8.00%)	12 (19.00%)	

The majority of the patients were living in furnished houses. Most of the patients had 1-2 rooms at least. The mean number of people living in one house was 9.23 ± 13.06 in males and 7.96 ± 4.58 in females ($p = 0.009$). In 61 (88.40%) male patients and 125 (93.30%) females, a factory was near the house. 46 (66.70%) males and 105 (78.40%) females consumed dairy products daily ($p = 0.071$). When knowledge of tuberculosis was assessed, it was found that ample knowledge was only claimed by 16 (23.20%) males and 41 (30.60%) females. At the same time, the remainder of the population had incomplete knowledge on the matter. There was no significant difference between the knowledge between males and females (Table-III).

DISCUSSION

Globally, there is evidence of gender discrepancies in patients with tuberculosis (TB).¹¹ The current study explored the tuberculosis between males and females. Moreover, the study comprehensively

ted with a higher prevalence of TB in women.¹² Chandir *et al*, speculated that there could be several factors into play here that may explain the higher incidence of TB in women in their study compared to men. Women tend to stay home and have poor nutritional uptake.¹²

In a study by Sreeramareddy *et al*, from Nepal, it was found that pulmonary tuberculosis was significantly higher in males than females, with a ratio of 2.29 ($p < 0.001$). Younger patients were more likely to acquire tuberculosis than older individuals ($p < 0.001$).¹³ Diabetes Mellitus and immunosuppressive drugs were significantly associated with an increased risk of pulmonary tuberculosis with a p -value of 0.001 and < 0.001 , respectively. The current study reported similar findings.

Another study elaborates on gender disparity among Eastern and Western provinces of Pakistan, with the high number of case notifications in Western regions compared to Eastern provinces, but the

Gender Disparity

Table-III: Socioeconomic Characteristics and Dietary Habits with Respect to Gender.

Characteristics	Male	Female	p-value
Rooms in Home			
1-Room	20 (29.00%)	22 (16.40%)	0.152
2-Rooms	22 (31.90%)	56 (41.80%)	
3- Rooms	14 (20.30%)	34 (25.40%)	
4-Rooms and Above	13 (18.80%)	22 (16.40%)	
Persons Living In A House	9.23 ± 13.06	7.96 ± 4.58	0.009
Children Living In House	2.63 ± 3.6	2.96 ± 2.89	0.68
Sunlight Access	3 (4.30%)	16 (11.90%)	0.081
No Sunlight Access	67 (95.70%)	117 (88.00%)	
Biomass Stoves	8 (11.40%)	8 (6.00%)	0.182
No Biomass Stoves	62 (88.60%)	125 (94.00%)	
Toilet Outside House	21 (30.00%)	41 (30.80%)	1.000
No Toilet Outside House	49 (70.00%)	92 (69.20%)	
Factory Near House	8 (11.40%)	8 (6.00%)	0.182
No Factory Near House	62 (88.60%)	125 (94.00%)	
Number of People Sharing Room			
1- Two	22 (37.90%)	40 (32.00%)	0.404
2- Four	23 (39.70%)	45 (36.00%)	
3- Above Five	13 (22.40%)	40 (32.00%)	
Animals in House	56 (80.00%)	115 (86.50%)	0.232
No Animals in House	14 (20.00%)	18 (13.50%)	
Meat Consumption Per Week			
0	14 (20.30%)	35 (26.10%)	0.478
1-2	36 (52.20%)	73 (54.50%)	
3-5	13 (18.80%)	20 (14.90%)	
6-7	6 (8.70%)	6 (4.50%)	
Eat dairy Products	47 (67.10%)	104 (78.20%)	0.093
Doesn't Eat Dairy Products	23 (32.90%)	29 (21.80%)	
Knowledge Towards TB			
Complete	16 (23.20%)	41 (30.60%)	0.186
Incomplete	48 (69.60%)	76 (56.70%)	
No idea	5 (7.20%)	17 (12.70%)	

triggering factors remained unexplored.¹⁴ Recently, Hertz and Schneider assessed the gender-related differences in tuberculosis and explored the factors responsible for the disparity.¹⁵ The authors revealed that the men to women ratio as per literature is 1.7 worldwide. World-wide analysis of studies shows that the male gender has a predilection towards the disease more than their female counterparts.^{15,16} However, notification of tuberculosis alone does not adequately reflect gender discrepancies which can vary significantly from one country to the other. Furthermore, lack of access to health care and the quality of sputum smear tests can result in underreporting of tuberculosis in the female population.^{17,18}

We reported that there are many clinical and socio-demographic differences between men and women who have been diagnosed with TB. We speculate that some biological or genetic components may be responsible for causing disparity between the two gen-

ders.^{19,20} It is of utmost importance to increase awareness among the public about the disease and its spread to control the infection. Further large-scale studies are needed to study the role of gender and ethnicity in determining the treatment response among patients.

LIMITATION OF STUDY

The current study findings were limited due to the small sample size, and the use of the non-probability sampling technique also limits the generalizability of current findings for the target population.

CONCLUSION

We reported some distinctive differences between male and female tuberculosis patients. Young females had more predilection toward tuberculosis as compared to men. Diabetes mellitus and substance abuse history were more common in male tuberculosis patients than in females.

Conflict of Interest: None.

Authors' Contribution

SBK: Framework, RI: Review, NS:, RS: Writing, SS:, AH: Data collection.

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