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PREVALENCE OF PULMONARY AND EXTRA PULMONARY TUBERCULOSIS IN PUNJAB POPULATION OF PAKISTAN

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Abstract

Tuberculosis, being one of the top 10 death causing diseases worldwide, is still widespread in developing countries. Pakistan is currently ranked fifth among the high tuberculosis burden countries and 5 % of the total patients worldwide are from this country. The study was conducted on 633 tuberculosis patients involving both pulmonary and extrapulmonary tuberculosis from Punjab population of Pakistan. Male to female ratio was found to be 0.96 in this population. Most of the individuals infected from this disease were found to be of age group 15-34 where 38.38% males and 46.43% females were infected. Among pulmonary tuberculosis, age group <15 was most infected with 31.11% males and 39.84% females while among extra pulmonary tuberculosis age group 15-34 was found most infected with 51.53% males and 56.31% females. Significant difference in MFR and age groups prevalence of this disease was noted when compares with neighbor countries India and Iran.

Key words: Tuberculosis; Male to female ratio; Prevalence; Age groups; Pakistan.

INTRODUCTION

Tuberculosis has been estimated that approximately more than 1.6 million people died because of this disease and more than 10 million people suffered from this disease (WHO, 2023). Tuberculosis is a serious disease caused by *Mycobacterium tuberculosis.* Tuberculosis leading to lung infection is referred as pulmonary tuberculosis, while tuberculosis effecting organs other than lungs is known as extra pulmonary tuberculosis (Gonzalez *et al*., 2003; Chandir *et al*., 2010).

According to World Health Organization, increased cases of extra pulmonary tuberculosis have been observed in recent years. In 2018, 7 million new cases of tuberculosis have been reported out of which 15% cases were extra pulmonary tuberculosis. Although, extra pulmonary tuberculosis is more prevalent in developed countries, its occurrence in developing countries is also increasing (Chandir *et al*., 2010). Social and economic status plays an important role in the spread of this disease as the lack of awareness and limited access to medical facilities are crucial factors for infection. Moreover, lack of early diagnosis and lack of proper follow up are also the major reasons for spread of this disease (Raviglione Sulis, 2015; Lönnroth *et al*., 2009).

It has been found that Human Immunodeficiency virus (HIV) is one of the most important risk factors for tuberculosis (TB) diagnosed patients. HIV patient when encounters tuberculosis (TB), there is a strong chance that it can lead to death of the patient due to compromised immunity. The association of TB with HIV, diabetes, and smoking has been studies in in African countries. Moreover, important threat in treatment of tuberculosis is the development of multidrug resistant in bacteria against rifampin and isoniazid (Herce *et al*., 2018; Baker *et al*., 2011; Amare et al., 2013). Most of drug susceptibility cases are not reported due to limited access to the medical facilities.

Severity of TB incidences vary according to the age of the individual. The association of TB cases with the age groups has more to do with epidemiology and biological factors inherent in the disease. There are several evidences to support that studying gender based differences in the spread of this disease play an important role in proper treatment and control of this disease (Salim *et al*., 2004). Pakistan is ranked fifth among high TB burden countries and 6% of the 10 million people suffering from this disease worldwide are from this country (WHO, 2019). A trend towards development of this disease has been observed higher in males as compared to females, however,

Male to Female Ratio (MFR) varies from one country to another. In 2017, 525 thousand cases were reported in Pakistan, out of them 234 thousands were females while 291 thousand were males accounting for overall Male to Female Ratio (MFR) of 1.24 (WHO, 2017).

This study was designed to assess the prevalence of pulmonary and extra pulmonary tuberculosis cases in Punjab (Largest province of Pakistan by population) population of Pakistan and to compare its prevalence with neighboring countries, like India and Iran. Reviews general spectrum of TB diagnosed cases, determines age group based prevalence, its male to female ratio and ratio of pulmonary to extra pulmonary infections.

METHODOLOGY

This study was conducted in eight different hospitals located in four districts of Punjab: Lahore, Faisalabad, Multan and Vehari, located in the Punjab province of Pakistan. Written consent was taken from the enrolled patients. The study was a retrospective study. 633 samples of TB patients received during year 2021 were collected from the above mentioned hospitals and evaluated for demographic characteristics of pulmonary and extra pulmonary tuberculosis in Punjab. All the statistical analysis were performed using GraphPad Prism version 8.0.1. Two way ANOVA was applied for statistical analysis and P value less than 0.05 % was considered statistically significant.

RESULTS

The studies showed that in 633 TB patients, Male to Female ratio (MFR) was found 0.96 indicating 48.97% male while 51.02% females. In addition it was found that MFR was 1.353 in pulmonary tuberculosis patients as compared to 0.684 in extra pulmonary tuberculosis patients. In pulmonary tuberculosis, 57.50% were male and 42.49% were female while in extra pulmonary tuberculosis 40.62% were male and 59.38% were females (Table 1).

To check the prevalence of TB in different age groups, two sets of age groups were created. The purpose of creating these two groups was to get deep insight into the age wise spread of this disease so that it can be compared across various populations like Iran and India. One set of age group contained age in years <15, 15-34, 35-54 and ≥55 (Set-I) while second group contained age ranged

in year <15, 15-30, 31-45, 46-60 and >60 (Set-II). In Set-I, maximum TB infected individuals fell in 15-34 age group range with 38.38% males and 46.43% females, while minimum infection was observed in ≥55 age group with 14.19% male and 8.04% females (Table 2).

Table 1: Gender based distribution of TB cases.

Gender	Total no of patients	No. of pulmonary tuberculosis cases	No. of extra pulmonary tuberculosis cases
Males	310 (48.97)	180 (57.50)	130 (40.62)
Females	323 (51.02)	133 (42.49)	190 (59.38)
Total	633 (100)	313 (100)	320 (100)
MFR	0.96	1.353	0.684

Table 2: Total TB cases based upon gender and age.

Age group	Male No.	Male %age	Female No.	Female %age
<15	75	24.19	82	25.38
15-34	119	38.38	150	46.43
35-54	72	23.22	65	20.12
>55	44	14.19	26	8.04

In Set-II, it was found that age group 15-30 was the most effected group with TB showing 34.83% male and 42.72% females. However age group >60 was found to be least effected by TB showing 9.67% males and 4.02% females in the studied population (Figure 1B). Comparison of pulmonary and extra pulmonary tuberculosis in Indian and Punjab population of Pakistan was also determined (Figure 1D). It was noted that high percentage of male (31.11%) and female (39.84%) was obtained in age group <15 in pulmonary TB patients while least susceptible age range was found to be >60 in males, and 31-45 and 46-60 in females (Figure 1F).

To study the effect of age on pulmonary and extra pulmonary tuberculosis, different age groups were studied. In extra pulmonary reported TB cases, age group 15-34 was found to be most affected group with 51.53% and 56.31% susceptibility in males and females, respectively. The age group ≥55 was found to be less prone to this disease in extra pulmonary reported TB cases (Figure 2B). In pulmonary tuberculosis, it appeared that age group <15 year was the most effected both in

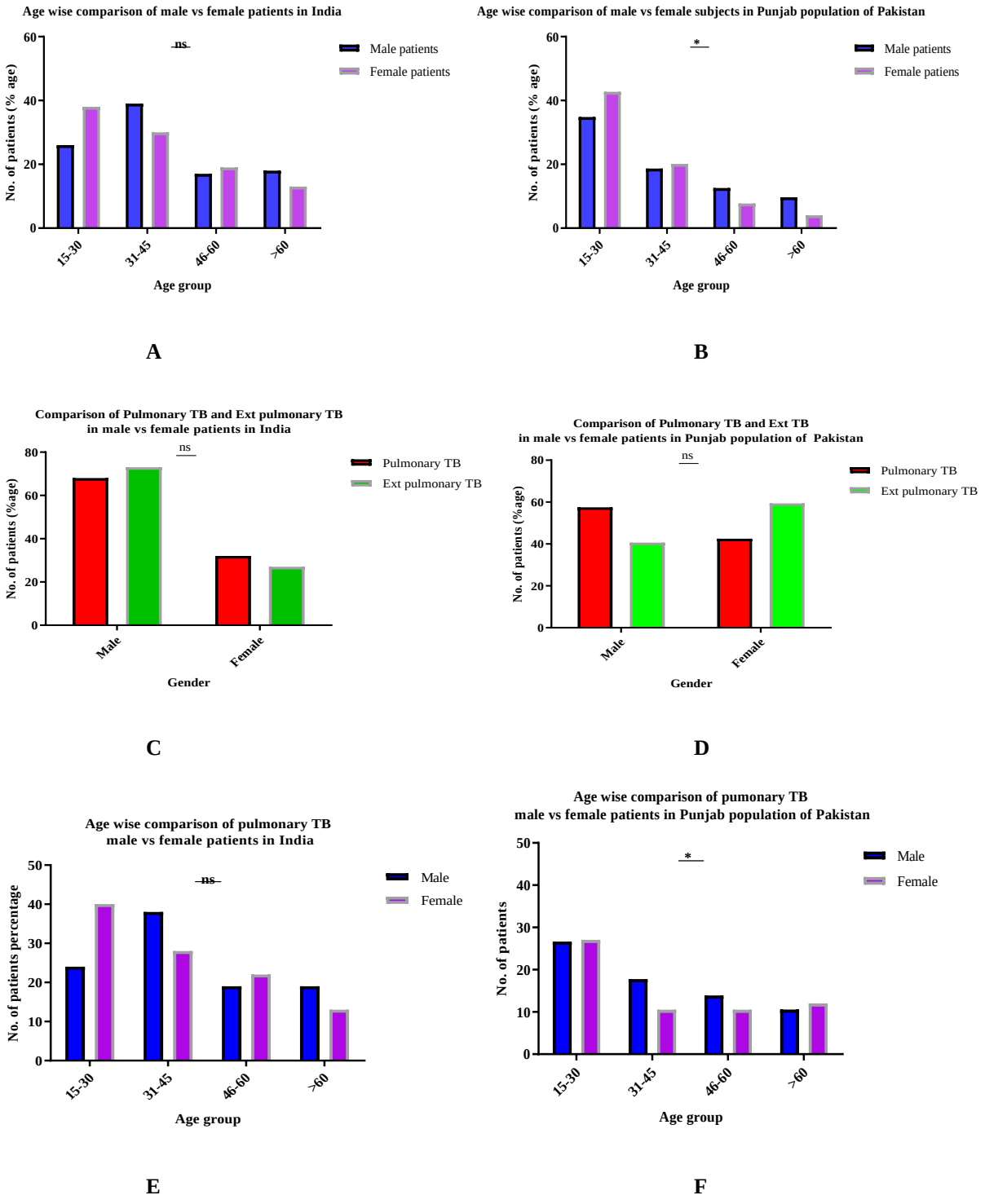

Figure 1: Demographic comparison of TB in Indian and Punjab population of Pakistan. **A** and **B** showing age wise comparison of TB patients between Indian and Punjab population of Pakistan. **C** and **D** show gender based pulmonary and extra pulmonary tuberculosis prevalence in Indian and Punjab population of Pakistan respectively. **E** and **F** show age wise comparison between male and female patients in Indian and Pakistani populations respectively.

males and females showing 31.11% and 39.84% infected results, respectively, however, age group 15-34 was not far away from age group <15 and showed comparable disease spread. The least susceptible age group was found to be ≥ 55 which showed 17.22 % and 14.28 % disease spread in male and females respectively (Figure 2D).

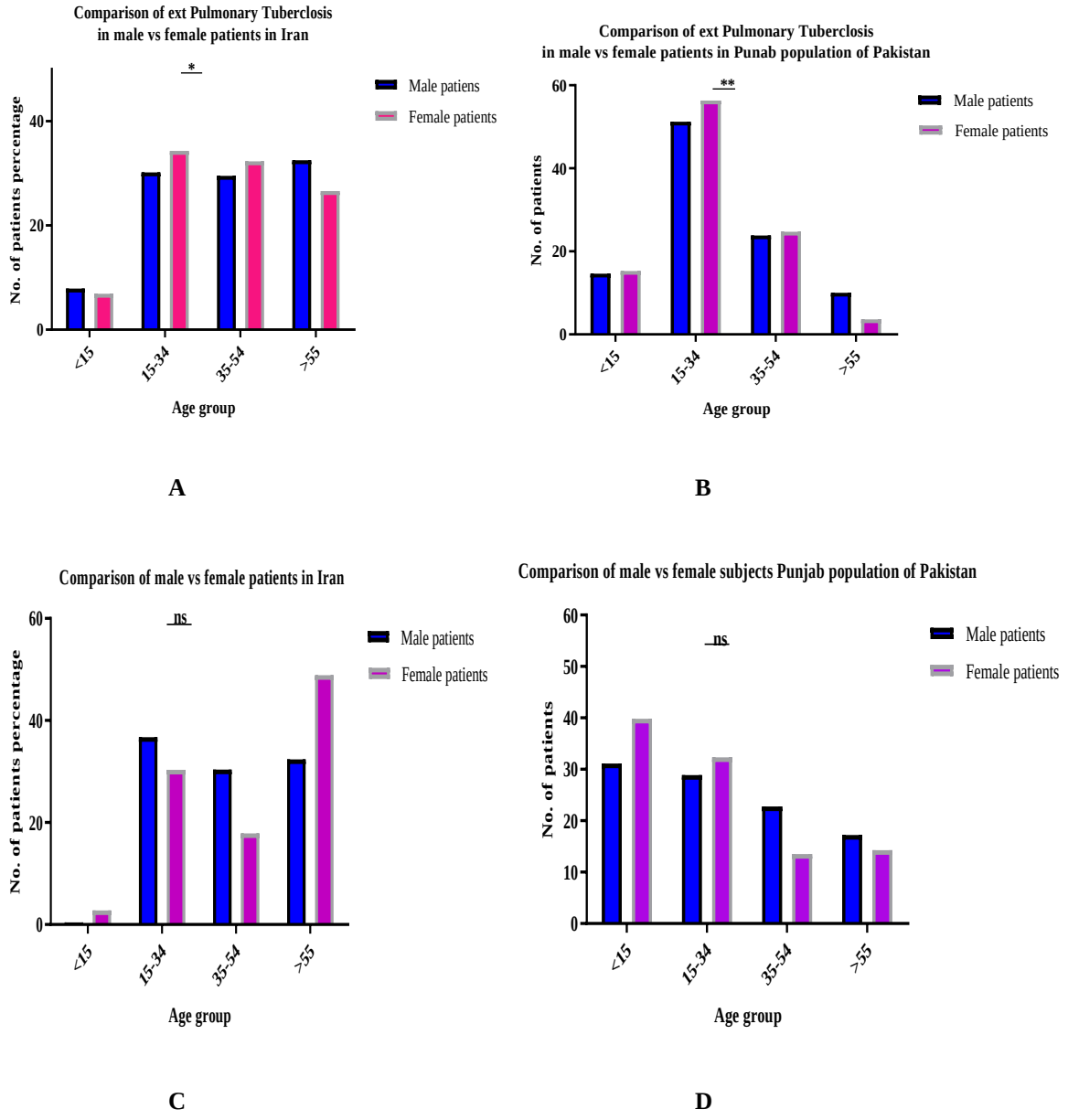

Figure 2: Demographic comparison of TB patients in Iranian and Punjab population of Pakistan. A and B show age wise distribution of extra pulmonary tuberculosis in Iranian and Punjab population of Pakistan respectively. C and D show age wise comparison of male and female pulmonary tuberculosis patients in Iran and Pakistan respectively.

DISCUSSION

This study was performed to investigate the MFR ratio of tuberculosis, its age based prevalence and determining ratios of pulmonary to extra pulmonary tuberculosis in studied population of Punjab province of Pakistan. Overall MFR ratio obtained from the studied population are in contrast to what has been determined in the past for different countries (Diwan & Thorson, 1999). It has been established that most of the countries effects with tuberculosis, the MFR is 2:1 while in our study MFR 0.96 has been observed. Similar studies conducted in the neighbor countries like India and Iran (Abedi *et al*., 2017; Rao, 2009) provide useful demographic differences. The same contrasting studies with respect to MFR have been observed both in pulmonary tuberculosis (1.35 in Pakistan as compared to 2.13 in India, and 1.9 in Iran) and extra pulmonary tuberculosis patients (0.68 in Pakistan as compared to 2.72 in India, and 0.87 in Iran). This relatively increased report of females in tuberculosis patients indicates the cultural and contextual factors which vary among one gender to another in a society. The inaccessibility of the females to healthcare facilities and certain social stigmas in this region are proposed reason for this decreased MFR in tuberculosis patients, however, important factors which can result in varying degree of immune response to the diseases such as genetic make-up of the individuals and life styles cannot be ignored (Rao, 2009; Munch *et al*., 2003; Abel *et al*., 2014).

Interesting information was obtained when compared across different age groups effected with tuberculosis. It has been observed that people falling in the Set-I of age group 15-34 and Set-II of age group 15-30 were found more prone to this disease as compared to other age groups which is contrary to neighbor country India where it has been reported that most individuals effected fall in the age group 31-45 (Rao, 2009). In addition, when compared with Iran (one of the neighbors of Pakistan), results were found in accordance as age group 15-34 was most susceptible to this disease when pulmonary tuberculosis cases were compared However, in contrast to Iranian population data, less percentage of cases were reported in age group ≥55 (Abedi *et al*., 2017). It was also noted that in age group 15-34, more females than males (32.33 % compared to 28.88 %) were effected in Pakistan as compared to Iran (30.3% compared to 36.7%). In case of extra pulmonary tuberculosis, when compared against Iran population, it was found that most effected population age group was 15-34 where 51.53% compared to 30.2% males and 56.31% compared to 34.3% females were affected. As Pakistan is a developing country and socioeconomic culture of this

country is such that the individuals of the age group 15-30 or 15-34 are more likely to be the earning hands of their family and most of the people get married in this age. Moreover, lack of knowledge about spread of this disease and being more exposed to the environment, this age group is more susceptible to this disease (Jiamsakul *et al*., 2018).

CONCLUSION

As Pakistan is facing extreme effects of tuberculosis, studying the pattern of spread of this disease can provide help for fighting against this disease. In contrast to worldwide MFR ratio of 2, MFR ratio in studied population in Pakistan has been found to be 0.96. This study gives us insight into the demographic characteristics of TB in Punjab province of Pakistan. Different age groups susceptibility towards this disease can give us important information about the mechanism of spread of this disease and can provide us essential precautionary measures for eradicating this disease in the society.

Conflict of interest

Authors declare no conflict of interest.

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