CODEN [USA]: IAJPBB ISSN: 2349-7750

INDO AMERICAN JOURNAL OF
PHARMACEUTICAL SCIENCES

http://doi.org/10.5281/zenodo.2564737

Available online at: http://www.iajps.com ***Research Article***

PULMONARY TUBERCULOSIS: GENDER DIFFERENCE OF MALE & FEMALE

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Abstract:

Background: *An association between gender and smear positive pulmonary tuberculosis.*

Objective: *To summarize the gender correlations of subjects with smear positive pulmonary tuberculosis.*

Design: *This is a cross-sectional research.*

Setting: *The present research was conducted from January 2017 to December 2017at the Department of Medicine, Nawabshah People's Medical College Hospital.*

Samples: *A total of 385 AFB-positive tuberculosis patients were recruited next to fulfilling the selection criteria.*

Material and Methods: *The data was gathered after a short interview. The subjects were categorized for variable assessment like age, gender and sputum AFB.*

Results: *Of the 385 subjects diagnosed with smear-positive PTB, 66.2% were male and 33.8% were female.*

Conclusion: *This study had concluded that male gender is more affected than female gender in patients who were suffering from pulmonary tuberculosis with smear-positive AFB.*

Keywords: *Pulmonary Tuberculosis, gender, Acid Fast Bacilli, Sputum AFB.*

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Please cite this article in press Anwar Ali Jamali et al., ***Pulmonary Tuberculosis: Gender Difference Of Male & Female..,*** *Indo Am. J. P. Sci, 2019; 06(02).*

INTRODUCTION:

Tuberculosis (TB) is a significant public health problem all over the world. Tuberculosis, including pulmonary as well as extra-pulmonary tuberculosis, is common problem in Pakistan in relation to health. There is large numbers of causes responsible for the progression of tuberculosis.

Reported cases of tuberculosis in 2015; from all around the globe were 10600000 case, of which 1200000 (11%) have HIV/AIDS syndrome / immunodeficiency [1]. In Pakistan burden of tuberculosis is a high challenge with prevalence rate of three hundred and forty three per lac [1].

The rate of HIV infection (1.02%) was high (1.23%) with extra-pulmonary and male subjects in comparison to respiratory (0.55%) & women (0.09%) subjects [2].

It is estimated that round 1/3rdof world's populace is suffering from MTB (Mycobacterium Tuberculosis) a causative organism for tuberculosis [3], but most show no signs or symptoms of active disease, i.e., latent TB infection (LTBI) [3]. Approximately 10% of those with LTBI will progress to active TB at some point in their lives [3] [4].

Every year about 1.7 million deaths around the globe are caused by Tuberculosis as reported by WHO [5]. Male gender is affected more in comparison to female gender with m:f of 01.9 ±0.6 for the global case reported, this ratio is variable, ratio less than 1 is very infrequent, ratio can be as 3 (04.7 Armenia) has been reported [5]. Male dominancy in pulmonary tuberculosis is noted in almost globally from all over the countries in non HIV subjects. Except children and teenagers it is applied in adults at all ages [5]. Approximately 8.7 million new cases and 01.4 million deaths were related to tuberculosis [6].

Male predominance was also reported by Wachinou, A in his study he reported that 63.1% of study subjects suffering from tuberculosis were male gender. The rates of case report were more in male gender in comparison to female gender i-e 96 vs 53/100,000 population.

In annual world level report by WHO show that the active tuberculosis is more frequent in male subjects [1].

On association of Tuberculosis and sex distribution many studies had been conducted throughout globe, but in our local setup no such study had been carried out. Continuous increases in population with increased frequency of PTB are the chief problems of our setup. Current research was designed to detail the relation of sex in patients with smear +ve pulmonary tuberculosis due to the reasons that these both problems are related with mortality and morbidity as notified from all over the world.

Keeping in observation through gender and pulmonary tuberculosis current study will be beneficial for designing the community health policies. Current research will conclude the occurrence of male and female difference in subjects with smear positive pulmonary tuberculosis and to discover whether gender may have any protecting part in the pulmonary tuberculosis. The reasoning for performing present study was the scarcity of this type of study in local populace and also the early studies were performed on retrospective data.

In Pakistani people present research will estimate the possibility of getting tuberculosis in association with different genders. Additional studies on relation of gender and pulmonary tuberculosis are needed in Pakistan.

OPERATIONAL DEFINITIONS:

PTB is common ailment of humans affecting the pulmonary system, and consequences due to a small rod like bacilli known as mycobacterium tuberculosis.

Sputum AFB (acid-fast bacillus)**: A** laboratory analysis performed on a sputum sample of patients suspicious of pulmonary tuberculosis to determine whether subjects had tuberculosis or not or had mycobacterial infection with other category[8].

MATERIAL AND METHODS:

All subjects of either gender with smear positive (AFB positive) pulmonary tuberculosis were included and subjects not willing to participate in study and subjects with respiratory ailments other than tuberculosis were excluded.

Ethical consideration

Study was approved by ethical committee of PMC hospital Nawabshah. Data was collected from the medical department of PMCH after permission from the head of departments. Written informed agreement was obtained from all the adult patients will be obtaining from mature individuals while guaranteeing them that statistics will be retained not to be disclosed. Detailed knowledge about the aims and methods of study were given to all subjects.

Data collection: subjects were categorized for evaluation of age, gender and AFB sputum. Early morning fasting samples were obtained for to analyze the presence of AFB. An interview based questionnaire was used to collect data. Data was collected through interview based questionnaire. Level of confidence 95%, with margin error of 5% were used to calculate the sample size. Sample size was 385 subjects from population of 1.6 millions through the Rao-software with distribution response rate of 50%. Patients were grouped to observe the occurrence of male and female gender and AFB

positivity. Sputum slides were stained with ZN stain and were examined for AFB presence. This research was carried out in the hospital on subjects more of either gender with age of above 20 years and confirmed cases of smear +ve PTB.

Statistical Analysis

All the collected data was analyzed on SPSS (20.0) version. Percentage and frequency were designed for gender, AFB and gender. Mean and SD were drawn for quantitative figures like age. Gender significance was detected in patients of pulmonary tuberculosis in regard to age, smear positive AFB and pulmonary tuberculosis to see the effect on results.

RESULT:

Suspected 1275 subjects of PTB were included in present study. The age of subjects ranged between 20 to 78 years while mean age was 37.16±13.941 years. Table 1

Table 1. Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Age in years	1275	20	78	37.16	13.941
Valid N (listwise)	1275				

The total subjects were divided into sputum AFB positive and sputum AFB negative cases, and then divided into male and female groups to assess the current research goals. Of these, 385 male and female AFB-positive were included here.

Table 2.Demographic statistics

The current study included 911(71.5%) male and 364(28.5%) female subjects. Of all subjects, 805 (63.1%) were from young age group, 352 (27.6%) were from middle age, & 118 (9.3%) were from the elderly group. There were 1181 (92.6%) married and 94(07.4%) unmarried patients. Pulmonary tuberculosis based on sputum AFB was positive in 385 subjects and negative in 890 subjects.

The number of patients from rural areas was 677 (53.1%), while 598 (46.9%) belonged to urban areas, 470 (36.9%) were uneducated, 569 (44.6%) were enrolled in primary to matriculation and 236 (18.5%) were from intermediate to graduated level. The socio-economic category shows a dominant ratio of 1161 (91.0%) in the lower economic category, while 76 (06.0%) and 38 (03.0%) belonged to the middle class and the upper class, respectively. By occupation, 308 (24.2%) claimed no occupation, 327 (25.6%) housewives, 440 (34.5%) manual workers, and the remaining 200 (15.7%) were office workers. In PTB subjects there was positive family history in 126 (9.9%) and negative in 1149 (90.1%).

Table 2. Frequency and % of Demographic variables

		Frequency	Percent	Valid Percent	Cumulative Percent
Age Groups	20-40 Years Young Age	805	63.1	63.1	63.1
	41-60 Years Middle Age	352	27.6	27.6	90.7
	>60 Years Old Age	118	9.3	9.3	100.0
Gender	Male	911	71.5	71.5	71.5
	Female	364	28.5	28.5	100.0
	Negative	890	69.8	69.8	69.8

Pulmonary Tuberculosis	Positive	385	30.2	30.2	100.0
Marital Status	Married	1181	92.6	92.6	92.6
	Unmarried	94	7.4	7.4	100.0
Address	Rural	677	53.1	53.1	53.1
	Urban	598	46.9	46.9	100.0
Education Level	Un-Educated	470	36.9	36.9	36.9
	Primary To Matriculation	569	44.6	44.6	81.5
	Intermediate To Graduate	236	18.5	18.5	100.0
Economical Class	Lower Class	1161	91.1	91.1	91.1
	Middle Class	76	6.0	6.0	97.0
	Upper Class	38	3.0	3.0	100.0
Occupation	No Occupation	308	24.2	24.2	24.2
	House Wife	327	25.6	25.6	49.8
	Manual Worker	440	34.5	34.5	84.3
	Office Worker	200	15.7	15.7	100.0
Family History Of TB	No	1149	90.1	90.1	90.1
	Yes	126	9.9	9.9	100.0

Table 3.Non parametric chi square test and Mote Carlo significance

Nonparametric chi-square test indicates that asymp. Sig was <0.001 in all variables except address sig. 0.027. Monte Carlo sig. was also<0.001 for all variables with the exception of the address 0.031. These results are statistically significant.

Table 3. Test Statistics												
			age in years	Age Groups	gender	pulmonary tuberculosis	marital status	address	education level	economical class	occupation	family History of TB
Chi-Square			1164.640[a]	574.066[b]	234.674[c]	200.020[c]	926.721[c]	4.895[c]	137.605[b]	1913.567[b]	90.939[d]	820.807[c]
Df			50	2	1	1	1	1	2	2	3	1
Asymp. Sig.			.000	.000	.000	.000	.000	.027	.000	.000	.000	.000
Monte Carlo Sig.	Sig.		.000[e]	.000[e]	.000[e]	.000[e]	.000[e]	.031[e]	.000[e]	.000[e]	.000[e]	.000[e]
	95% Confidence Interval	Lower Bound	.000	.000	.000	.000	.000	.021	.000	.000	.000	.000
		Upper Bound	.002	.002	.002	.002	.002	.040	.002	.002	.002	.002

Table 4.Pulmonary TB and Gender

A sum of 1275 suspected cases of pulmonary tuberculosis were included in the study. Of these, 385 sputum AFB-positive were men and women. From total 1275 count of gender including male and females, 890 were negative and 385 were positive. From total count % of negative cases was 69.8% and positive was 30.2%.The total effective rate of PTB patients was negative, 100.0%, and the positive result of PTB patients was 100.0%.

Of the 911 male patients, 656 were negative and 255 were positive, the expected count for negative males was 635.9, and that for positive males was 275.1.Male gender was 72.0% in negative cases and 28.0% in positive cases. The percentage of males with negative PTB was 73.3%, and that of males with positive PTB was 66.2%.The total percentage of negative males was 51.5% and positive was 20.0%.

Of the 364 female patients, 234 were negative and 130 were positive. The expected count for negative women was 254.1 and that for positive women was 106.9. Female gender was 64.3% in negative cases and 35.7% in positive cases. The percentage of females with negative PTB was 26.3%, and that of females with positive PTB was 33.8%. The total percentages of negative females' were 18.4% and positive was 10.2%.

Among the genders, the female% was 64.3% in the negative cases and 35.7% in the positive cases. Female%, PTB negative 26.3%, male positive PTB 33.8%.

The different statistical values like chi-square and symmetric values were assessed for male and females gender. Chi-square, continuity corrections, Likely hood ratio, and Linear by linear association for values were 7.360, 6.998, 7.229 and 7.345, for df of 01, 01, 01 and 01 asymp. sig (2-sided), 0.007, 0.008, 0.007 and 0.007 respectively. Linear by linear association point of probability was .001.

Fisher Exact test was exact sig (2-sided and 1 sided) were .008 and .004 respectively.

Interval by interval pearsons R value, .076 with sig 0.005. Ordinal by ordinal Spearman correlation value was .076, Approx. Sig .007 with sig .005 and are described in Table 4.

Table 4. gender * pulmonary tuberculosis Crosstabulation

			pulmonary tuberculosis		Total
			negative	positive	
gender	male	Count	656	255	911
		Expected Count	635.9	275.1	911.0
		% within gender	72.0%	28.0%	100.0%
		% within pulmonary tuberculosis	73.7%	66.2%	71.5%
		% of Total	51.5%	20.0%	71.5%
	female	Count	234	130	364
		Expected Count	254.1	109.9	364.0
		% within gender	64.3%	35.7%	100.0%
		% within pulmonary tuberculosis	26.3%	33.8%	28.5%
		% of Total	18.4%	10.2%	28.5%
Total		Count	890	385	1275
		Expected Count	890.0	385.0	1275.0
		% within gender	69.8%	30.2%	100.0%
		% within pulmonary tuberculosis	100.0%	100.0%	100.0%
		% of Total	69.8%	30.2%	100.0%

Chi-Square Tests[d]

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	Point Probability
Pearson Chi-Square	7.360[a]	1	.007	.007	.004	
Continuity Correction[b]	6.998	1	.008			
Likelihood Ratio	7.229	1	.007	.008	.004	
Fisher's Exact Test				.008	.004	
Linear-by-Linear Association	7.354[c]	1	.007	.007	.004	.001
N of Valid Cases	1275					

Symmetric Measures

						Monte Carlo Sig.		
							95% Confidence Interval	
		Value	Asymp. Std. Error[a]	Approx. T[b]	Approx. Sig.	Sig.	Lower Bound	Upper Bound
Interval by Interval	Pearson's R	.076	.029	2.719	.007[c]	.005[d]	.001	.010
Ordinal by Ordinal	Spearman Correlation	.076	.029	2.719	.007[c]	.005[d]	.001	.010
N of Valid Cases		1275						

Table 5**. Pulmonary TB and correlation of demographic variables**

There was valid relation of PTB with gender and married category. Gender was statistically notably connected with married category, address & occupation, age groups with marital status, marital status with PTB, age groups, economical class and occupation, address with gender and education level, education level with address, economical class, occupation and family history of PTB, economical class with marital status and education level, occupation with gender, married category and level of education and finally PTB with family history with education level **Table 5.**

Table 5. Correlations

		pulmonary tuberculosis	gender	Age Groups	marital status	address	education level	economical class	occupation	family History of TB
pulmonay tuberculosis	Pearson Correlation	1	.076**	-.025	.069*	-.002	.030	-.033	-.031	.023
	Sig. (2-tailed)		.007	.377	.013	.944	.285	.235	.265	.419
gender	Pearson Correlation	.076**	1	-.037	.134**	.140**	-.013	.050	-.071*	-.017
	Sig. (2-tailed)	.007		.192	.000	.000	.655	.076	.011	.537
Age Groups	Pearson Correlation	-.025	-.037	1	-.075**	-.004	.023	-.041	.018	.039
	Sig. (2-tailed)	.377	.192		.008	.879	.412	.140	.514	.159
marital status	Pearson Correlation	.069*	.134**	-.075**	1	-.037	-.053	.117**	-.136**	-.003
	Sig. (2-tailed)	.013	.000	.008		.191	.058	.000	.000	.917
address	Pearson Correlation	-.002	.140**	-.004	-.037	1	-.120**	.038	-.029	.042
	Sig. (2-tailed)	.944	.000	.879	.191		.000	.180	.309	.137
education level	Pearson Correlation	.030	-.013	.023	-.053	-.120**	1	.099**	.197**	-.069*
	Sig. (2-tailed)	.285	.655	.412	.058	.000		.000	.000	.014
economical class	Pearson Correlation	-.033	.050	-.041	.117**	.038	.099**	1	.035	.013
	Sig. (2-tailed)	.235	.076	.140	.000	.180	.000		.209	.647
occupation	Pearson Correlation	-.031	-.071*	.018	-.136**	-.029	.197**	.035	1	.037
	Sig. (2-tailed)	.265	.011	.514	.000	.309	.000	.209		.185
family History of TB	Pearson Correlation	.023	-.017	.039	-.003	.042	-.069*	.013	.037	1
	Sig. (2-tailed)	.419	.537	.159	.917	.137	.014	.647	.185	

Table 6.Vitamin D and demographic variables (paired statistic and correlations)

Different testing & correlation for paired samples were assessed and statistically established important. Different mean values & SD with standard mean error were analyzed in equivalent to correlation & importance as revealed in p-value which was significant statistically with Pulmonary TB & gender (0.007), age group (0.377), marital status (0.013), addresses (0.944), education levels (0.285), economical classes (0.235) occupation (0.265), & PTB family history (0.419).**Table 6**

Table 6. Paired Samples Statistics&Paired Samples Correlations						
		Mean	Std. Deviation	Std. Error Mean	Correlation	Sig.
Pair 1	pulmonary tuberculosis	1.3020	.45929	.01286	.076	.007
	gender	1.2855	.45182	.01265		
Pair 2	pulmonary tuberculosis	1.3020	.45929	.01286	-.025	.377
	Age Groups	1.4612	.65873	.01845		
Pair 3	pulmonary tuberculosis	1.3020	.45929	.01286	.069	.013
	marital status	1.0737	.26143	.00732		
Pair 4	pulmonary tuberculosis	1.3020	.45929	.01286	-.002	.944
	address	1.4690	.49924	.01398		
Pair 5	pulmonary tuberculosis	1.3020	.45929	.01286	.030	.285
	education level	1.8165	.72142	.02020		
Pair 6	pulmonary tuberculosis	1.3020	.45929	.01286	-.033	.235
	economical class	1.1192	.40588	.01137		
Pair 7	pulmonary tuberculosis	1.3020	.45929	.01286	-.031	.265
	occupation	2.4173	1.02021	.02857		
Pair 8	pulmonary tuberculosis	1.3020	.45929	.01286	.023	.419
	family History of TB	1.0988	.29854	.00836		

Table 7. PTB and different parameters (paired sample tests)

Regarding PTB and other demographic variables in this study, tuberculosis parameters and paired sample tests were performed using mean and standard deviation, up & low levels, 95% confidence intervals as revealed in Table 7, PTB and gender pair was statically insignificant 0.342,while significant p-value was seen for PTB with pair of age group<0.001, marital status <0.001, address<0.001, education level <0.001, economical status<0.001, occupation<0.001, and family history of PTB<0.001. **Table 7**

Table 7. Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
					95% Confidence Interval of the Difference				
		Mean	Std. Deviation	Std. Error Mean	Lower	Upper			
Pair 1	Pulmonary tuberculosis - gender	.01647	.61932	.01734	-.01756	.05050	.950	1274	.342
Pair 2	Pulmonary tuberculosis - Age Groups	-.15922	.81233	.02275	-.20385	-.11458	-6.999	1274	.000
Pair 3	Pulmonary tuberculosis - marital status	.22824	.51247	.01435	.20008	.25639	15.903	1274	.000
Pair 4	Pulmonary tuberculosis - address	-.16706	.67903	.01902	-.20437	-.12975	-8.785	1274	.000
Pair 5	Pulmonary tuberculosis - education level	-.51451	.84352	.02362	-.56085	-.46817	-21.780	1274	.000
Pair 6	Pulmonary tuberculosis - economical class	.18275	.62296	.01745	.14852	.21697	10.475	1274	.000
Pair 7	Pulmonary tuberculosis - occupation	-1.11529	1.13183	.03170	-1.17748	-1.05311	-35.185	1274	.000
Pair 8	Pulmonary tuberculosis - family History of TB	.20314	.54210	.01518	.17335	.23292	13.380	1274	.000

DISCUSSION:

Many important research initiatives on gender bias in tuberculosis are being considered at different levels. The following important aspects are available for debate. The following are the main actions regarding gender bias.

A common question is whether sex steroids have an effect on mycobacterial immunity? The answers to the above questions are explained by the fact that innate immune cells (monocytes, macrophages and dendritic cells) and T cells direct particular receptors for steroid hormones, at least a small part of them [9].

The other question which needs much more advance research that; is tuberculosis related to gender-specific gene structure? Again here the answer of this question was that; nowadays it is recognized broadly that host genetic elements perform a most important part in defining human susceptibility to infection and disease outcomes[10],[11].A number of assessments argued the probability of not being able to notify females owing to larger problems in obtaining approach to health facilities and attaining suitable diagnosis and treatment, especially in rising nations [12]

Tuberculosis (TB) reporting is twofold as much in males as in females in many of republics.

Though at hands strong evidence suggests that socio-economic and traditional issues leading to hurdles in gaining access to health facility could reason for decreased notification in females, especially in rising nations, biological tools might in fact account for a substantial role of this dissimilarity among men and women vulnerability to tuberculosis.

The part of bio-sex had been identified in many infectious and non-communicable diseases. Conversely, there is a lack of facts on the part of biological sex in tuberculosis.

Therefore, a survey must be directed to obviously recognize the effects of sex hormones, gender associated genetic contextual and gene regulation, and metabolic factors on the predisposition alterations among male and female.

Current study not only helps to completely know the apparently influenced sex sharing in tuberculosis patients, but then also helps to better adapt to forthcoming interference policies at the level of public. Current assessment had expanded various issues related to tuberculosis notifications and gender biases [13].

WHO (World Health Organization) noted that the worldwide prevalence of men and women with TB is 01.85 [5]. This sex inequality rises by age and might have an impact on the treatment of tuberculosis [5]. Although the reasons of gender imbalances in the diagnosis of tuberculosis persist uncertain and differ from country to country, many of available researches on the relationship among gender and tuberculosis had not been yet evaluated, diverse imaginable reasons in the identical environment. To the best of our understanding, none of researches had investigated sex alterations in non-sputum subjects (primarily HIV-infected patients) to evaluate the impact of gender on diagnosis of tuberculosis in this populace. In addition, there is no available statistics on the frequency of gender and tuberculosis in south-western Uganda, with high rates of tuberculosis and HIV occurrence [14][15].

We identified the incidence of AFB-positive tuberculosis in men and women at the Nawabshah referral hospital in Pakistan, and we assessed the frequency of associations between male and female-related gender for the diagnosis of tuberculosis.

The occurrence of tuberculosis among men and women varies widely from country to country, and in some areas, women have a higher prevalence. In Pakistan, the large numbers of tuberculosis subjects in all age clusters are women [16].

The observation of this research are in contrast with this statement, because this was overall report at general level but our local demography is quite different from other parts of Pakistan in many respects.

Women of childbearing age have an increased prevalence of tuberculosis than men of the same age as noted in Peru [17]. Whereas in Africa and Eastern Europe it had been noted that a great number of adult subjects with tuberculosis are male [18][19][20].

In current study only adult population was selected the females were of young age mostly.Males were also dominant in present study.

Indeed, the number in Eastern Europe is higher than in African countries, with incidence rates of 66.0% and 88.0% respectively in Uzbekistan and Belarus[21][22].Several causes had been put forward to clarify the gender difference in the tuberculosis epidemic. Many countries had reported a reduced approach of women to health services, so more unreported cases of tuberculosis [19], [14]. [23],
In our culture females are not free to seek medical advice or treatment because of male dependency and dominancy, poverty, lack of education, social, cultural, religious factors, lack of awareness, hard beliefs that tuberculosis is only when there is blood in sputum not before that, these are the common factors responsible for more frequency of tuberculosis in females than males. Less sensitive screening and diagnostic approaches for females may lead to underestimation of tuberculosis in females [19]. Here in our setup females were usually ignored from health point of view due to many factors.

The paucity of bacilli in pulmonary tuberculosis, which is common in raised HIV pervasiveness situations, had led to an increase in the proportion of negative results for microscopy smears. So, any gender differences in HIV incidence situations may be imitated in tuberculosis testing for the reasons that HIV is associated with a reduction in the results of diagnostic tests for tuberculosis, particularly microscopy [24]. Diagnosing tuberculosis by microscopy in most resource-constrained situations may underrate the load of tuberculosis in females who are HIV infected than males, and usually produce lesser quality of sputum specimens [24]. Further justifications were also mentioned, such as the social behavior of men and the dissimilarity of susceptibility of men and women to tuberculosis [25],[26].

Our current status about HIV and PTB is not still up to date due to many reasons but in future there is possibility that every person with tuberculosis must be tested for HIV also.

LIMITATIONS:

There are some limitations in this study.
First of all, it focuses on subjects transferred to local referral hospitals, that can't reveal the similar populace of the locals that had approach health care facility, they may reveal care of those subjects that may had been referred after failure of treatment or diagnosis. In fact, a significant ratio of the inhabitants may not reach district hospital, but sought treatment in other health facilities. As a result, a significant number of females with tuberculosis might be identified in other health facilities. Second, this study did not comprised any facts that assesses the activities of male and female in seeking access to medical facilities, which can explain the dissimilarities that we observed. Although the only single laboratory investigation was focused for diagnosis of PTB in reported cases other investigation were matter of cost effectiveness and availability.

CONCLUSION:

The population is generally significantly resistant to Mycobacterium tuberculosis, while females were likely additional resistant to Bacillus in comparison to males. This research indicates gender differences in tuberculosis cases. Exposure to M. tuberculosis causes tuberculosis, and the incidence of up to 66.2% is noted in males. A field research consortium should be established that includes not only microbiologist, immunologist, and human geneticist, however also epidemiologist and sociologist may be included to reveal many aspects of gender inequality in tuberculosis and to address tuberculosis-related subtle mechanism of natural and gender-related resistance. These efforts will help to design future strategies for contending disease interventions and develop valuable tools for assessing the prediction and safety in forthcoming clinical trials.

Conflict of Interest.

There is no Conflict of Interest by authors regarding paper publishing.

Authors' Contribution

Shamasuddin Shaikh, Hajira/Naila rahu and Anwar Ali Jamali enrolled the subjects, gathered and evaluated data, and composed the paper. Ghulam Mustafa Jamali and Bhojomal Tanwani contributed in introduction and discussion, Aamir Shahzad helped in data interpretations and statistics.

Acknowledgments

The authors would like to thank the professionals at the Jholylal Diagnostic Center for their support in gathering statistics, processing and evaluating laboratory investigations.

The authors are greatly thankful to Dr Bhojomal Tanwani and Mr. Parkash Kumar Tanwani for their kind support for current research. The author also wishes to express his gratitude to the participants for their persistence and collaboration.

Funding

This project is not supported by any government/non-government/institutional organization.

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