Research Article

Survey of socio-demographic prevalence, risk factors and clinical characterization of tuberculosis in Nishtar Hospital Multan

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ABSTRACT

Tuberculosis is a worldwide health problem affecting one third of world's population and Pakistan is no exception. In this study, we used a structured and close-ended questionnaire to collect data about socio-demographic prevalence of tuberculosis, its risk factors, multiple drug resistance tuberculosis and clinical characterization of tuberculosis from Nishtar Hospital Multan, Pakistan. Tuberculosis is an infectious disease, affecting young people and females more commonly in Pakistan. Urbanization, illiteracy, poverty, family history of TB, associated immunosuppressive disorders, smoking and alcohol consumption are major factors of tuberculosis. Multiple drug resistance tuberculosis is also an emerging problem.

INTRODUCTION:

World Health Organization (WHO) reported that one third of the world's population is latently infected with Mycobacterium tuberculosis and three million people die from it yearly (Rafiee *et al*., 2015). In 2012, 8.6 million incident cases of TB were estimated in the world. 1.3 million Persons were killed by tuberculosis in 2012 (Glaziou *et al*., 2015). Formerly, Pakistan was ranked 6th amongst 22 high endemic countries and now for the last few years, it has shifted to 5th position in this group (Awan and Akhtar 2015). Directly Observed Short Strategy (DOTS) was introduced in Pakistan in 1990. Although DOTS coverage for 100% population was achieved in 2005 but majority of our population has not using DOTS centers for treatment (Hameed *et al*., 2015).

Mycobacterium tuberculosis primarily affects lungs and causes pulmonary tuberculosis. The disease can proliferate to other parts of the body and termed as extrapulmonary tuberculosis. Extrapulmonary tuberculosis generally affects the lymph nodes, pleura, bones and joints, the genitourinary system and soft tissues (Musellim *et al.,* 2005). Various exogenous and endogenous risk factors contribute to tuberculosis infection and disease. Young age, indoor air population, contact with tuberculosis patient and various other socioeconomic and behavioral factors has been shown to increase the susceptibility to infection. Human immunodeficiency virus (HIV), malnutrition, diabetes, use of immunosuppressive drugs, smoking and alcohol use impairs the host defense against tuberculosis infection (Narasimhan *et al*., 2013).

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The emergence of drug resistance tuberculosis causes a great threat to Tuberculosis control programs worldwide. Multi-drug resistant tuberculosis (MDR-TB) is caused by organisms resistant to most effective anti-tuberculosis drugs, isoniazid and Rifampin. Extensively drug resistant tuberculosis (XDR-TB) is resistant to isoniazid and Rifampin plus any Flouroquinolones and at least one of three second line injectable drugs (i.e. Amikacin, Kanamycin or Capreomycin) (Chen *et al.,* 2013). According to World Health Organization (WHO), almost 450,000 people developed MDR-TB in 2012 around the world. About 9.6% cases were of XDR-TB. (Organization 2013) Among 27 high burden MDR-TB countries, Pakistan is on eighth number (Ayaz *et al*., 2012).

This prospective study of 3 months ranging from the month of April 2014 to July 2014 was conducted in Nishtar Hospital Multan, Pakistan. The objective of this study was to determine the impact of socio-economic factors on prevalence of tuberculosis, risk factors of tuberculosis, prevalence of type of tuberculosis and MDR-TB and clinical characterization of tuberculosis patients in Southern Punjab of Pakistan.

METHOD:

Population and Setting Area:

The survey was conducted during time period of 15th April to 15th July 2014. Random sample of 300 patients was collected from outpatient door (OPD) of tuberculosis of Nishtar Hospital Multan, Pakistan. Nishtar Hospital is one of the biggest hospitals in South Asia, located in Multan, Pakistan.

Selection Criteria:

Patients who were diagnosed cases of tuberculosis by physicians and taking anti-TB treatment are included in this study. Tuberculosis patients associated with other medical problems are also included. Patients who were unwilling to participate and not meeting the above inclusion

criteria were excluded. Children under 18 years were enrolled into the study after assent from legal guardian.

Ethical Approval and Informed Consent:

Patients who were agreed to participate in the study were explained the aims and objectives lying behind the study and their informed consent were formally obtained. Patients who were underage, informed consent was obtained from their parents/guardians.

Data Collection:

The data was collected by 5 trained pharmacists working in collaboration with prescribers who met with participants when they visited the hospital. The participants were interviewed in their mother languages by trained interviewers.

The Questionnaire:

We used a structured and closed-ended questionnaire for collecting data from the study population. Questionnaire was based on extensive literature review of similar studies. The questionnaire contained a series of questions related to patients' socio cultural status, type of tuberculosis (pulmonary or extrapulmonary), family history of tuberculosis, smoking and alcohol habit, specific symptoms of their tuberculosis disease and presence or absence of MDR-T.B. Questionnaires were filled up for each patient through face to face interviews.

Data Analysis:

The data was summarized using descriptive statistics.

Table 1: Descriptive summary for study participants (N=300)

Variable	Frequency	%age	Variable	Frequency	%age	Variable	Frequency	%age
Age(years)			**Occupation**			**District**		
10-20	75	25	Labor	66	22	Multan	168	56
21-30	63	21	Farmer	21	7	Muzzafargarh	6	2
31-40	39	13	Office work	18	6	Shujahbad	15	5
41-50	42	14	Unemployed	60	20	Khanewal	12	4
50-60	45	14	House wife	81	27	Mianchannu	6	2
61-70	21	7	Student	54	18	Larr	12	4
71-80	6	2				Jalalpur	12	4
80-90	9	3				Others	69	23
Variable	**Frequency**	**%age**	**Variable**	**Frequency**	**%age**	**Variable**	**Frequency**	**%age**
Gender			**Type of TB**			**Education**		
Male	141	47	Pulmonary	252	84	Literate	96	32
Female	159	53	Extra-pulmonary	48	16	Illiterate	204	68
Variable	**Frequency**	**%age**	**Variable**	**Frequency**	**%age**	**Variable**	**Frequency**	**%age**
Family History			**Other Medical Problems**			**Smoking**		
Yes	90	30	Yes	69	23	Yes	60	20
No	210	70	No	231	77	No	240	80
Variable	**Frequency**	**%age**	**Variable**	**Frequency**	**%age**	**Variable**	**Frequency**	**%age**
Alcohol Intake			**MDR-TB**			**Demography**		
Yes	21	7	Yes	114	38	Urban	198	66
No	279	93	No	186	62	Rural	102	34
Variable	**Frequency**	**%age**	**Variable**	**Frequency**	**%age**	**Variable**	**Frequency**	**%age**
Economics			**Symptoms of TB**			**Symptoms of TB**		
Poor	213	71	Cough	240	80	Fever	213	71
Middle Class	72	24	Expectoration	192	62	Fatigue	207	69
Upper Middle Class	15	5	Weight Loss	189	63	Shortness of Breath	174	58
			Anorexia	162	54	Chest pain	189	63
			Hemoptysis	78	26	Night sweats	120	40

RESULTS:

The present data was analyzed for the age wise distribution showed that high number of cases 25% were recorded at age 10 to 20 years, followed by age 21 to 30 years 21%, age 31 to 40 years 39 (13%), 41 to 50 years 42 (14%), age 51 to 60 years 45 (15%), age 61 to 70 years 21 (7%), age 71 to 80 years 6 (2%), and age 81 to 90 years 9 (3%). The results demonstrate that high number of cases 159 (53%) were found in female population of Southern Punjab as compare to male population 141 (47%). In our study, pulmonary tuberculosis was more common as compared to extra pulmonary tuberculosis. 252 (84%) patients were with pulmonary tuberculosis and 48 (16%) patients were with extra pulmonary tuberculosis. Out of 300 patients, only 96 (32%) patients were educated and 204 (68%) patients were illiterate. Socioeconomic class for the majority of patients was described as "Poor". 213 (71%) patients were poor, 72 (24%) patients were from middle class and only 15 (5%) were from upper middle class family.

Out of 300 patients, 66 (22%) patients were labors, 21 (7%) patients were farmers, 18 (6%) were office workers, 60 (20%) were unemployed

and 81 (27%) were house wives. 54 (18%) students were also suffering with tuberculosis. Mostly patients were from Multan city but some patients also came from adjacent areas of Multan. 168 (56%) patients were from Multan, 6 (2%) patients were from Muzzafargarh, 15 (5%) patients were from Shujahbad, 12 (4%) patients from Khanewal, 6 (2%) from Mianchannu, 12 (4%) from Larr, 12 (4%) from Jalalpur, and 69 (23%) patients were from other cities of Punjab. In case of demography, mostly tuberculosis patients were found in urban areas of Punjab. Out of total 300 patients, 198 (66%) were from urban areas and 102 (34%) were from rural areas of Southern Punjab. Out of all 300 tuberculosis cases, 90 (30%) had a known history of tuberculosis exposure. 69 (23%) patients were carrying other medical disorders like diabetes mellitus, hepatitis, HIV etc along with tuberculosis. Out of total 300 study participants, 60 (20%) were smokers and 21 (7%) were alcohol consumers. 114 (38%) patients were of multidrug resistance cases of tuberculosis.

Clinical symptoms:

Table 1 also shows the percentages of patients with each symptom. The most common presenting symptoms were cough (80%), expectoration (64%), weight loss (63%), fever (71%) and fatigue (69%). Other presenting complaints were shortness of breath (58%), anorexia (54%), hemoptysis (26%), chest pain (63%) and night sweats (40%).

DISCUSSION:

Mycobacterium tuberculosis attacks productive age groups more commonly as compared to elderly. These age groups are economically productive individuals thus tuberculosis has potential to impede the development of society. The present study demonstrates 69% patients are <40 years old. This result correlates with other studies done in Pakistan and some other countries. (Ahmad, 2013; Rajeswari *et al*., 1999; Yu *et al*.,

2006; Forssbohm *et al*., 2008; Ahmad *et al*., 2014; Hameed *et al*., 2015).

In other countries, tuberculosis is more among male population as compared to female population (Cailhol *et al*., 2005; Rhines, 2013). Although reasons are not clearly known but in Pakistan women are more vulnerable to tuberculosis as compared to men (Ahmad, 2013; Chandir *et al*., 2010 ; Ayaz *et al*., 2012; Dogar *et al*., 2012; Ahmad *et al*., 2014; Hameed *et al*., 2015; Shah *et al*., 2015). However we postulate that this is because of less exposure to sunlight because of housebound culture and poorer nutritional status of Pakistani women. There is strong association between occurrence of tuberculosis and vitamin D deficiency. Vitamin D metabolism causes activation of macrophages and prohibits the intracellular growth of Mycobacterium tuberculosis. It is evident that Pakistani women have low levels of serum 25-hydroxyvitamin D (Chandir *et al., 2010* ; Davies, 1985; Wilkinson *et al*., 2000; Nursyam *et al*., 2006; Wejse *et al.,* 2009; Junaid *et al*., 2013).

Proportion of extrapulmonary among all tuberculosis cases varies from country to country. In 2007, World Health Organization estimated that about 15% of newly reported cases were of extrapulmonary (Chandir *et al*., 2010). Poverty, illiteracy, family history of tuberculosis, co-occurrence of other medical disorders, smoking and alcohol consumption all are risk factors contributing in the enhancement of the disease.

Tuberculosis is mostly termed as the disease of poverty. In Pakistan, mycobacterium tuberculosis mostly attacks poor people because of malnutrition, reduced treatment uptake and crowded living conditions. Although poor people are more susceptible to get tuberculosis due to poor housing and environmental conditions but they will plunge deeper into poverty as a result of tuberculosis because tuberculosis effects productive age groups (Sánchez-Pérez *et al*., 2001; Holtgrave and Crosby, 2004; Shetty *et al*.,

2006; Kaulagekar and Radkar, 2007; Bhunu and Mushayabasa, 2012; Oxlade and Murray, 2012; Low *et al*., 2013). Our study detected a correlation between illiteracy and tuberculosis. Illiterate people are less likely to report it so they are at higher risk to develop tuberculosis. Our study correlates with Kaulagekar et al which shows that prevalence of tuberculosis is more among illiterate population (Shetty *et al*., 2006; Kaulagekar and Radkar, 2007). High population density, crowded living and working conditions as well as lifestyle changes due to globalization in urban areas have made urban areas more favorable for tuberculosis prevalence (Lönnroth *et al*., 2009).

Family history of tuberculosis also played an important role in transmission of tuberculosis. It is evident from the previous literature that persons who have more contact with tuberculosis patients are at a high risk of developing this infection. Because Mycobacterium tuberculosis stays suspended in the air as droplets. Healthy people become infected with tuberculosis through inhalation of the droplets containing tuberculosis bacilli (Yu *et al*., 1988; Morrison *et al*., 2008; Augustynowicz-Kopeć *et al*., 2012).

Presence of other medical problems also increases the risk of tuberculosis. Human immunodeficiency virus (HIV), diabetes mellitus and other diseases which suppress the immune system are categorized in endogenous risk factors of tuberculosis (Narasimhan *et al*., 2013). It is reported in WHO 2013 that about one-third people living with HIV are infected with mycobacterium tuberculosis. People who are latently infected with TB bacteria and HIV are at 30 times more risk to develop active tuberculosis disease than people without HIV (Organization 2013). Similarly diabetes impairs the innate and adaptive immune responses and diabetic patients are at three folds increased risk of developing tuberculosis (Narasimhan *et al*., 2013).

Smoking and alcohol consumption are also risk factors of tuberculosis. There is ample literature on the fact that higher incidence rates of tuberculosis is among smokers than non-smokers (Yu *et al*., 1988; Pednekar and Gupta, 2007; Lin *et al*., 2008; Bonacci *et al.,* 2013; Chen *et al.,* 2014). Smoking not only deceases the immunity but also affects anti-TB treatment. Although smokers have more innate immune cells and lymphocytes in their lungs but still they are more vulnerable to tuberculosis because functions of these cells are altered in the presence of cigarette smoke (Chan *et al*., 2014). Chiang *et al* study shows the effect of smoking on tuberculosis treatment. Their study proposed that smoking may reduce the respiratory function, immunity and affect the metabolism of anti-TB agents (Chiang *et al*., 2012). Alcohol use is associated with increased rates of tuberculosis. Patients who consume alcohol have low resistance to tuberculosis because alcohol exerts immunosuppressive effects. Alcohol damages protective anatomical barrier of lungs, interferes with expression of growth factors and impairs the action of cytokines. Concomitant nutritional defects also exacerbates these immune defects (Kaulagekar and Radkar, 2007; Fiske *et al*., 2008).

Multiple drug resistance has been seen more frequently in previously treated patients of tuberculosis (Chen *et al*., 2013). In our study, we also found some MDR-TB cases. In one of the previous study, it has shown that MDR-TB is more common in males. These patients were also suffering overcrowded living conditions, illiteracy, and poor socioeconomic status and smoking habits (Khurram *et al*., 2011).

CONCLUSION:

TB is more common in poor, illiterate and places which are overcrowded. Tuberculosis is disease which spreads with the close contact with the effected people. Age and gender both are traditionally known variables acting in favor of

adult males making females more prone due to lack of treatment. Improving economy and reducing poverty are rather long term goals, it may take several years to bring down level of poverty and increase in standard of living or making better housing. However, by improving the health care system and by improving the knowledge of the community about the disease, tuberculosis occurrence rate can be reduced. Reducing smoking and alcohol use can substantially lower prediction of tuberculosis burden. Educational programs and seminars on TB occurrence and risk factors can be helpful to improve knowledge of the community. Similarly, we can avoid MDR-TB by improving patient compliance.

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