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An Investigation into Implications of Tuberculosis Control Efforts in Pakistan: A Comparative Approach

Farhan Muhammad Qureshi, Samira Faiz, Ayesha Khalid

ABSTRACT

Objective: To investigate the difference of Tuberculosis (TB) related information in diagnosed TB patients and healthy individuals in relation to the implications of National Tuberculosis Program (NTP) control efforts.

Study Design and Setting: This comparative case-control study was conducted from May to December 2022 in public sector tertiary care setups of Karachi.

Methodology: In this case control study, 100 hospitalized diagnosed patients of TB were compared with 155 healthy individuals from May to December 2022. We analyzed sociodemographic characteristics of both groups related to the information for transmission and prevention of TB, as a basic element for the disease control.

Result: TB patients were more likely to be uneducated, have low household income and positive family history of TB as compared to non-TB (OR 0.52, 0.30, 0.40). 18% of TB patients believed that TB infected person cannot be a source of spread to cause TB disease (OR=4.7; P=0.006). There was a statistically significant association among both the groups deemed to malnutrition and multiple households as the risk factors of tuberculosis (P=0.002 and <0.001 respectively

Conclusion: TB related information with respect to its cause, preventive and treatment was insufficient in both study groups leading to delay in TB treatment and increase mortality from the disease. Health education interventional strategies, focused on primitive and advanced TB related information are needed in general population with special attention on low socioeconomic groups of community, and the population living in isolated and remote areas.

Key words: Perceptions, TB control, patients, treatment, Tuberculosis

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INTRODUCTION:

Tuberculosis remains a global health challenge especially in developing part of the world, despite its incidence decreased worldwide. In Pakistan, the National Tuberculosis Control Program (NTP) has been working under the Ministry of Health since 2001 and is now operating parallel with the National Institute of Health (NIH) of Pakistan. NTP aims to reduce tuberculosis (TB) prevalence up to 50% and succeeding to attain no TB deaths by 2025 through appropriate TB care.[1] To develop a strategic program, NTP has been working on a multi-sectoral approach through engaging public and private sector, in collaboration with community-based organizations and the civil society for early detection and control of tuberculosis.[2,3]

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Despite the continuous efforts, Pakistan still endeavors and struggling towards a TB free country.[1,2] Presently, Pakistan shares sixty one percent of TB burden in the Eastern Mediterranean Region and ranks fifth in worldwide prevalence of TB with more than five hundred thousand new cases of tuberculosis every year.[3] Besides, the worldwide prevalence reached to fourth highest place for the cases of multidrug-resistance TB (MDR-TB).[2]

Literature revealed that early diagnosis and adherence to prompt treatment of tuberculosis patients reduces the transmission of disease and thus a practiced strategy to reduce the occurrence of TB.[4,5] It is evident that reduction in an incidence of TB can happen when patient's knowledge is increased regarding the consequences, communicability and non-adherence to the treatment regime of the disease.[6]

Suboptimal TB care due to poor health-seeking behaviors among Pakistani population is manifested by several factors comprising at both societal and individual levels.[7] Despite the provision of free of cost TB treatment facilities in Pakistan, patients especially belong to low socio-economic

group seek advice and get treatment from private doctors and hospitals because of lack of awareness about free government-based TB care centers in the country.[8] Consequently, these patients faced a huge financial loss ultimately leading to non-adherence or even, discontinuation of treatment.[8] Also, substance abuse was another reason of treatment default as around 36% of the TB patients discontinued the treatment due to injectable drug usage.[9]

Similarly, isolation of TB patients by their family produces untoward outcome. Awareness and behaviors of the family members of TB patients regarding patient handling techniques and being on a high risk of TB, simultaneously taking care of themselves, was associated with close contacts TB patients.[3,10] Therefore, in-time identification and adequate treatment of TB and MDR-TB cases is imperial to cut the chain of transmission of this disease but, education plays a major role to reduce the risk of developing TB.[3,7,11] However, responsibility for the provision of delivery of TB related education for an underprivileged people is still questionable. Various studies have been published regarding the evaluation of the National TB Control Program in Pakistan examining the implementation of universal DOTS coverage, the laboratory system, operational drug management systems, involvement of the public and private sector.[6] There is lack of evidence deemed to the "communication strategies" apprehended by NTP for the disease control. The main aim of this study was to investigate the difference of information regarding TB disease among healthy and TB diagnosed patients to find out the implications of the NTP in the realm of "communication strategies" which is the backbone to this program.

METHODOLOGY

This comparative case-control study was conducted from May to December 2022 in public sector tertiary care setups of Karachi. Two groups (n=255) were divided based on the history of TB; 155 with no history of TB ever and 100 individuals with history of Pulmonary TB through consecutive sampling method. Participants with history of TB were diagnosed patients of active pulmonary TB admitted in tertiary care hospitals for anti-tuberculosis therapy. Comparative group were defined as people not having tuberculosis on self-report and were attendants of indoor and outdoor patients matched on the bases of age and gender. Age group for both groups was above 18 years.

A structured and pretested questionnaire was developed to observe the perception of participants deemed to the causative and risk factors and the treatment outcome of pulmonary tuberculosis. At first, participants were explained about the purpose, data collection procedure, interview duration and possible risks and benefits of the study verbally. Those who volunteered to participate were asked to sign/give thumb impression on a written informed consent. Afterwards, participants were interviewed for basic demographic traits and the study questionnaire.

Data was compiled and analyzed through SPSS Version 23 while MS Excel was used for graphical presentation of the data. Continuous data was explained as mean ± standard deviation while categorical data was analyzed as frequencies, percentages and p-value for significance. To understand the association regarding perception of tuberculosis among cases and controls, binary logistic regression analysis was performed expressed in odds ratio at 95% confidence intervals for all the variables.

Ethical Consideration: Ethical consideration (ERC-KIMS/006/22) was obtained from the Ethical Review Committee (ERC) of Karachi Institute of Medical Sciences, Karachi.

RESULTS:

Among the 255 total participants of both comparison groups, there was no significant difference among regarding age (categorical) and gender (P= 0.119 and 0.716 respectively). However, TB patients were more likely to be uneducated, have low household income and positive family history of TB as compared to their healthy counterparts (OR 0.52, 0.30, 0.40) (Table 1).

The logistic regression model in Table 2 describes the participants' perception regarding the causative and risk factors of TB. The Nagelkerke R^2 Model accounted for 37% of the total variance. About 71% was the correct prediction rate.

93.5% of non-TB group and 82% of TB patients believed that TB infected person can be a source of spread and cause TB disease (OR=4.7; P=0.006). Similarly, results generated had a statistically significant association among both the groups deemed to malnutrition and multiple households as the risk factors of tuberculosis (P=0.002 and <0.001 respectively). 72% TB patients had the concept that malnutrition is a risk factor of TB as compared to 31% non-TB group (OR=0.30). However, only 2% TB patients took multiple households as a risk factor in comparison to the no-TB group (35%) [OR=20.52]

In case of spread through air, smoking, substance abuse, indoor air pollution and overcrowding at work place, the results were not statistically significant. Nevertheless, non-TB group were 49% more likely to believe that "TB can spread through air" than TB patients (non-TB group=17.4%; TB patients=10%). Similarly, the odds were higher in non-TB group to take substance abuse as a risk factor of TB (OR=1.25). Taking diabetes as a risk factor of TB, the healthy group was 41% more likely to answer positively than TB patients (OR=1.41) however, the difference was not statistically significant (P=0.260). When both TB patients and non-TB were asked "Is TB curable?" results generated were statistically significant (P=<0.0001). 78% cases said that TB was curable that was more than the positive responses

by the controls (58%). However, about the question "is TB preventable?" the results remained consistent between the groups (OR=1.00). Regarding the cost of TB treatment only 5% cases claimed that the treatment was costly in comparison to the healthy participants that is 17%. (P=0.003). However, only 11% of each of the TB and non-TB groups knew that the government provide free of cost TB treatment (Table 3). In case of symptoms of pulmonary tuberculosis most of the participants among both the groups the most frequent answer was cough and weight loss followed by night sweats, fever and breathlessness.

Figure 1 presents the information gathered from both the groups, the source of knowledge regarding TB stood statistically significant (P = <0.001). About half of the participants from TB patients got the information from other TB patients (51%) while main source among non-TB group was media followed by friends and relative. Information given by health care workers was only 7% among TB patients and in 3.9% in non-TB group. 49% of healthy respondents had no definite knowledge about Tuberculosis.

DISCUSSION:

Virtually all nations across the globe have a National Tuberculosis Program that takes a prime responsibility to control TB. Though information related to TB transmission and its prevention is a basic element for the disease control, it is not clear that how much Pakistani population have correct information about TB.Prior studies have been conducted published regarding the evaluation of the National TB Control Program in Pakistan analyzing different parameters.[12-14] This Case Control study aimed to find out the gap in information regarding tuberculosis infection despite the implications of National TB control efforts in Pakistan. 100 TB cases and 155 non-TB healthy participants were interviewed to observe the difference of information regarding tuberculosis infection. Non-TB group were matched in terms of age and gender however, most of the TB Group patients had low monthly household income and were uneducated as compared to the non-TB group. Monthly household income and educational status worked as a proxy for the socio-demographic status as poverty deprives people from the basic social determinants of health like nutrition, housing, education and so on.[15] It is an established fact now that tuberculosis and poverty are mutually related[15-17] and our results came out to be parallel to this fact. Moreover, 38% of cases and 20% controls had a positive family history of tuberculosis. Shamu et al. in 2019 reported that participants having a TB patient in the family had better understanding of TB infection and treatment.[18] To some extent our findings were analogous as more than half participants from the TB group reported that their source of information are TB patients.

Significant number in non-TB group knew that TB infected person can spread the disease than the cases, however, very few believed that TB can spread through air. The difference was insignificant among both groups. On the contrary, a recent study done in Khyber Pakhtunkhwa (KPK)-Pakistan, widely held responses were in affirmation that TB is spread through "the air," followed by "coughing or sneezing by TB patients".[6] This revealed the fact that our study population had inadequate knowledge regarding the mode of transmission of pulmonary TB. Myths and falls believe raised as a result of such inadequate information often cradle complications in fighting TB stigma.[19] Moreover, having a contagious ailment, TB patients suffer social isolation at the time when they need more care and support of their family.[20]

Pakistan, being a developing nation, is fighting against malnutrition which is a complex, multisectoral issue and has a bidirectional relationship with tuberculosis.[21,22] Khalid et al. reported that TB patients in Pakistan were twice as likely to be malnourished than the healthy group.[23] TB group patients of the current study belonged to low socio-economic

Table 1: Descriptive of the participants (N=255)

Variables		Non-TB Group? (n, %) (n = 155)	TB Group (n, %) (n = 100)	AORΦ	95% C.I. for AOR		P- Value
					Lower	Upper	
Age in Years	> 30	21 (13.5)	15 (15.0)	0.534	0.242	1.176	0.119
	< 30	134 (86.5)	85 (85.0)				
Gender	Male	79 (51.0)	49 (49.0)	1.110	0.633	1.947	0.716
	Female	76 (49.0)	51 (51.0)				
Education	No education	36 (23.2)	37 (37.0)	0.520	0.281	0.947	0.038
	Educated*	119 (76.8)	63 (63.0)				
Household Income	<30,000	104 (67.1)	86 (86.0)	0.301	0.149	0.608	0.001
	>30,000	51 (32.9)	14 (14.0)				
Family history of TB	Yes	31 (20.0)	38 (38.0)	0.402	0.223	0.725	0.002
	No	124 (80.0)	62 (62.0)				

*Taken as the reference category; ΦAdjusted Odds Ratio; *Any level of formal education*
Mean SD controls = 41.58 11.44 years, Mean SD Cases 43.61 13.45 years (P = 0.198

Table 2: Perception about TB disease

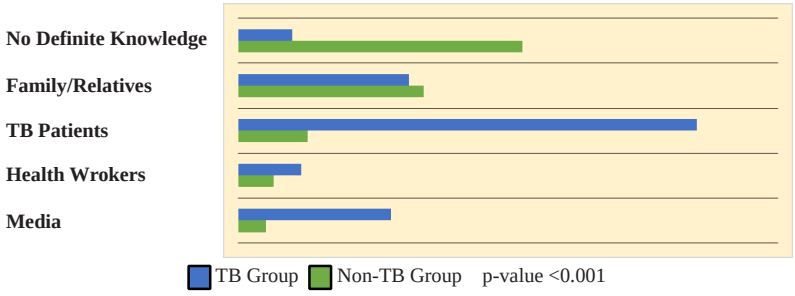
Variables	Non-TB Group? (n, %) (n = 155)	TB Group (n, %) (n = 100)	AORΦ	95% C.I. for EXP (B) Lower	Upper	P- Value
Do you think TB is caused by an Infective Person?						
Yes	145 (93.5)	82 (82.0)	4.776	1.575	14.428	0.006
No	10 (6.5)	18 (18.0)				
Do you think TB can spread through air?						
Yes	27 (17.4)	10 (10.0)	1.498	0.550	4.082	0.429
No	128 (82.6)	90 (90.0)				
Is malnourishment a risk factor of TB?						
Yes	48 (31.0)	72 (72.0)	0.301	0.140	0.646	0.002
No	107 (69.0)	28 (28.0)				
Do you think cigarette smoking is a risk factor?						
Yes	29 (18.7)	16 (16.0)	0.776	0.326	1.846	0.566
No	126 (81.3)	84 (84.0)				
Is substance abuse a risk factor of TB?						
Yes	9 (5.8)	7 (7.0)	1.256	0.322	4.899	0.742
No	146 (94.2)	93 (93.0)				
Do you think indoor air pollution is a risk factor of TB?						
Yes	28 (18.1)	20 (20.0)	0.750	0.335	1.677	0.483
No	127 (81.9)	80 (80.0)				
Do you think overcrowding is a risk factor of TB?						
Yes	55 (35.5)	32 (32.0)	0.805	0.412	1.575	0.527
No	100 (64.5)	68 (68.0)				
Do you think multiple households is a risk factor of TB?						

Taken as reference category; ?Adjusted Odds Ratio

Table 3: Perception about TB treatment

Variables		Non-TB Group? (n, %)	TB Group (n, %)	P- Value
Is TB curable?	Yes	90 (58.1)	78 (78.0)	<0.001
	No	65 (41.9)	22 (22.0)	
Is TB preventable?	Yes	26 (16.8)	16 (16.0)	1.00
	No	129 (83.2)	84 (84.0)	
Does TB infection need a prolong treatment?	Yes	82 (52.9)	55 (55.0)	0.797
	No	73 (47.1)	45 (45.0)	
Is TB treatment costly?	Yes	27 (17.4)	5 (5.0)	0.003
	No	128 (82.6)	95 (95.0)	
Do you know about government based free of cost TB centers?	Yes	17 (11.0)	11 (11.0)	1.00
	No	138 (89.0)	89 (89.0)	

Figure 1: Source of knowledge about TB Disease N=255



status and therefore might be malnourished as well as, we did not evaluate the physical status of the participants. This may explain our result that TB patients were more aware than the healthy respondents that malnutrition is a risk factor of TB.

Whether substance abuse and cigarette smoking are risk factors of pulmonary tuberculosis-the results produced were analogous. Very few of the respondents agreed - explaining the lack of information among both the groups. Wang et al. identified smoking as an important risk factor to develop pulmonary TB.[24] A meta-analysis also concluded that cigarette smoking had a detrimental effect on TB eradication efforts.[25] It has also been reported earlier that injectable drug use, alcohol addiction and cigarette smoking lead to missed doses and treatment default.[9]

Social determinants of tuberculosis like increasing age, poverty, cigarette smoking and crowded houses are major contributing factors to TB infection. [24] When this study participants were asked whether multiple house hold is risk factor of TB, there was huge information deficit among the cohorts. Only 35% among the non-TB group were aware while 98% of cases did not see multiple households as a risk factor of TB. Moreover, respondents were uncertain regarding the effects of diabetes on TB occurrence and treatment nonetheless, diabetes had been reported to be highly associated with tuberculosis previously.[23]

On the one hand, pulmonary tuberculosis was recognized as a curable disease by majority of cases which was significantly different from non-TB group of this study. On the other hand, results showed that about 31% from non-TB group and 6% from TB group had poor knowledge regarding this aliment and not having any definite knowledge about TB prevention. On the contrary, 96% participants of a recent study in Khyber Pakhtunkhwa believed that TB is curable. This study also reported various responses regarding prevention from Pulmonary Tuberculosis and that only 14% had no or very little knowledge of TB.[6] Similarly, vast majority among both of our study groups did not know about government based free TB treatment centers. They relied on tertiary care public hospitals and therefore did not take the treatment costly. This may not only elevate hospital workload but also the risk of disease infectivity. TB treatment drugs do not impose any fiscal burden on patients however, losing job due to TB though being the only breadwinner of the house are the factors that leads to treatment default.[8]

TB centers are not supposed to provide diagnostic and treatment services only but, they are bound to deliver appropriate information to TB cases about the disease infectivity, progression and outcome. They have to keep the patient motivated for treatment continuation as well.[1,2] Unfortunately, more than half among TB group gained knowledge from other TB patients rather than the health care providers followed by friends/family and then media. On the other hand, 36% from non-TB group reported media was the main source of information, however, 31% among 36% from non-TB group while the 31% had no certain TB related knowledge and information. This explains the poor and inadequate understanding of the disease.

"Advocacy, Communication and Social Mobilization to fight TB (ACSM)" is a framework that focuses on the key barriers deemed to TB care and treatment completion. This framework raised the number of sputum examination and early detection of TB in India.[16] NTP has been working in collaboration with the community-based organizations and the civil society for which a strong group effort is needed in the domain of communication network. Evidence suggest that progress has been made deemed to the Stop TB Strategy Program in Pakistan on national and provincial level.[11] However, study findings revealed the gap in communication strategies and there is a need to do a lot in the realm of communication through which health care providers might play an imperial role to defeat the deeply rooted false believes, enhance public awareness regarding TB infectivity, associated risk factors, occurrence and treatment outcome, availability of TB centers, hazards of non-adherence and treatment default and so on. Simultaneously, NTP shall utilize all forms media for general and proper information as advocacy and communication have all the potentials to close the gap in this disease cascade. Moreover, TB related stigma in community can also be reduced, since patients of TB are usually unseen as deviating from any social norms that may single them out for stigmatization.

The limitations of study has the potential of selection bias as both TB and non-TB groups were recruited exclusively from the hospital. Diversity among interviewers for different participants of both groups might have influenced the interviewer's questioning consistency. Also, truthfulness of the participants' responses remains difficult due to recall bias, especially for the perceptions related questions. However, these issues were considered to our best by increasing the number of participants of non-TB (control) group to increase the statistical power of the study. Besides, strict supervision of the data collection process, extensive training of the data collectors was done and instructed them not to ask leading questions.

CONCLUSION:

The overall elementary information of TB remained low and appeared to significantly vary by socio-demographic status among both groups. It has been observed that health care workers had least role in providing general information especially to TB patients.

Authors Contribution:
Farhan Muhammad Qureshi: Conceived, designed and responsible for integrity and accuracy of the work. Did data collection and editing and final approval of the manuscript
Samira Faiz: Conceived, designed and responsible for integrity and accuracy of the work. Did data collection and editing and final approval of the manuscript
Ayesha Khalid: Manuscript writing, data collection, statistical analysis and interpretation of data

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