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Factors Driving the Knowledge of Tuberculosis in Pakistani Men: Evidence from a Nationally Representative Survey

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ABSTRACT

Introduction: Tuberculosis (TB) continues to be a significant infectious disease worldwide. The prevalence of TB in Pakistan remains high. A thorough assessment of the population's knowledge about the disease could aid in reducing its transmission. Our objective was to identify demographic and socioeconomic variables that may impact the understanding of TB among Pakistani men (n=3691) and to analyze its influence. **Methods:** We utilized secondary data from the Pakistan Demographic and Health Survey (DHS), collected between November 2017 and April 2018. We examined participants' knowledge about tuberculosis (TB) through various questions about its characteristics, transmission, curability, and duration. Other factors such as residence, education, internet access, and media preferences were also assessed. A knowledge index ranging from 0 to 9 was developed for each participant in which correct responses were scored as "1," while incorrect ones were scored as "0". The data were analyzed using both one-way ANOVA and Mann-Whitney U tests. **Results:** Most participants were aged 15 to 34 (48.2%) and had completed secondary school (35.8%). 94.3% of participants reported being aware of TB, with higher education showing the highest level of awareness (98.7%). Greater knowledge of TB was associated with reading newspapers or magazines once a week or less (mean score 7.22 ± 1.14, CI: 7.15-7.29, and 7.31 ± 1.11, CI: 7.23-7.40, respectively), watching television once a week or less (mean score 7.22 ± 1.13, CI: 7.00-7.25, and 7.15 ± 1.06, CI: 7.05-7.23, respectively), owning a mobile phone (mean score 7.15 ± 1.1, CI: 7.08-7.19), and having a bank account (mean score 7.33 ± 1.14, CI: 7.28-7.39) (all P<0.01). **Conclusion:** There was a significant association between a higher level of TB knowledge and higher educational status, access to print media or television, mobile phone ownership, and having a bank account. Despite the high knowledge among participants, several practical implications should be addressed to combat the disease effectively. These practical implications include a high prevalence of TB, limited access to healthcare, socioeconomic factors, and the emergence of drug-resistant TB strains. In the context of future research on the same topic, we suggest conducting comparative studies among different nations to discern the variances in TB knowledge across the globe.

INTRODUCTION

Tuberculosis (TB) is a debilitating disease that can cause severe health, social, and economic consequences. According to estimates from the World Health Organization in 2020, TB affected approximately 10 million people globally, with 56% of cases occurring in men, making it the second most deadly infectious disease worldwide [1]]. Eight developing countries, including Pakistan, account for approximately two-thirds of TB cases [1]]. However, many low-income countries lack sufficient data on TB prevalence and knowledge about preventive measures.

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A thorough review of relevant studies shows that the Pakistani population's knowledge regarding TB seems relatively low [2, 3]. There appears to be a misconception, particularly concerning the mode of transmission of tuberculosis [4]. Our study aims to bridge this gap by tailoring our questions on the different aspects of TB, such as its symptoms, transmission mode, and treatment modalities.

A study conducted from 2010 to 2011 among the adult population in Pakistan found that the smear-positive TB prevalence-to-notification ratio was 3.1, with a higher ratio observed among men than women [5]. This indicates a potential underestimation of the actual number of cases. TB cases were 1.8 times more prevalent in men than in women, according to the same study [5].

Although TB is a treatable condition, several barriers can reduce treatment efficacy and adherence, including limited access to health services in developing countries and treatment costs and duration [6-9]. Recent data from a study conducted in four South African countries suggest that stigmatization, as a social factor, could negatively affect TB control and treatment [10]. This is partly because infected individuals choose to isolate themselves instead of seeking medical attention. Therefore, a thorough understanding and awareness of TB is crucial to improving treatment-seeking behavior and adherence and controlling the spread of the disease within the community [10].

Moreover, various misconceptions regarding TB, including the exact transmission modes, presenting symptoms, prognosis, and the misconception that it only affects the lungs, can significantly impact the spread of TB and the motivation to seek treatment [11, 12]. Various factors and determinants, including age, sex, socioeconomic status, literacy, and mass media access, likely influence knowledge & perception of TB [13, 14]. Therefore, it is essential to comprehensively examine these factors in the context of understanding and awareness of TB. Nevertheless, most relevant surveys have limited sample sizes or are restricted to specific geographical regions [4, 13, 15, 16].

This study aimed to identify demographic and socioeconomic variables and assess their impact on TB knowledge among male respondents in Pakistan. We hypothesize that the demographic and socioeconomic characteristics of the respondents significantly influence the understanding of TB.

This study intends to identify gaps and misconceptions regarding TB characteristics, transmission, symptoms, curability, and duration by comprehensively reviewing the existing body of knowledge. The conclusions of this study are crucial, as they can potentially direct the establishment of focused awareness campaigns and early detection programs while also attempting to lessen the stigma around the disease.

MATERIAL AND METHODS

Study design. This cross-sectional study utilized secondary data from the 2017-18 Pakistan Demographic and Health Survey (DHS) [17]. The DHS Program collects data on various public health aspects of demographic and socioeconomic factors in the general population, with a particular emphasis on health-related variables. Relevant variables for this study were selected from the data and grouped for analysis. This study received approval from the Institutional Review Board of the University of Sharjah (IRB No. 1450-22-13), which was conducted following the principles of the Declaration of Helsinki [18].

Study setting. The study is based on data collected from various geographic locations within Pakistan between November 22, 2017, and April 30, 2018.

Study participants and data collection. The study included 3,691 Pakistani men aged 15 to 49 (mean age = 35 ± 7.8 years). The study utilized the DHS household questionnaire to collect data and identify eligible household members from whom various information was gathered. The data was thoroughly cleaned before it was received and analyzed. The household questionnaire for men encompassed topics such as demographics, reproduction, contraception, employment status, gender roles, and several health matters.

Multiple questions relevant to this study were posed to evaluate TB knowledge. Participants were first asked about their familiarity with TB, followed by questions about its characteristics. Respondents were required to identify possible modes of transmission, state their beliefs regarding the curability of TB, and determine the duration of the disease in months. The participants were asked whether they had ever been diagnosed with TB. In addition to these variables, other factors were measured, including type of residence, educational level, internet access, mobile phone ownership, possession of a bank account, and preferred modes of mass media consumption, if applicable.

Statistical analysis. Microsoft Excel (2016 version) was used to organize and categorize the TB knowledge questions and the corresponding responses. Scores of "1" were assigned to correct responses, while "0" was given to incorrect answers. Participants were given a knowledge index ranging from 0 to 9 based on the number of questions they answered correctly. The knowledge index represents the overall knowledge of the participant regarding TB. The data were exported to SPSS for statistical analysis of descriptive statistics. One-way ANOVA was used to determine the effect of print media, television, radio, and the internet on TB knowledge. In contrast, the Mann-Whitney U test was used for dichotomous questions. Participants were asked dichotomous questions about ownership of mobile/telephone, ownership of bank account, use of mobile/telephone for financial transactions, and

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rural/urban status. The response options were "Yes" or "No" except for the type of residence where the response options were "Rural" or "Urban". P< 0.05 was taken into consideration for statistical significance.

RESULTS

Table 1 summarizes the socio-demographic characteristics of the study population. Nearly half (48.2%) of the respondents aged 15 to 34. A higher percentage of respondents in the rural area had formal education compared to the urban area. In contrast, a considerably large proportion of respondents in the urban area had completed higher education degrees. While the overall employment status showed minimal variation, a higher proportion of respondents in rural areas were engaged in agricultural occupations. In contrast, more people were employed in the clerical, sales, and technical sectors in urban areas. There was a distinct disparity in wealth distribution, with a higher concentration of wealthier individuals residing in urban areas than rural areas.

Next, we assessed participants' awareness and knowledge of TB, including various aspects such as symptoms, transmission, and treatment. In total, 94.3% of participants demonstrated a general understanding of TB. Participants with higher education showed a higher awareness of TB than other education levels (Table 2). Compared to men with lower levels of education, those with higher education correctly identified the mode of transmission as predominantly airborne (70.4% *vs.* 43.3%, respectively) (Table 2). However, the belief that sharing cutlery and food could transmit the disease was similar among men with low and high education levels, with 46.4% and 39.7% of respondents, respectively (Table 2). A small percentage of men correctly identified touch, sexual contact, and mosquito bites as modes of transmission. However, no significant differences were observed in these identifications across different educational backgrounds (Table 2).

Among respondents, the belief that TB is a treatable disease was held by most of those with higher education (97.4%) and secondary education (93.6%). However, a significant proportion of respondents with primary education (87.7%) and no education (80%) also believed in the curability of TB (Table 2).

Among the participants, approximately 11% believed that TB could be treated within 1-3 months, while a more significant proportion, 34%, believed it required a treatment duration of 4-6 months. Only 25% of participants correctly identified the recommended course of TB therapy as being seven or more months. However, most participants (75%) either provided incorrect responses or required clarification regarding the duration of the TB treatment. The study found that approximately 4% of the participants had been diagnosed with active TB (Table 2).

Overall, all participants reported having access to some form of media as a source of information. Among the age groups surveyed, those aged 30-44 years had the highest proportion of individuals with access to media (56.3%), followed by the 15-30 age group (27.5%) and those aged 45 and older (16.2%).

The frequency of media usage was similar among all age groups surveyed. Among the various forms of media, access to a mobile phone (including both mobile and landline telephones) was the most common, with 93.2% of participants indicating they had access to one (Table 3). Of the surveyed participants, 56.1% reported watching television for news or entertainment purposes, while 29% reported using newspapers weekly for news consumption. Additionally, 31.4% of the participants reported internet usage in the past 12 months. In contrast, radio usage was the least prevalent across all age groups, as only 9.83% of participants reported using it (Table 3).

Statistically significant differences were observed in the knowledge indices of participants based on their preferred form of mass media (Figure 1). Participants who reported reading newspapers or magazines at least once a week exhibited significantly higher knowledge indices than non-readers (7.22 ± 1.14, CI: 7.15-7.29, *vs.* 7 ± 1.03, CI: 6.96-7.05, respectively, $P<0.0001$). Similarly, participants who reported reading newspapers or magazines less than once a week exhibited a significantly higher TB knowledge index (7.31 ± 1.11, CI: 7.23-7.40) compared to non-readers ($P<0.0001$) (Figure 1A).

In general, participants who watched television either weekly or less frequently had a higher knowledge index (7.22 ± 1.13, CI: 7.00-7.25 and 7.15 ± 1.06, CI: 7.05-7.23, respectively) than those who never watched television (6.86 ± 0.96, CI: 6.77-6.92, $P<0.0001$) (Figure 1B).

Among the 3,691 respondents, mobile phone ownership or telephone (mean score 7.15 ± 1.1, CI: 7.08-7.19, $P<0.0001$) did not affect the knowledge index (Fig. 1C).

Similarly, possessing a bank account or other financial account (mean score 7.33 ± 1.14, CI: 7.28-7.39, $P<0.0001$) was not associated with differences in the knowledge index (Figure 1D).

In contrast, no statistically significant difference was observed in respondents' knowledge of using radio, the internet, mobile phones, or telephones in financial transactions or the type of residence (Figures 1 E-H).

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Table 1. Comparison of socio-demographic characteristics between study participants in rural and urban areas of Pakistan. Percentages are shown in parentheses (n = 3691, indicating the total number of participants).

Characteristic	Rural, n (%)	Urban, n (%)	Total, n (%)
Age (years)			
15-34	912 (50.5)	867 (46.0)	1779 (48.2)
35-44	612 (33.9)	704 (37.4)	1316 (35.7)
≥45	283 (15.7)	313 (16.6)	596 (16.1)
Educational level			
No Education	567 (19.4)	302 (34.8)	869 (23.5)
Primary	351 (33.2)	277 (44.1)	628 (17.0)
Secondary	600 (16.0)	723 (54.6)	1323 (35.8)
Higher	289 (31.4)	582 (66.8)	871 (23.6)
Number of wives/partners			
1	1742 (96.4)	1825 (51.2)	3567 (96.6)
2 or more	33 (1.8)	28 (1.5)	5 (1.7)
No wives/partners	32 (1.8)	31 (1.6)	63 (1.7)
Occupation			
Employed	1691 (93.6)	1805 (95.8)	3496 (94.7)
Agriculture	481 (28.4)	88 (4.9)	569 (16.3)
Clerical/sales/technical	425 (25.1)	846 (46.9)	1271 (36.4)
Skilled manual	271 (16.0)	464 (25.7)	735 (21.0)
Unskilled manual	416 (24.6)	270 (15.0)	686 (19.6)
Services	92 (5.4)	134 (7.4)	226 (6.5)
Others	6 (0.4)	3 (0.2)	9 (0.3)
Unemployed	116 (6.4)	79 (4.2)	195 (5.3)
Wealth quintile			
Richest	137 (7.6)	648 (34.4)	785 (21.3)
Richer	208 (11.5)	517 (27.4)	725 (19.6)
Middle	339 (18.8)	369 (19.6)	708 (19.2)
Poorer	532 (29.4)	269 (14.3)	801 (21.7)
Poorest	591 (32.7)	81 (4.3)	672 (18.2)
Total	1807 (49.0)	1884 (51.0)	3691

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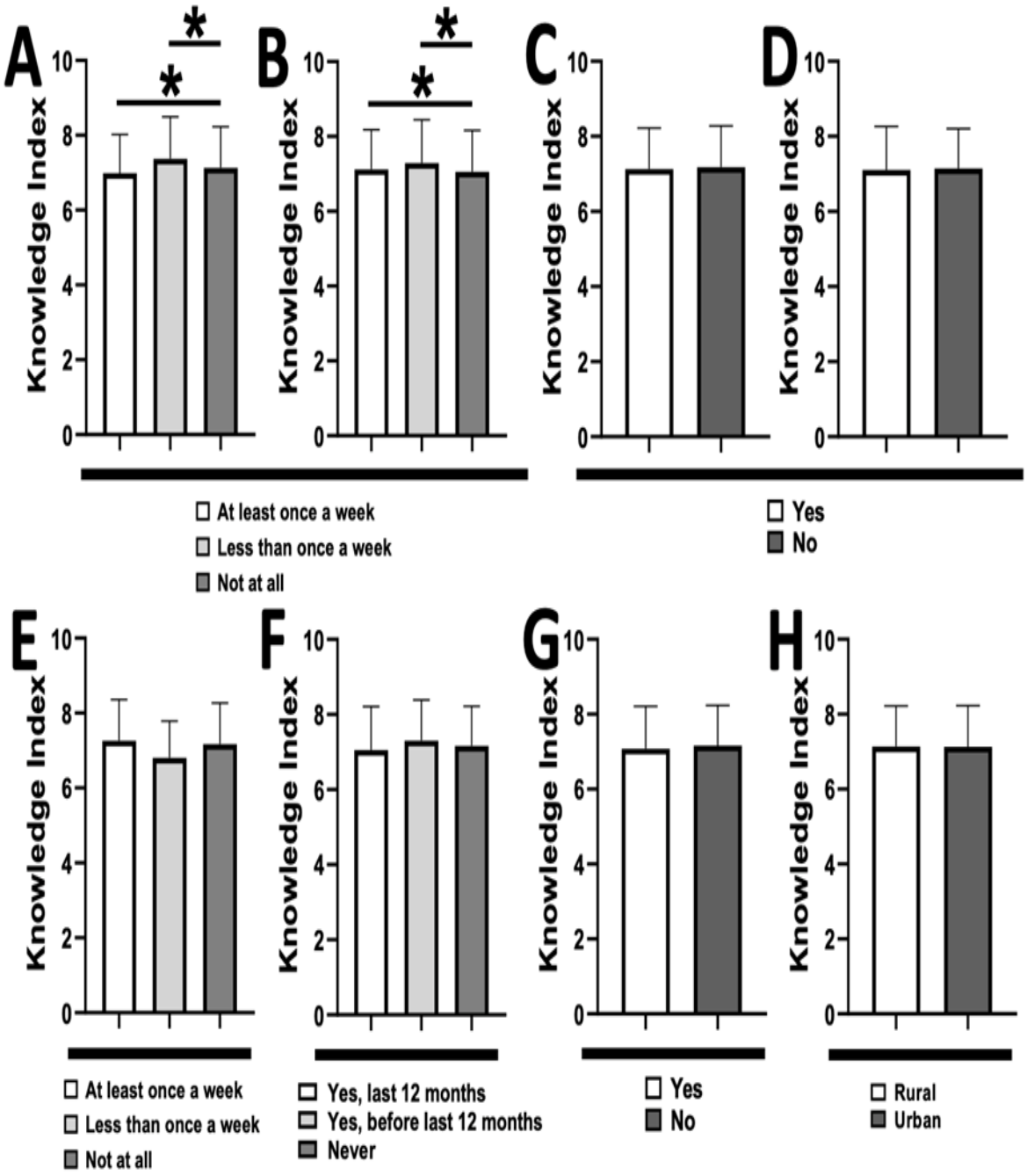


Fig. 1. TB knowledge indices of participants categorized based on various factors, including exposure to different media forms such as newspapers/magazines (A), television (B), radio (E), and the internet (F); ownership of a mobile/telephone (C) and bank account (D); use of mobile/telephone for financial transactions (G); and rural/urban residence (H). Data analysis was performed using a one-way analysis of variance; *$P < 0.05$.

DISCUSSION

This study assessed the knowledge of male TB patients in Pakistan and examined the impact of socio-demographic factors on their understanding of TB. We identified demographic, socioeconomic, and educational factors that affected the level of TB knowledge among men in Pakistan. Higher formal education, regular newspaper reading, watching educational programs on television, utilizing mobile phones to access health-related information, and having access to healthcare services through a bank account were critical factors associated with higher TB knowledge. Residing in urban

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areas with higher healthcare infrastructure and working in healthcare-related administrative roles were associated with a higher awareness of TB symptoms and improved knowledge of TB prevention.

Table 2. Analysis of TB knowledge among study participants, categorized by different education levels. Percentages are shown in parentheses (n = 3691, indicating the total number of participants).

Questions		No education n= 868 (%)	Primary education n= 628 (%)	Secondary education n= 1322 (%)	Higher education n= 870 (%)
Have you heard of TB? *		769 (88.6%)	586 (93.3%)	1277 (96.6%)	859 (98.7%)
Mode of Transmission*					
	Air through cough/sneeze	282 (32.5%)	260 (41.4%)	741 (56%)	613 (70.4%)
	Sharing utensils	320 (37%)	256 (40.7%)	530 (39.3%)	421 (48.4%)
	Touch	95 (11%)	80 (12.7%)	170 (13%)	124 (14.2%)
	Food	355 (41%)	243 (38.7%)	550 (41.6%)	387 (44.5%)
	Sexual Contact	126 (14.5%)	79 (12.5%)	207 (15.6%)	150 (17.2%)
	Mosquito Bites	14 (1.6%)	6 (1%)	9 (~ 1%)	11 (1%)
	Others	13 (1.5%)	14 (2%)	25 (2%)	19 (2.2%)
	Don't know	171 (19.7%)	127 (20.2%)	197 (15%)	68 (8%)
Do you think TB can be cured?					
	Yes	693 (80%)	551 (87.7%)	1238 (93.6%)	848 (97.4%)
	No	17 (2%)	10 (1.6%)	4 (0.3%)	3 (0.4%)
	Don't know	59 (7%)	25 (4%)	35 (3%)	8 (1%)
Length of Disease					
	1-3 months	75 (8.6%)	60 (9.5%)	172 (13%)	105 (12%)
	4-6 months	225 (26%)	202 (32.2%)	480 (36%)	355 (41%)
	7 months or above	183 (21%)	165 (26.2%)	338 (25.6%)	239 (27.4%)
	Don't know	203 (23.4%)	118 (19%)	231 (17.4%)	139 (16%)
Have you ever been told you have TB? *		27 (3%)	30 (4.7%)	50 (3.7%)	40 (4.6%)

*** Only "Yes" responses are tabulated**

A strong positive correlation was found, indicating that a higher level of formal education was associated with more excellent knowledge of specific aspects of TB, such as knowledge of the symptoms of TB. The results showed that respondents with higher levels of education showed significantly higher knowledge levels. Previous studies conducted in Nigeria [19] and Bangladesh [13] reported that individuals with higher levels of schooling exhibited greater awareness of TB symptoms and improved understanding of TB prevention and treatment. These findings suggest that education significantly improves knowledge of specific aspects of TB, such as symptoms and transmission. Furthermore, it emphasizes the critical role of education in promoting informed health decisions.

Increased access to various mass media channels, such as newspapers, television, and mobile phones, was significantly associated with greater awareness of TB symptoms and improved understanding of TB prevention

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and treatment. Newspapers, television programs, and health-related mobile applications are crucial in raising awareness about common infectious diseases like TB. Previous studies conducted in Nepal [20] and Gambia [21] reported that individuals with access to mass media demonstrated greater awareness of specific aspects of TB, such as symptoms and prevention. Participants without access to mass media showed comparatively lower levels of TB knowledge. Participants with access to newspapers, television, and mobile devices exhibited significantly higher knowledge of TB than those without access to these media sources. However, TB knowledge did not show a significant relationship with the use of the internet and radio.

Table 3. Types of media sources accessed by study participants for information on TB (n = 3691, indicating the total number of participants).

Source/Age	15-29 years n = 1014 (%)	30-44 years n = 2081 (%)	≥45 years n = 596 (%)
Use of newspaper/ magazine			
More than once a week	0	2 (0.1%)	0
At least once a week	227 (22.4%)	651 (31.3%)	191 (32.1%)
Less than once a week	198 (19.5%)	401 (19.3%)	101 (16.9%)
Not at all	589 (58.1%)	1027 (49.3%)	304 (51.0%)
Use of radio			
More than once a week	0	0	0
At least once a week	103 (10.2%)	205 (9.90%)	55 (9.20%)
Less than once a week	153 (15.1%)	265 (12.7%)	59 (9.90%)
Not at all	758 (74.8%)	1611 (77.4%)	482 (80.9%)
Use of television			
More than once a week	0	1 (0.05%)	0
At least once a week	530 (52.3%)	1200 (57.7%)	340 (57.0%)
Less than once a week	169 (16.6%)	358 (17.2%)	103 (17.3%)
Not at all	315 (31.1%)	522 (25.1%)	153 (25.7%)
Mobile/telephone Owners			
Yes	942 (92.9%)	1954 (93.9%)	543 (91.1%)
No	72 (7.10%)	127 (6.10%)	53 (8.90%)
Use of Internet			
In the last 12 months	356 (35.1%)	660 (31.7%)	142 (23.8%)
Before the last 12 months	16 (1.6%)	50 (2.40%)	6 (1.00%)
Never	642 (63.3%)	1371 (65.9%)	448 (75.2%)

We assessed participants' understanding of TB-related domains, including transmission modes, common symptoms, and treatment options. A substantial proportion of participants (51.4% or 1896) recognized that pulmonary TB could spread through coughing or sneezing (Table 2). Moreover, we observed a significant association between education level and correct recognition of coughing and sneezing as modes of TB transmission. Higher education levels were associated with a higher likelihood of correctly identifying these transmission routes. However, some respondents incorrectly associated touching, sharing utensils, eating, and sexual contact with TB transmission. These findings suggest a need for improved health awareness and

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education programs to address misconceptions about TB transmission [22].

The utilization of an internationally standardized survey is a notable strength of this study, which has not been previously used in evaluating TB knowledge, attitudes, and related factors among Pakistani men. We observed significant findings in our analysis of a large sample. These findings have important implications for increasing public awareness of TB, particularly among communities at high risk and promoting a positive attitude towards TB prevention and treatment. Our results have important implications in shaping public health policies and initiatives.

However, this study has limitations, as it did not include women and elderly individuals. The exclusion of women and elderly individuals was due to the study's specific focus on men within the patriarchal context of Pakistan, where gender roles and societal dynamics influenced the study design. Our study achieved a sample size of 3691 and assessed the literacy status of men, contributing to the reliability of our data. Including literacy status is particularly relevant in understanding their decision-making power within the study context. Future research will focus on conducting a separate study on women and children. The generalizability of our findings may be limited due to specific factors not investigated in our study. For instance, we did not explore factors such as knowledge of healthcare accessibility, which could potentially influence individuals' knowledge and attitudes towards TB.

In the context of future research on the same topic, we suggest conducting comparative studies among different nations to discern the variances in TB knowledge across the globe. Along with this, studies can be performed to explore the social and psychological impact of TB-related stigma, the effectiveness of community-driven education, and its influence on the knowledge of the population.

This study reveals a notable level of TB knowledge among men in Pakistan. Several factors, including education level, media exposure (television and newspapers), residential area, and bank account ownership, were positively associated with higher levels of TB knowledge. To increase public awareness of TB among high-risk communities, specific techniques should be implemented to enhance knowledge about the modes of transmission, duration of treatment, and available treatment options for TB. Although participants demonstrated a high level of knowledge regarding TB, several practical implications, such as TB education campaigns, inclusion of TB education into the school curricula, and increased accessibility to information on the disease, to name a few, must be addressed for an effective response against the disease. These factors include high disease prevalence, limited healthcare access, socioeconomic factors, and drug-resistant TB variants. Targeted interventions are needed to increase awareness of TB and effectively reduce the disease burden. Interventions such as information, education, and communication (IEC) campaigns, community-based programs, mobile clinics, active case-finding strategies, and strengthening healthcare infrastructure can effectively address TB. Effective control of TB necessitates enhanced access to high-quality healthcare services, such as timely diagnosis, comprehensive treatment options, and follow-up care. Pakistan faces several healthcare challenges, including limited resources and funding, shortages of specific healthcare professionals, challenges related to particular aspects of care (e.g., infrastructure, technology), low health literacy levels, and limited awareness among the population, which affect its ability to provide quality care to the people.

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CONFLICT OF INTEREST

The authors declare that there are no conflicts of interest associated with this manuscript.

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