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A cross-sectional study about knowledge and attitudes toward multidrug-resistant and extensively drug-resistant tuberculosis in a high-burden drug-resistant country

Hasnain Javed^{a,b,*}, Zarfshan Tahir^b, Hafiza Jawairia Hashmi^a, Nazia Jamil^a

^a Department of Microbiology and Molecular Genetics, University of the Punjab, Lahore, Pakistan

^b Punjab Provincial TB Reference Lab, Institute of Public Health, Lahore, Pakistan

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ABSTRACT

Objective/Background: Tuberculosis (TB) is a leading cause of death worldwide, with new threats of multidrug-resistant (MDR) and extensively drug-resistant (XDR) TB. Pakistan is the fifth highest among high-burden TB countries and the fourth highest among high-burden drug-resistant-TB countries. Pakistan is the sixth most populous country in the world, and Pakistani youth is the highest population group in Pakistan and second in the world. This study was aimed at assessing the understanding, awareness, and mindset of university students toward TB, MDR TB, and XDR TB in Lahore.

Methods: A cross-sectional questionnaire-based study was performed on 1137 individuals from three major public-sector universities in Lahore, Pakistan. Information regarding their knowledge and attitude toward MDR and XDR TB was gathered using a structured questionnaire. Data collected was analyzed using SPSS version 20.

Results: Male (531) and female (606) students were asked about different aspects of MDR and XDR TB. Although 80.47% students had good knowledge about simple TB, a very small fraction had awareness and appropriate knowledge about MDR/XDR-TB. Considering TB as a stigma, only 9.3% students disclosed that they had household TB contact. Only 25% students knew about XDR TB.

Conclusion: Our results indicated that a small fraction of people knew the exact definition and treatment duration of MDR TB and XDR TB in our society. There is a need to increase the awareness and knowledge status of university students about MDR and XDR TB.

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Introduction

Tuberculosis (TB) is an infectious disease and one of the deadliest contagious diseases worldwide, reaching the status of

epidemic in several countries with high-burden TB. In 2014, 9.6 million people acquired TB infection leading to 1.5 million deaths [1]. Of the total TB cases and deaths, 5.4 million people were men, 3.2 million women, and 1.0 million patients were

* Corresponding author at: Department of Microbiology and Molecular Genetics, Quaid-e-Azam Campus, University of the Punjab, Lahore 54590, Pakistan.

E-mail address: hasnain_javed@hotmail.com (H. Javed).

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children [2]. According to the World Health Organization, Asia and Africa account for the highest burdens of TB in the world [1,3]. Every year, there are reports of approximately 9 million new TB cases, with the highest number of TB cases reported in Southeast Asia [1]. Pakistan is fifth among 22 high-burden TB countries and fourth among 27 high-burden multidrug-resistant (MDR) TB countries [4].

Regardless of the extensive availability of TB therapies, there is only 1.5% decline in incidences of TB per annum [5,6], and each year, 37% of new cases of TB remain undiagnosed [6,7]. Poor community knowledge, incomplete courses of anti-TB therapy [8], reduced involvement of government and community organizations [1], customary values, lack of availability of adequate health services [9], socio-economic factors, carelessness about personal health status, inadequate knowledge, and misconceptions regarding the disease [10] are some of the factors that hinder early TB diagnosis and treatment. Fear of being stigmatized is another decisive factor in delayed TB diagnosis and treatment [11].

The rapid increase in the incidence of MDR and extensively drug-resistant (XDR) TB complicate the issue. MDR includes resistance to two of the most potent first-line drugs (rifampicin and isoniazid) [12], while XDR TB is defined as MDR TB strains resistant to isoniazid, rifampicin, any fluoroquinolone, and at least one of the three second-line injectable drugs, such as kanamycin, amikacin, and capreomycin [13]. Knowledge about the timely and accurate diagnosis of drug-resistant TB is of supreme importance for suitable interven-

tion to halt disease progression. It also facilitates arrest of the transmission of MDR and XDR TB strains [14].

Due to lack of knowledge, patients generally leave treatment before completing the therapeutic regimen. The aftermath of incomplete regimens can be adverse, as they can develop MDR TB [15]. For this reason, proper knowledge about the disease is crucial to decreasing TB cases among the general population [16]. Lack of adequate knowledge about the cause, spread, and treatment of the disease leads to increased apprehension of stigmatization, and patients become averse to securing proper treatment. This social trepidation augments the spread of disease [17]. Pakistan has the second highest population of youth in the world. As of 2012, the literacy rate of Pakistan's youth was 56% [18], while the literacy rate of Pakistani youth (aged 15–24 years) is 77% for males and 53% for females [19]. In view of the high population of youth and the fourth highest incidence of drug-resistant TB, the current study was conducted with the primary aim of assessing TB knowledge among the youth of Lahore and to determine the level of understanding, awareness, and the mindset of university students toward TB, MDR TB, and XDR-TB.

Materials and methods

Study design

A cross-sectional questionnaire-based study was conducted among different individuals currently enrolled in three major



Fig. 1 – Geographical location of Lahore, Pakistan.

Name: _____ Age: _____ Sex: _____
 Department name: _____ Class: _____

- Do you know the common sign and symptoms of Tuberculosis (TB) disease?
 a) Yes b) NO
- Do you know what the route of transmission of TB is?
 a) Air borne transmission (from coughing and sneezing)
 b) Blood borne transmission
 c) Sexual transmission
- Which Organ is affected most by TB?
 a) Heart b) Lungs
 c) Bones d) Kidney
- Do you know the treatment duration of TB?
 a) 3 months b) 6 months
 c) 12 months d) 15 months
- Do you know that TB is completely curable?
 a) Yes b) NO
- In which Age group TB is more common in Pakistan?
 a) 10-20 years b) 20-30 years c) 30-40 years
 d) 40-50 years e) 50-60 years
- Do you have/had any TB Patient in your home?
 a) Yes b) NO
- Do you have/had any TB patient in your relatives or neighbors?
 a) Yes b) NO
- DO you know (Multi Drug Resistant) MDR TB?
 a) Yes b) NO
- DO you have knowledge about treatment duration of MDR TB?
 a) 4 months b) 8 months c) 12 months
 d) 18 months e) 24 Months
- Do you know XDR TB (Extremely Drug Resistant TB)?
 a) Yes b) NO
- Do you think that XDR TB is non-curable?
 a) Yes b) NO
- Do you know that National TB Control Program (NTP) is providing free of cost medicines to TB patients?
 a) Yes b) NO
- Do you know that TB organism MTB can be detected via PCR machine (GeneXpert) which detects within 2 to 3 hours?
 a) Yes b) NO
- Do you know that which sample is used for diagnosis of Tuberculosis?
 a) Blood b) Sputum
 c) Urine d) CSF

Fig. 2 – Structured questionnaire used in the study. CSF = cerebrospinal fluid; PCR = polymerase chain reaction.

public-sector universities in Lahore, Pakistan (Fig. 1). The estimated sample size was approximately 1000 individuals. Information was gathered using structured or closed-ended questionnaires. Students were asked to answer the different questions regarding different types of TB, its treatment duration, household contacts, and knowledge about the latest rapid diagnostic assays. All the participants involved were >18 years of age and had completed at least 12 years of their education. All participants had heard about TB through different sources. This study was conducted with the consent and approval of the Punjab provincial TB Control Program.

Data analysis

A questionnaire based on previously conducted surveys related to TB was prepared (Fig. 2). Questions regarding the basic demographics (sex and age), curability, treatment duration, MDR TB, and the TB control program provisions for free anti-TB drugs and free diagnostic tests were asked. The questionnaire was based on yes/no and multiple-choice questions.

The data collected was analyzed statistically using SPSS version 20 (IBM Corp., Armonk, NY, USA) [20]. Data was categorized into different groups, such as male/female, biological/non-biological students, and among the biological students, data was categorized as microbiological/non-microbiological students. Statistical differences between the different groups were analyzed by *p* value. A *p* value <0.05 was considered significant. The qualitative data was presented as proportions and percentages where appropriate.

Results

Demographics

A total of 1137 students were randomly selected to evaluate their knowledge of TB, with a mean age of 20.95 ± 2.95. Male students (531) had a mean age of 21.39 ± 2.69, while that of female students (606) was 20.56 ± 3.11. Among the 1137 students, 696 (61.21%) were students of the biological sciences and, of these, 204 (29.31%) were studying microbiology as a

major subject. The remaining 441 (38.79%) students were in fields of study other than the biological sciences (computer science, economics, business; Fig. 3).

Basic TB knowledge

Most students (80.47%) said that they knew about the common signs and symptoms of the disease, while 19.53% said that they did not know about common TB signs and symptoms. Students (84.43%) knew that the route of transmission of the disease is airborne or aerosol, and 5.54% and 8.70% believed that the route of transmission was sexual contact or through blood contact, respectively. Students (94.46%) said that the organs mostly affected during TB are the lungs, while 2.64% said the major organ affected was the kidney, 0.53% said it was the heart, and 1.58% said it was the bones. Interviewees (57.26%) knew that samples collected for the diagnosis of MDR TB consisted of the sputum, while 28.23% believed that blood samples were used, 5.54% believed that it was cerebrospinal fluid, 0.79% believed diagnosis was made through urine samples, and 1.06% said they did not know which sample was collected for diagnosis. Students (75.73%) knew that TB is completely curable, while 24.27% still assumed that TB was a non-curable disease.

Among those students that said that they had knowledge about the common signs and symptoms of TB, 26.65% did not know which sample is usually taken for diagnosis. Similarly, 7.91% knew the signs and symptoms of the disease, but not the route of transmission, and only 1.58% knew the signs and symptoms, but not the major organ affected.

The average score was better in students older than 24, but statistical significance in the differences was not found in any age group (Fig. 4). There was no difference in the average

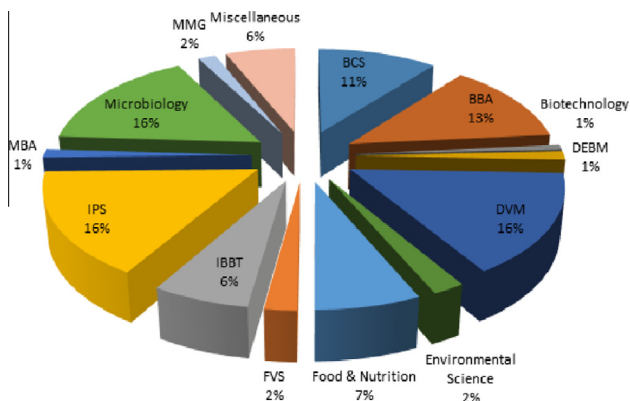


Fig. 3 – Pie graph showing percentages of students participated in this study from different fields.

BBA = Bachelors of Business Administration; BCS = Bachelors in Computer Science; DEBM = Department of Economics & Business Management; DVM = Doctor of Veterinary Medicine; FVS = Faculty of Veterinary Sciences; IBBT = Institute of Biochemistry and Biotechnology; IPS = Institute of Pharmaceutical Sciences; MBA = Masters of Business Administration; MBF = Master of Business Management; MMG = Department of Microbiology & Molecular Genetics.

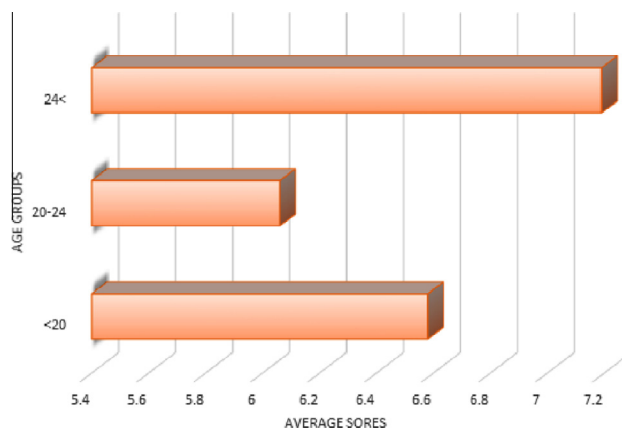


Fig. 4 – Average score of students with respect to different age groups. The data shows that knowledge is greater in participants greater than 24 years old.

knowledge between female and male respondents, but a significant statistical difference was observed between the biological and non-biological students. Although the biological students had increased knowledge of TB as compared to non-biological students, significant difference was discovered between different groups of biological students (Table 1).

Treatment duration

A small number of students (20.54%) knew about the exact treatment duration for TB, with 8.70% thinking that treatment duration was 3 months, 10.03% for 15 months, and 2.64% saying they did not know. The majority of the students thought that treatment was for 9 months (see Table 2).

Common age

Only 17.94% knew that TB is common in Pakistan in middle-aged people (30–40 years), 37.20% believed that TB was more common in older age groups (40–55 years), 16.36% believed that it is more common in those 50–60 years of age, and 20.05% thought it more common in those aged 20–30 years. A small percentage of students (4.22%) considered TB common in age groups of 10–20 years, while 4.22% of students did not know the common age group in Pakistan.

TB patients nearby

Students (9.5%) had TB patients in their home, and 27.18% had TB patients as relatives or neighbors. Many students did not intend to answer this question.

Knowledge about multidrug-resistant TB

Only 36.41% of the university students knew about MDR TB, with 63.59% students not knowing the term MDR TB. Among the 1137 students, only 93 (8.18%) students knew that the treatment duration for MDR TB is 24 months, while others considered it to be the same as normal TB. Students (11.08%) believed that the treatment duration for MDR TB was 18 months, 29.82% believed it was 12 months, 34.83%

Table 1 – Comparison of knowledge scores based on percentage of students belonging to different fields.

Patient characteristics	Knowledge score						p
	Percentage of patients (%)	Below average score (%)	Average score (%)	Above average score (%)	Mean score	SD	
Sex							
Male	46.70	29.38	49.15	21.47	6.54	2.42	0.7187
Female	53.30	31.19	44.55	24.26	6.63	2.43	
Study field							
Biological sciences	61.21	16.81	52.16	31.03	7.40	2.04	<0.0001
Other fields	38.79	51.70	38.10	10.20	5.25	2.50	
Subject field in biological sciences							
Microbiology	71.61	16.41	55.22	28.36	7.48	2.22	0.6588
Other biological sciences	28.39	17.75	50.89	31.36	7.35	1.98	

believed it was 8 months, 8.97% believed it was 4 months, and 7.12% did not know the treatment duration.

Only 0.79% of students knew the exact duration of MD, as well as non-MDR TB. Students (49.34%) had knowledge of the treatment duration of non-MDR TB, but not MDR TB. Students (7.39%) knew the treatment duration of MDR TB, but not of non-MDR TB, while 42.48% of students did not know the treatment duration of either non-MDR TB or MDR TB.

Extensively drug-resistant TB

Students (25.33%) were aware of XDR TB, while 74.67% of students had never heard of it. Among the 25.35% of students who had knowledge of MDR TB, only 27.97% supposed that XDR TB was not curable, while 72.03% felt that it was curable.

There were 219 students (19.26%) that knew about MDR TB, but not XDR TB, while 31 (2.7%) knew about XDR TB, but not about MDR TB.

Knowledge about TB-control programs

A good fraction of students (52.51%) knew that TB-control programs in Pakistan provided free medicine to cure TB, while 47.49% did not know.

Knowledge about molecular diagnostic assays for TB

Students (67.28%) had knowledge about molecular diagnosis of MDR TB via polymerase chain reaction, while 32.72% did not know about molecular detection. Among the 67.3%, only

Table 2 – Percentage of correct answers to different knowledge-based questions among different age groups.

Knowledge items	Percentage of participants answered correctly (%)		
	<20	20–24 years	>24 years
Basic knowledge about TB			
Signs & symptoms	78.79	81.63	80.60
Air transmission	86.06	88.44	74.63
Lungs mostly affected	93.94	96.60	88.06
Curable disease	73.33	76.87	79.10
Sputum sample	47.88	74.83	41.79
Treatment duration			
12-month regimen	18.18	23.81	20.90
Common in which age in Pakistan			
20–30 years	15.76	18.37	22.39
MDR TB			
What is MDR TB?	22.42	49.66	41.79
Treatment duration	8.48	8.16	7.46
XDR TB			
What is XDR?	17.57	31.29	29.85
	76.36	72.11	65.67
National TB programme			
Provision of free of cost anti-tuberculosis drugs	48.48	58.50	49.25
Molecular diagnosis			
Gene Xpert	46.67	58.50	62.69

MDR = multidrug resistant; TB = tuberculosis; XDR = extensively drug resistant.

37% knew about Gene Xpert. The majority of students who knew about molecular assays were those who had a TB patient in their homes or as relatives.

Discussion

Mycobacterium tuberculosis is becoming a more deadly pathogen day by day with the introduction of drug resistance in its genome, commonly known as MDR TB and XDR TB, which are classes as risk groups 3 and 4, respectively. Knowledge about its transmission and geographical prevalence is very important, especially among the most productive age groups in society [21,22]. Awareness about MDR and XDR TB, its basic definition, diagnostic tests, treatment duration, and possible outcomes are very important in high-burden countries, given that risk of exposure to drug-resistant bacilli is at a maximum [23,24]. University students are the main avenue for creating awareness, so their level of knowledge should be higher than others. Our findings showed that only 36.4% of participants had good knowledge of MDR TB, which agreed with results reported by Patle and Khakse [23] that medical internees had an overall knowledge of 45%. Knowledge and attitudes about MDR and XDR TB was mostly assessed in health care workers [24,25] or among TB patients [26], but little assessment has been done among general populations or any specific groups.

Knowledge about treatment duration is also very important, as it increases early intervention to stop the spread of disease. Kansal et al. [27] reported that only 20% of health care workers, especially nurses, have knowledge about category 4 treatment, which is MDR TB treatment [27]. This differed from our results, where knowledge about treatment durations for susceptible TB and MDR TB was 49.34% and 8.18%, respectively.

Misconceptions about XDR TB diagnosis, causes, and treatment duration were prevalent, and students showed poor knowledge about XDR TB. Only 25.33% students were found to be familiar with XDR TB, while the rest of the students had never heard about XDR TB. Many of the students were found to have a false belief that XDR TB is non-curable, which is an alarming situation for TB-control programs, indicating the need to create awareness among the general population.

Our study is evidence that false impressions concerning TB were common among Pakistani students. Many patients stop taking the medicine when they start feeling better and do not complete their drug regimens due to their poor knowledge about the benefits of completion of a drug regime. This may lead to increased prevalence of disease in society. Poor knowledge about TB, even in the most educated group of the country, constitutes a reason for high TB prevalence in the country [28]. Many studies reported correlation between familiarity and understanding about TB in overcoming the disease [29,30]. TB burden can be lowered in any community by providing education to patients, as well as the general population, and by removing their misconceptions [31,32].

These misconceptions can be removed only by designing areas based on awareness programs that will spread the true knowledge regarding TB diagnosis and treatment in the community [33,34]. Such education-based campaigns in parallel

with communal and cultural settings in Bangladesh have proven to be effective in improving the knowledge and attitude of people [32,35].

Other researchers found that mass media, especially television and internet, can play an important role in spreading constructive information concerning TB [36,37]. Tasnim et al. [38] investigated the different sources of information by conducting a survey, finding that the chief source of knowledge among people was television. They reported the level of awareness by television was physicians, friends, relatives, print media, and non-governmental organizations to be 46.8%, 18.2%, 14.6%, 3.3%, and 7.9%, respectively. Other sources, such as mobile phones, can be used to educate people individually [39].

From this study, we concluded that misunderstandings and limited knowledge pertaining to TB are widespread in Pakistani students. Different programs capable of creating awareness among students by means of literature and electronic media are vital to enlightening students and removing misapprehensions and folk tales [32]. TB-control plans will be futile if the misconceptions and folk tales about TB are not addressed along with the disease.

Conflicts of interest

The authors declare no conflicts of interest.

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