



EVALUATION OF TUBERCULOSIS DISEASE AWARENESS AND UNDERSTANDING AMONGST PHARMACY STUDENTS AT THE UNIVERSITY OF WOLVERHAMPTON

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ABSTRACT

Introduction: Tuberculosis (TB) caused by the bacterium *Mycobacterium tuberculosis* is recognised as the leading cause of death due to infectious disease in the world. Pharmacies and pharmacy workers, together with GPs and other health care professionals, have key roles and responsibilities in facilitating TB management, therefore aiding prompt treatment and reducing incidence. **Objectives:** This study aims to determine the level of awareness, perceptions and knowledge of TB and its treatment among pharmacy students at various stages in study. One of the main objectives is to identify key sources of gained awareness and identify which of these were the most effective in information delivery. **Methods:** A cross-sectional study was conducted among pharmacy students at the University of Wolverhampton using a questionnaire. A total of 50 participants, who fully completed the questionnaire, were included in the study. **Results:** All participants had previously heard about TB, 46.0% of participants indicated that they first heard of TB through their school or college. More than half of respondents (71.4%) highlighted that the most effective source of TB-related learning was through university. Questions based on basic knowledge of TB, such as causative organism, achieved the highest correct answers (98.0%), those based on treatment duration (56.0%) and medications yielded poorer results. Participants' perceptions of whether complete recovery can be achieved and whether TB is curable, or a long-term illness, were poor. **Conclusion:** Results suggest that participants' basic knowledge of TB is acceptable, although improvements are advised in understanding of preventative measures that can be taken, recommended standard pharmacological treatments and their durations.

KEYWORDS: *Mycobacterium tuberculosis*, Tuberculosis (TB).

INTRODUCTION

Tuberculosis (TB) is recognised as the leading cause of death in the world from a bacterial infectious disease^[1], it is one amongst the top 10 causes of death globally, with over 10.4 million new cases and 1.7 million deaths occurring in 2016.^[2,3] The world health organisation (WHO) estimated that in 2017, TB caused between 9.0-11.1 million new incidences globally, and between 1.2-1.4 million deaths amongst HIV-negative people and just under 0.5 million in HIV-positive people.^[1] Over 95% of these deaths were found to occur in countries with low- and middle- incomes.^[2]

WHO estimates that in 2016, the highest incidence of TB cases occurred in Asia - 45% of new cases.^[2,4] Estimates for 2017 suggested that two thirds of all TB cases were in eight countries globally: India (27%), China (9%), Indonesia (8%), the Philippines (6%), Pakistan (5%), Nigeria (4%), Bangladesh (4%) and South Africa (3%).^[1] Only 6% of the total global cases were found to be within WHO regions of Europe and Americas, each making up 3% of the overall estimate. Global rates of TB

incidence (i.e. new cases per 100,000 population per year) are estimated to be decreasing^[4] at about 2% annually, with the fastest regional declines in 5 years, seen between 2013-2017, occurring within the WHO European Region and WHO African Region, at rates of 5% and 4% per year, respectively.^[1] WHO, (2018) reported the annual TB mortality rates (i.e. deaths among HIV-negative people per 100,000 people per year) to be constantly reducing at the rate of around 3% per year; "the best estimate for the overall reduction during 2000-2017 is 42%".

Aetiology

TB is an infection caused primarily by a rod-shaped, aerobic bacterium *Mycobacterium Tuberculosis*^[5], mainly transmitted by the respiratory route through exposure to tubercle bacilli contained in expired airborne droplets by people who have pulmonary or laryngeal TB.^[6,7,8] These bioaerosols can be generated by infected people through coughing, sneezing or talking and can remain airborne for hours after expectoration, thus allowing easy spread of the bacterium.^[5]

Likelihood of transmission can be determined by various factors.^[8] It can be enhanced through frequent and prolonged exposure to TB and infected patients (treated or untreated, although contagiousness has been found to decrease rapidly once effective treatment is initiated^[4], in overcrowded, poorly ventilated or enclosed spaces. Risk of infection is greater in those who are immunocompromised (i.e. AIDS, HIV patients, the elderly), or are working in close contact with patients with active TB (i.e. family and friends of infected people, as well as healthcare professionals directly involved in their treatment).

The outcome of an infection will principally be determined by and dependent upon the host's immune response and the balance between host defences and invading mycobacteria.^[5] Once transmitted to a new host, there are a few possible outcomes of disease progression; there may be complete destruction of the bacilli by the host's innate immune response; it may develop into an active, transmittable infection after an incubation period of 2 to 10 weeks; it might cause a clinically latent and non-transmittable infection that could persist for a lifetime or cause an active infection at a later stage.^[6,9]

It is estimated that a quarter of the world's population has latent TB and have a 5-15% lifetime risk of it developing into an active infection. This risk is considerably greater in those who smoke or are immunocompromised, such as people living with HIV or diabetes, members of an ethnic minority and those considered to be living in poverty.^[3,10,11] It was suggested that 'infants and young children are more likely to develop severe forms of TB', such as disseminated TB, because of their lack of a rapid and mature immunological response.^[12] Within the UK population, prevalence and incidence of TB are highest within deprived or low income populations, and three quarters of the nearly 8000 total cases that were notified in 2013 were in people who were born outside of the UK.^[8]

Overview of Treatment

During the initial months following development of active TB, mild symptoms such as cough, fever, night sweats, and weight loss may only occur. This may lead to delays in seeking diagnosis, subsequently resulting in increased transmission of TB, with each person infecting around 10-15 people over a year.^[2] Infection is usually non-contagious in the primary stages, before activation, as well as in its latent state.^[4] Thus, latent TB is not routinely treated, whereas active TB is treated with a standard regimen of a six-month course of four antimicrobial drugs (pyrazinamide and ethambutol for the first two months of treatment; isoniazid and rifampicin continued throughout the whole six month treatment period), together with information, supervision and support.^[6,13] While most patients make a complete recovery from the infection with prompt provision of effective treatment and adherence to the regime, there is

a possibility of the infection becoming resistant to the antimicrobials used in other patients. These cases are more difficult to treat and will usually require a longer and more intensive course of treatment. With the emergence of multidrug-resistant strains (MDR-TB), TB cases are becoming increasingly difficult to treat and the extreme need of prevention, containment and prompt treatment of new and existing cases is apparent.^[3] For prevention and reduction of incidence, the WHO expanded programme on immunisation (EPI) has recommended the use of *Bacillus Calmette-Guérin* (BCG) vaccine which is currently the only authorised vaccine in use against TB - in all new-born babies who are born in countries with high TB incidence.^[3,14] In 2017, WHO stated that 158 countries provided BCG vaccination as a standard part of childhood vaccination programmes, with 120 reported coverage of at least 90% of all children.

Treatment awareness

Poor adherence remains one of the most common causes of treatment failure.^[6,15,16] Patients often discontinue their medications after leaving hospital.^[17] Improving the patient TB knowledge has been proved to improve patients' recovery outcomes.^[18] Current interventions implemented worldwide, including campaigns to boost awareness of TB, with great focus on reducing stigma that may delay presentation for treatment, increase adherence to treatment and likelihood of treatment completion in patients.^[19] A systematic review by M'Imunya, (2012), evaluated the effects of providing patient education on treatment adherence and treatment completion for patients with TB. Other interventions used to promote treatment adherence include motivation, incentives, reminder systems, directly observed therapy (DOT), mutually-agreed contracts and peer assistance. The study by Jamlick-Karumbi, (2015), concluded that although overall TB-cure was low in patients on self-administered therapy, it was not considerably improved through DOT implementation. M'Imunya, (2012), states that patient education ensure that people have sufficient knowledge and understanding to make informed choices and actively participate in their recovery journey. Nerges-Mistry, (2017) suggests that treatment commencement delays, may increase the probability of TB transmission in communities. Although most patients (94%) were found to approach private sectors as their first point of care, the study suggested that patients, treated in hospitals within the public sector (6%), had shorter mean pathway duration, from approach to initiation of treatment, than those treated in private sectors.

Pharmacies and pharmacy workers, together with GPs and other health care professionals, have key roles and responsibilities in facilitating early detection of TB.^[23,24,25,26] Knowledge amongst undergraduate health care students is important as they represent future health care workers.^[27] Akin, et al., (2011) suggests that insufficient understanding and knowledge of TB in

health care workers, it may affect their ability to counsel patients and may affect their behaviour and increasing their level of anxiety when encountering a TB patient due to the associated stigma surrounding TB.^[28,17]

AIM

To determine the extent of Tuberculosis awareness and knowledge amongst pharmacy students, of varying educational and academic backgrounds, at the University of Wolverhampton (UoW), including its basic pathogenesis, i.e. causative organism and transmission, treatment and treatment outcomes. The study also aims to identify key sources and methods of any gained awareness and education, that could be implemented would be beneficial for the purpose of increasing awareness levels.

OBJECTIVES

The objectives of this study were to:

- Determine the extent of TB knowledge amongst pharmacy students at the UoW, School of Pharmacy.
- Recognize the extent of general TB awareness amongst participants; identify areas of lacking knowledge or understanding that could be targeted for improvement.
- Distinguish, and explore effectiveness of, key points or sources of any gained awareness among participants.
- Investigate any associations between students' TB-knowledge and demographic characteristics.

METHODS AND DESIGN

Many studies have attempted to explore knowledge and attitudes of health care professionals of various disciplines, e.g. nursing and medical students, towards TB but not pharmacy students. A study carried out by Akin, et al., (2011), investigated the level of knowledge and attitudes of 615 Turkish nursing and midwifery students, with an aim to determine whether making changes to their teaching would improve their attitude. The study found that the level of knowledge was poor and that attitudes towards TB were generally negative. Results identified that students who received TB education were more knowledgeable and positive towards TB when compared to those who did not.^[27,30] Research carried out by Singla, Sharma, & Jain, (1999), investigated TB-related awareness of nurses using a questionnaire in Delhi, India. A total of 213 nurses participated, of which there were 82 nurses from a TB institute and 131 nurses from a general hospital (GH); 97.6% of participants indicated that they regularly faced TB patients. Study outcomes highlighted that a significant quantity of nurses have inadequate knowledge regarding causes of TB. 84% of TB nurses and 56.5% correctly identified mycobacteria as the causative organism, but 8.5% of TB nurses and 36% of GH nurses indicated a viral cause. However, they showed great awareness about TB transmission, predisposing factors and precautions to take on hospital TB wards. There was 95.1% of TB and 68.7% of GH nurses correctly

identified medications routinely used in treatment; 72.3% of total participants expressed interest for TB-related training.

A cross-sectional study by Behnaz, et al., (2014), also employed a survey to determine knowledge, attitudes and practices among medical students. Participants were 145 (65.5% (93) female and 34.5% (49) male) final-year medical students. Mean knowledge scores were significantly higher in women than men (16.45 ±1.87 and 15.67 ±2.30, respectively). There were 97.2% correctly responded that TB is curable, and only 48.3% of participants answered that BCG vaccination is used to prevent TB. Most participants (95.1%) also identified the six months' duration of standard treatment in a new case of pulmonary TB. Behnaz, et al., (2014) concluded that students' knowledge regarding transmission of TB and importance of BCG vaccination should be improved.

Another cross-sectional study, by García, et al., (2018), investigated TB-related knowledge, attitudes and practices of pharmacy workers at 45 pharmacies in Peru. Majority of participants were female (78%), and only 11% of total participants were pharmacists with complete university training. Data was collected using a survey aimed to explore participants' knowledge and attitudes towards TB, as well as their interest in receiving more information to improve their understanding of TB. Results showed that though their knowledge was adequate, the workers had vital gaps in knowledge on the prevention of TB transmission. Most participants (88.9%, 40/45) showed interest in learning about TB to increase their knowledge base as well as taking part in prevention activities in their respective areas.

Study Question

The present study sought to explore the degree of tuberculosis awareness among pharmacy students at the UoW and identify key points of gained awareness.

Methods

This was a cross-sectional study, questionnaire based. The participants information and questionnaire were distributed in-class, to pharmacy students at the UoW by the researcher. The questionnaire was made up of 20 multiple-choice style questions divided into three separate categories. Section-A contained three demographic questions, on age, ethnicity and gender, intended to be used to understand the differences in awareness and level of knowledge between different population groups. Section-B contained five questions relating to TB awareness and possible sources of existing knowledge. The remaining questions were contained in Section-C; these included detailed questions on causes, transmission and treatment, designed to test participants' basic understanding of TB. The final questions in this section explored participants' attitudes towards provision of optional university-based courses or training for increasing TB awareness and allowed for any further comments. All participants were provided with an

information leaflet on tuberculosis to support their learning after they returned their responses.

Ethics

Ethical approval was granted from the UoW Ethics Committee prior to undertaking research.

Sample

Participants were exclusively made up of pharmacy students at different stages of study at the UoW, with the understanding that their completion of the questionnaire will imply their consent to participate in the study. Three incomplete questionnaires were later omitted from the data set which resulted in yielding a total of 50 complete responses.

Data analysis

Statistical analysis was carried out using the IBM Statistical Package for Social Sciences Version 24 (SPSS V.24). Prior to running analysis, responses were screened for incomplete forms (i.e. partially answered or completely unanswered questionnaires), which were subsequently removed from the data set. Questionnaires with more than 3 unanswered questions were considered incomplete (Appendix A). Question responses were categorised and separated into dichotomous variables to aid interpretation of yielded results. The entered data set was checked manually, and through running practice analysis, to verify that variables were accurately recorded without errors and detect any missing or invalid values. Analysis consisted of using frequency distributions for the total participant sample and for each demographic characteristic (gender, age range and ethnicity). Dichotomous formatting enabled detailed analysis of responses within each participant

demographic variable. For example, responses indicating “Males” were coded as ‘1’ and “Females” were coded as ‘2’. Dichotomous values associated with each of the responses are shown in appendix B.

RESULTS

Demographic characteristics of respondents

The analysis involved 50 pharmacy students (64.0% females, 36.0% males) from various years in study. The age range of participants was of 20-40. 78.0% of participants were in the age range of 22-30 and 16.0% were in the age range 31-40. A total of 3 participants (6.0%) were below these age ranges at 20 and 21 years of age (2.0% and 4.0% respectively). Most respondents, 58.0%, were of South Asian (i.e. Asian/Pakistani/Indian/Bangladeshi) ethnic backgrounds, followed by 24.0% of Black/African/Caribbean/Jamaican, 12.0% of White/Caucasian and 6.0% of non-specified ethnic groups.

TB awareness and sources of existing knowledge

All respondents indicated that they had previously heard of TB, 46.0% first heard about TB at school or college. Although most participants had selected multiple methods for being the most effective for TB related learning, the top selected response (71.4%) was university learning, followed by school/college (44.9%) and course/degree-related material (40.8%). There was a 22% of all participants mentioned that they, or someone they knew, have been diagnosed with TB; the majority, 70.0% indicated otherwise and 8.0% were uncertain. Table 1 and 2 summarise participant responses to TB awareness questions and sources of gained understanding.

Table 1: Participants' TB awareness and self-identified sources of knowledge.

Questions / Statement	Answer Options	Frequency	Percent	Valid Percent	Cumulative Percent
I heard about TB before	Yes	50	100.0	100.0	100.0
	No	0	0	0	0
The first time I heard TB was from.....	TV/Radio/News paper	2	4.0	4.0	4.0
	School/College	23	46.0	46.0	50.0
	University	7	14.0	14.0	64.0
	Printed Information	1	2.0	2.0	66.0
	Healthcare Professionals	4	8.0	8.0	74.0
	Family/Friends/ Colleagues	13	26.0	26.0	100.0
I need to acquire more information about TB	Yes	41	82.0	82.0	82.0
	No	9	18.0	18.0	100.0
Do you know anyone diagnosed with TB	Yes	11	22.0	22.0	22.0
	No	35	70.0	70.0	92.0
	Don't know	4	8.0	8.0	100.0

Table 2: Participants source of knowledge.

		Responses		Percent of Cases
		N	Percent	
Where you learnt about TB	TV/Radio/Magazine/Newspaper	17	11.7%	34.7%
	School/College	22	15.2%	44.9%
	University	35	24.1%	71.4%
	Printed information	18	12.4%	36.7%
	Healthcare Professionals	18	12.4%	36.7%
	Family/Friends/Colleagues	15	10.3%	30.6%
	Course/Degree-related material	20	13.8%	40.8%
Total		145	100.0%	295.9%

Participants' basic understanding of TB

Majority of participants (98.0%) identified the causative organisms as bacteria and the remaining 2.0% identified a viral source. Most participants, 94.0%, agreed that TB was infectious, and the same proportion also indicated that it was curable; 78.0% agreed that patients would

achieve complete recovery with treatment. In relation to standard treatment length, over half of the total participants (56.0%) indicated a length of 6 months; durations of 3 months and longer than one year were both each selected by 8.0%. Table 3 and 4 summarise all participants' responses on Section-C of the survey.

Table 4: Understanding of TB.

Questions	Answer Options	Frequency	Percent	Valid Percent	Cumulative Percent	
TB is infectious	I don't know	2	4.0	4.0	4.0	
	No	1	2.0	2.0	6.0	
	Yes	47	94.0	94.0	100.0	
	Total	50	100.0	100.0		
TB is treatable and curable	I don't know	3	6.0	6.0	6.0	
	Yes	47	94.0	94.0	100.0	
	Total	50	100.0	100.0		
	Standard treatment length	I don't know	8	16.0	16.0	16.0
Longer than one year		4	8.0	8.0	24.0	
1 Year		3	6.0	6.0	30.0	
3 Months		4	8.0	8.0	38.0	
2 Months		2	4.0	4.0	42.0	
1 Month		1	2.0	2.0	44.0	
6 Months		28	56.0	56.0	100.0	
Total		50	100.0	100.0		
Will patients achieve complete recovery		I don't know	6	12.0	12.0	12.0
		No	5	10.0	10.0	22.0
	Yes	39	78.0	78.0	100.0	
	Total	50	100.0	100.0		
Perception of long term illness	I don't know	5	10.0	10.0	10.0	
	No	10	20.0	20.0	30.0	
	Yes	35	70.0	70.0	100.0	
	Total	50	100.0	100.0		
Is TB preventable disease	I don't know	3	6.0	6.0	6.0	
	No	1	2.0	2.0	8.0	
	Yes	46	92.0	92.0	100.0	
	Total	50	100.0	100.0		

Table 5: Understanding treatment and transmission of TB.

		Responses		Percent of Cases
		N	Percent	
Drugs used in treatment of TB	Isoniazid	42	25.8%	84.0%
	Pyrazinamide	38	23.3%	76.0%
	Rifampicin	43	26.4%	86.0%
	Ethambutol	35	21.5%	70.0%
	I do not know	5	3.1%	10.0%
Total		163	100.0%	326.0%
How is TB spread Frequencies	Unclean food or water	14	15.4%	28.0%
	Cough airborne	47	51.6%	94.0%
	Touching items	12	13.2%	24.0%
	Hereditary Genetic	3	3.3%	6.0%
	Sexual contact	12	13.2%	24.0%
	I do not know	3	3.3%	6.0%
Total		91	100.0%	182.0%

Table 6 shows the distribution of correct answers provided by participants to Section-C of the survey. Correct identification of a bacterial cause was made by 100% male and 97.0% females. Correct responses indicating that TB was infectious were achieved by 100% males, 91.0% females. Correct recognition of airborne transmission of TB was made by 94.0% males, 94.0% females. There were 94.0% male, and 53.0% female participants correctly stated a standard treatment duration of 6 months and 94.0% males, 69.0% females agreed with patients achieving complete recovery with treatment.

Table 6: Distribution of correct answers to Section-C amongst participants.

Knowledge about TB		Causative organism	Infectious	Treatable /Curable	Treatment length	Complete recovery	Long -term	Transmission	Preventable
		Bacteria	Yes	Yes	6 Months	Yes	No	Airborne	Yes
Ethnicity	W/C	100%	100%	100%	50%	83%	17%	83%	67%
	B/A/C/J	100%	92%	100%	50%	100%	17%	92%	100%
	A/P/I/B	100%	97%	93%	59%	69%	24%	100%	97%
	Other	67%	67%	67%	67%	67%	0%	67%	67%
Gender	Male	100%	100%	100%	61%	94%	22%	94%	94%
	Female	97%	91%	91%	53%	69%	19%	94%	91%
Age Group	Other	100%	100%	67%	33%	67%	67%	100%	100%
	22-30	97%	92%	95%	56%	77%	21%	92%	92%
	31-40	100%	100%	100%	63%	88%	0%	100%	88%

Percentages are calculated using the total number of students within each demographic characteristic variable.

W/C: White/Caucasian

B/A/C/J: Black/African/Caribbean/Jamaican

A/P/I/B: Asian/Pakistani/Indian/Bangladeshi

Most participants were able to identify some drugs used in standard treatment; Distribution of participants indicating each drug are shown in table 7. Only 3.1% of the total responses indicated “I do not know anything about TB”. All remaining responses were for the four of

the standard drugs used in treatment; each drug was selected by a minimum of 70.0% participants. Results highlighted that Rifampicin was selected by 86.0% of participants; Isoniazid, Pyrazinamide and Ethambutol were selected by 84.0%, 76.0%, 70.0% respectively.

Table 7: Distribution of answers for drugs used in TB treatment (Question 13).

Drugs used in treatment of TB		Drugs regularly used in treatment of TB				
		Isoniazid	Pyrazinamide	Rifampicin	Ethambutol	Do not know
Ethnicity	White/Caucasian	83%	83%	83%	83%	17%
	Black/African/Caribbean/Jamaican	75%	75%	92%	67%	8%
	Asian/Pakistani/ Indian/Bangladeshi	90%	76%	90%	72%	7%
	Other	67%	67%	33%	33%	33%
Gender	Male	94%	89%	94%	94%	6%
	Female	78%	69%	81%	56%	13%
Age Group	Other	67%	67%	67%	33%	33%
	22-30	85%	77%	90%	74%	8%
	31-40	88%	75%	75%	63%	13%

Percentages are calculated using the total number of students within each demographic characteristic variable.

Views on provision of optional TB awareness and education

86.0% of participants indicated that optional university-led education about TB would be beneficial, however, 8.0% were not in favour of this suggestion. 8.0% of

participants also indicated that they would not be interested in attending if such forms of education were made available, but the majority, 74.0%, stated that they would be likely to attend (Table 8).

Table 8: Participants' views and interests towards provision of optional TB-related education at University.

Questions	Answer Options	Frequency	Percent	Valid Percent	Cumulative Percent
Would optional TB education be beneficial	I do not know	3	6.0	6.0	6.0
	No	4	8.0	8.0	14.0
	Yes	43	86.0	86.0	100.0
	Total	50	100.0	100.0	
Interest in attending TB related awareness	I do not know	9	18.0	18.0	18.0
	No	4	8.0	8.0	26.0
	Yes	37	74.0	74.0	100.0
	Total	50	100.0	100.0	

Appendix A: Dichotomous value labelled TB questionnaire.

PROJECT TITLE: Tuberculosis: disease awareness and understanding amongst pharmacy students from the University of Wolverhampton

Section A

This information will be used to understand the differences in awareness and level of knowledge between different population groups

- What is your gender?
 - Male (1)
 - Female (2)
 - Other (please specify) (3).....
- How do you describe your ethnicity?
 - White/Caucasian (1)
 - White/mixed (2)
 - Black/African/Caribbean/Jamaican (3)
 - Asian/Pakistani/Indian/Bangladeshi (4)
 - Other (please specify) (5).....
- What is your age group?
 - 22-30 (1)
 - 31-40 (2)
 - 41-50 (3)
 - 51-60 (4)
 - 60-70 (5)
 - Other (please specify) (0).....

Section B

These questions are designed to gain some insight your general awareness of TB and the sources by which you may have developed this.

- Have you ever heard about TB? (Please tick as appropriate)
 - Yes (1)
 - No (2)
- How did you hear/learn about TB for the first time? (Tick one)
 - TV/Radio/Magazine/Newspaper (1)
 - School/College (2)
 - University (3)
 - Printed information and materials (booklets, posters etc) (4)
 - Healthcare workers (hospital, Pharmacy, GP, talks etc) (5)
 - Family/Friends/Colleagues (6)
 - Course/Degree related material or teaching (7)
 - Other, please specify: (string (text) entry)

Appendix B: Complete analysis and output.

```
GET
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FREQUENCIES VARIABLES=Gender Ethnicity Age_Group
/ORDER=ANALYSIS.
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Frequencies

Notes		
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Comments		
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	Weight	<none>
	Split File	<none>
	N of Rows in Working Data File	50
Missing Value Handling	Definition of Missing	User-defined missing values are treated as missing.
	Cases Used	Statistics are based on all cases with valid data.
Syntax		FREQUENCIES VARIABLES=Gender Ethnicity Age_Group /ORDER=ANALYSIS.
Resources	Processor Time	00:00:00.00
	Elapsed Time	00:00:00.01

[DataSet1] C:\Users\User\OneDrive\Documents\Dissertation\Drafts\Analysis_Data_set.sav

Statistics

		Gender	Ethnicity	Age_Group
N	Valid	50	50	50
	Missing	0	0	0

Frequency Table

DISCUSSION

Participants were surveyed on their knowledge including causative organism, mode of transmission, treatment length and standard drugs used in treatment. Sources of gained education and awareness were also explored to identify which methods were most effective in their opinion.

All participants stated that they had heard about TB with 14% of students indicated that they first became aware of TB at university. The majority, however, stated that they first learnt about TB in school or college (46.0%), closely followed by family, friends and colleagues (26.0%). This highlights the importance of carrying out public awareness programmes and implementation of TB-related education earlier within the education system. A study by Gothankar, (2013), proved that providing TB-related education to school students through awareness programmes can improve their knowledge of TB; mean pre-test scores of 52.58% and post-test scores of 85%. There was 82.0% of total participants indicated that they have acquired more TB-related knowledge since they became aware of it.

Most participants selected multiple options for being the most effective for TB-related learning. As participants

been given the opportunity to choose more than one option, the top three responses were university (75%), school or college (44.9%) and educational material (40.8%); results suggest that students preferred structured and formal learning. The study of TB knowledge in medical students by Behnaz, et al., (2014), found that students had sufficient knowledge through receipt of education primarily through lectures and first-hand patient encounters. The least responses, 30.6% (10.3% of responses; 15 of 145) were for awareness through family, friends and colleagues although 26.0% of students had indicated that they first became aware through this source. There was a 22% of all participants mentioned that they, or someone they knew, have been diagnosed with TB (Personal Experience). This can be considered another source of TB-related knowledge that may have altered their perceptions towards TB.

Results demonstrate that students' knowledge about TB was generally acceptable but could be improved. Questions based on basic knowledge of TB, such as causative organism and whether TB is infectious, achieved the highest correct answers. In general, participants' knowledge regarding treatment length, and perceptions of whether patients achieve complete recovery after treatment and whether TB is a long-term

illness, was poor. Results suggest that male participants were more well-informed than their female peers as they achieved higher proportions of correct answers for each question in Section-C.

There was a 98.0% of all participants identified causative organisms as bacteria and the remaining 2.0% identified it as a viral source. Correct identification of a bacterial cause was made by 100% male and 97.0% females; 97.0% 22-33, 100% 31-40 and "other" age (OA); 67% "other" ethnicity (OE), 100% White/Caucasian (W/C), Black/African/Caribbean/Jamaican (B/A/C) and Asian/Pakistani/ Indian/ Bangladeshi (A/I/P). These results were better than results shown in the study by Singla, Sharma, & Jain, 1999, where only 67.1% of total participants correctly identified the causative organism with 25.4% mentioning a viral cause.

There was a 94.0% of participants said TB was infectious, 2.0% believed it was not, and 4.0% said they were not certain. Similarly, 94.0% of participants also indicated that transmission was mainly airborne, i.e. through coughing or sneezing. 28.0% of participants suggested spread through unclean food or water, 24.0% mentioned spread through touching items and possible sexual transmission (24.0%). A minority, 6.0%, indicated a hereditary mode of spread and the remainder were undecided. Correct recognition of airborne transmission was made by 83.0% W/C, 92.0% B/A/C, 100% A/I/P and 67.0% OE; 94.0% males, 94.0% females; 100% OA, 92.0% 22-30, and 100% 31-40. Misunderstandings regarding transmission were equal in males and females (6.0%), and most prevalent in OE (33.0%), W/C (17.0%) and age range 22-30 (8.0%). Almost all participants, 92.0, correctly responded that TB can be prevented, however, 2.0% did not feel this to be the case. 6.0% of overall respondents answered that they did not know.

In response to whether TB was treatable or curable; 94.0% agreed it was whereas the remaining 6.0% indicated uncertainty. However, perceptions of TB as a long-term disease were predominant. Nearly three-quarters of all participants, 70.0%, responded that they perceived TB as a long-term illness in contrast to 20.0% who differed this opinion. Only 10.0% of total participants self-identified as undecided on their perceptions of the disease. There were no significant differences between demographic characteristics highlighted.

Responses to standard treatment length had the least correct answers (after perception of TB as a long-term illness) and suggests that further education is required to improve understanding. Only just over half of the total participants (56.0%, 28) indicated a correct length of 6 months for standard treatment; durations of 3 months and longer than one year were both each selected by 8.0%; 1 year, 6.0%; 2 months, 4.0%; 1 month, 2.0%; 16.0% were uncertain. More than 50.0% of participants of each demographic characteristic provided the correct answer

except for OA where only 33.0% (1) answered correctly. 78.0% of participants agreed that patients would achieve complete recovery with treatment. Only 12.0% were undecided and the remaining 10.0% disagreed that a complete recovery is achieved.

Most participants were able to identify some of the regularly used medications in TB treatment. Majority of the participants were able to correctly identify the four antibiotics/drugs used in the treatment of TB. There was a 62.0% (31) of all participants were able to identify all four drugs used in standard TB treatment; 16.0% (8) identified three; 8.0% (4), two; 4.0% (2), single drug; 10.0% (5) no identification. Most of the participants (86.0%, 43) agreed that optional university-led education about TB would be beneficial and raise better awareness. A small proportion (8.0%, 4) were not in favour of introducing such educational courses through university; 2.0% (1) of these respondents provided a statement with justification for their opinion in the comment section at the end of the questionnaire "*People will not opt in for awareness courses unless they have a special interest or prior knowledge*" (Student 1). "*Believe this condition is overlooked greatly on an academic level and more teaching should be provided on this topic*" (Student 2). Attending such awareness programmes if made accessible yielded similar results with 8.0% (4) indicated that they would not be interested in attending, but most participants, 74.0%, (37) stated that they would attend if such short-courses or awareness-days were made available.

Benefit to practice

The findings have highlighted the need to increase awareness and place enhancements on current education of TB. It will also improve participants' awareness of TB and allow them to assess their current understanding in order to identify areas needing improvement.

Limitations

Most participants were final year pharmacy students. This may influence answers due to increased lectures and university-based education. Male participants were considerably low when compared to female, and not all pharmacy students were approached to take part; inclusion of these participants may have altered distributions.

Conclusion and Recommendations

In conclusion, results suggest that participants' basic knowledge of TB is acceptable, although improvements are advised in understanding of preventative measures that can be taken, recommended standard pharmacological treatments and their durations. Male participants achieved higher proportions of correct answers for questions determining TB-knowledge. There were no significant differences between any other demographic variables. Participants' perceptions of whether complete recovery can be achieved and whether TB is curable, or a long-term illness, were poor. In order

to establish general awareness and extend current understandings, students would benefit significantly from enhanced structured learning (identified most effective source of TB-education), and most have shown interest towards attending optional programmes, if made available, to increase TB knowledge.

Placing more importance on TB-related teaching into health care courses and university-led awareness campaigns are advisable to create awareness in all students. Exploring the level of TB-related knowledge in other health care and non-health care students is also necessary.

REFERENCES

- World Health Organisation. (2018). Global Tuberculosis Report 2018. WHO. Retrieved from <http://apps.who.int/iris/bitstream/handle/10665/274453/9789241565646-eng.pdf?ua=1>
- World Health Organisation (n.d.). WHO | Tuberculosis. Retrieved 12, 2018, from Who.int: <http://www.who.int/mediacentre/factsheets/fs104/en/>
- Martin, C.; Aguilo, N.; Gonzalo-Asensio, J. (2017). Vaccination against tuberculosis. *Enfermedades Infecciosas y Microbiología Clínica*.
- Tierney, D. (2018, April). Mycobacteria: Tuberculosis (TB). (D. Tierney, & E. A. Nardell, Editors) Retrieved from MSD Manual: <https://www.msdmanuals.com/en-gb/professional/infectious-diseases/mycobacteria/tuberculosis-tb>
- Knechel, N. A. (2009, April). Tuberculosis: Pathophysiology, Clinical Features, and Diagnosis. *Critical Care Nurse*, 29(2): 34-43. doi:10.4037/ccn2009968
- Nehaul, L. K. (2012). In C. W. Roger Walker (Ed.), *Clinical Pharmacy and Therapeutics* (pp. 608-618). Churchill Livingstone.
- Desalu, O. O.; Adeoti, A. O.; Fadeyi, A.; Salami, A.; Fawibe, A. E.; Oyedepo, O. O. (2013). Awareness of the Warning Signs, Risk Factors, and Treatment for Tuberculosis among Urban Nigerians. *Tuberculosis Research and Treatment*, 2013; 369717-369717. Retrieved 9 18, 2018, from <https://ncbi.nlm.nih.gov/pmc/articles/pmc3557638>
- Rutter, P. (2017). In *Community Pharmacy: Symptoms, Diagnosis and Treatment* (p. 14). Elsevier.
- Flynn, J. L.; Chan, J. (2001). Tuberculosis: Latency and Reactivation. *Infection and Immunity*, 69(7): 4195-4201. Retrieved 12, 2018, from <http://ia.asm.org/content/69/7/4195.full>
- Vukovic, D.; Nagorni-Obradovic, L. (2011). Knowledge and awareness of tuberculosis among Roma population in Belgrade: a qualitative study. *BMC Infectious Diseases*, 11(1): 284-284. Retrieved 9 24, 2018, from <https://bmcinfctdis.biomedcentral.com/articles/10.1186/1471-2334-11-284>
- Kasten, M. J. (2016). Tuberculosis: A Report from CROI 2016. *Journal of Clinical Tuberculosis and Other Mycobacterial Diseases*.
- Carvalho, I., Goletti, D., Manga, S., Silva, D. R., Manissero, D., & Migliori, G. (2017). Managing latent tuberculosis infection and tuberculosis in children. *Pulmonary Journal*.
- BNF. (2017). In BNF 74 (pp. 546-549). BMJ Group.
- Montagna, M.; Napoli, C.; Tafuri, S.; al, e. (2014). Knowledge about tuberculosis among undergraduate health care students in 15 Italian universities: a cross-sectional study. *BMC Public Health*, 14. doi:10.1186/1471-2458-14-970
- Tang, Y.; Zhao, M.; Wang, Y.; Gong, Y.; Yin, X.; Zhao, A.; Lu, Z. (2015). Non-adherence to anti-tuberculosis treatment among internal migrants with pulmonary tuberculosis in Shenzhen, China: a cross-sectional study. *BMC Public Health*, 15(1): 474-474. Retrieved 9 22, 2018, from <https://bmcpublichealth.biomedcentral.com/articles/10.1186/s12889-015-1789-z>
- Chan, E. D.; Iseman, M. D. (2002). Current medical treatment for tuberculosis. *BMJ*, 325(7375): 1282-1286. Retrieved 12, 2018, from <https://ncbi.nlm.nih.gov/pmc/articles/instance/1124748/table/t2>
- Singla, N.; Sharma, P.; Jain, R. (1999). Awareness about tuberculosis among nurses working in a tuberculosis hospital and in a general hospital in Delhi, India. *The International Journal of Tuberculosis and Lung Disease*, 2(12): 1005-10.
- Panaligan, R.; Guiang, J. (2012). Impact of health education on the knowledge and awareness of tuberculosis among high school students. *European Respiratory Journal*, 40(56).
- Moszynski, P. (2010). New campaign is launched in England to increase awareness of tuberculosis. *BMJ*, 340. Retrieved 9 24, 2018, from <https://bmj.com/content/340/bmj.c1089>
- M'Imunya JM, K. T. (2012). Patient education and counselling for promoting adherence to treatment for tuberculosis. *Cochrane Database of Systematic Reviews* (5).
- Jamlick-Karumbi, P. G. (2015). Directly observed therapy for treating tuberculosis. *Cochrane Database of Systematic Reviews* (5).
- Nerges-Mistry, E. L. (2017). Pulmonary tuberculosis in Patna, India: Durations, delays, and health care seeking behaviour among patients identified through household surveys. *Journal of Epidemiology and Global Health*, 7(4).
- García, P.; Hernández-Córdova, G.; Pourjavaheri, P.; Gómez-Paredes, H., S; S.; Bayer, A. (2018). Knowledge, attitudes and practices related to tuberculosis in pharmacy workers in a cross-sectional survey in El Agustino, Peru. *PloS one*, 13(7). doi:10.1371/journal.pone.0196648
- Abebe, G.; Deribew, A.; Deribew, A.; Apers, L.; Woldemichael, K.; Shiffa, J.; Colebunders, R. (2010). Knowledge, Health Seeking Behavior and

- Perceived Stigma towards Tuberculosis among Tuberculosis Suspects in a Rural Community in Southwest Ethiopia. *PLOS ONE*, 5(10). Retrieved 9 18, 2018, from <http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0013339>
25. Gutsfeld, C.; Oлару, I. D.; Vollrath, O.; Lange, C. (2014). Attitudes about Tuberculosis Prevention in the Elimination Phase: A Survey among Physicians in Germany. *PLOS ONE*, 9(11). Retrieved 9 21, 2018, from <http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0112681>
 26. Gothankar, J. S. (2013). Tuberculosis Awareness Program and Associated Changes in Knowledge Levels of School Students. *International Journal of Preventive Medicine*, 4(2): 153-157. Retrieved 9 18, 2018, from <https://ncbi.nlm.nih.gov/pmc/articles/pmc3604846>
 27. Mangtani, P.; Abubakar, I.; Ariti, C.; Beynon, R.; Pimpin, L.; Sterne, J. A. (2014). Protection by BCG Vaccine Against Tuberculosis: A Systematic Review of Randomized Controlled Trials. *Clinical Infectious Diseases*, 58(4): 470-480. Retrieved 9 22, 2018, from <https://academic.oup.com/cid/article/58/4/470/347668>
 28. Akin, S.; Gorak, G.; Unsar, S.; Mollaoglu, M.; Ozdilli, K.; Durna, Z. (2011). Knowledge of and attitudes toward tuberculosis of Turkish nursing and midwifery students. *Nurse Education Today*, 31(8): 774-779.
 29. Behnaz, F.; Mohammadzade, G.; Mousavi-e-roknabadi, R. S.; Mohammadzadeh, M. (2014). Assessment of knowledge, attitudes and practices regarding tuberculosis among final year students in Yazd, central Iran. *Journal of Epidemiology and Global Health*, 4(2): 81-85. doi:10.1016/j.jegh.2013.09.003.
 30. Sharma, D.; Sharma, J.; Deo, N.; Bisht, D. (2018). Prevalence and risk factors of tuberculosis in developing countries through health care workers. *Microbial Pathogenesis*, 124: 279-283. Retrieved from <https://doi.org/10.1016/j.micpath.2018.08.057>.