

Knowledge and Practice of Primary School Teachers About Tuberculosis at Basra City Center

Raghad Samir Lazim *, Zainab Ahmed Abdulzahraa **, Mariam Abdul-Jalil Muhsin ***

* Family Medicine Specialist, Basrah Health Directorate, Basrah, Iraq.

** Family Medicine Specialist, Basrah Health Directorate, Basrah, Iraq.

*** Family Medicine Specialist, Basrah Health Directorate, Basrah, Iraq.

Abstract: Tuberculosis (TB) remains a major global public health problem and one of the leading causes of mortality, particularly in developing countries including Iraq. Limited knowledge about TB may negatively influence health-seeking behavior and contribute to continued disease transmission. Therefore, this study aimed to assess the knowledge, attitudes, and practices of primary school teachers regarding tuberculosis in the center of Basra city. A descriptive cross-sectional study was conducted among primary school teachers selected to represent all teachers working in the city center of Basra. A total of 400 teachers were recruited from 20 primary schools using a systematic random sampling technique. Data were collected between March and April 2016 through group interviews using a semi-structured, pre-tested questionnaire. Statistical analysis was performed using SPSS version 20. Awareness of TB was universal among participants (100%). The main sources of information were television and radio media (53%) and family members (30.8%). More than half of the teachers (51.2%) correctly identified bacteria as the cause of TB, while 40.8% believed pollution was responsible. Most participants recognized the common symptoms of TB (79%) and knew that the disease is transmissible (92%), although only 55.9% identified the correct route of transmission. Nearly all participants understood that TB is preventable (97.5%) and curable (97%). Positive healthcare-seeking behavior was observed, with 95% reporting they would seek medical advice if symptomatic. The study demonstrated generally good awareness and positive attitudes toward TB among primary school teachers in Basra.

Index Terms: Tuberculosis, Knowledge, Attitude, Practices, Primary School Teachers

INTRODUCTION

Tuberculosis (TB) is a granulomatous infectious disease caused by *Mycobacterium tuberculosis*, transmitted mainly through inhalation of aerosolized droplets from patients with pulmonary TB.(1,2) After infection, a Ghon focus may develop and spread to regional lymph nodes to form a Ghon complex.(2) A major feature of TB is its ability to remain latent for long periods as latent tuberculosis infection.(3) TB mainly affects the lungs but can involve almost any body organ, particularly among vulnerable groups such as immunocompromised patients, children, elderly people, and malnourished individuals.(1,4,5,6,7) Delay in diagnosis and healthcare seeking allows continued transmission, as one infectious case may infect many contacts before detection.(8)

TB cases are classified into new and previously treated cases, including relapse, treatment default, treatment failure, other previously treated cases, and chronic cases.(2,9,10,11) Globally, TB remains a major public health problem, with millions of new cases and deaths reported annually, mostly in developing countries.(12,13,14,15,16) In the United States, TB declined after strengthening control measures, although latent infection remains important.(17) In Iraq, thousands of pulmonary and extrapulmonary TB cases are reported, with poverty, poor living conditions, and limited healthcare access contributing to the burden.(18,19)

Important risk factors for TB include HIV infection, poverty, overcrowding, malnutrition, smoking, silicosis, diabetes mellitus,

alcoholism, immunosuppressive drugs, and possible genetic susceptibility.(4,20,21,22,23,24,25,26,27,28,29) *M. tuberculosis* is a slow-growing, acid-fast bacillus with a lipid-rich cell wall, which contributes to its resistance and difficulty of treatment.(12,14,15,30,31,32)

Transmission occurs when infectious pulmonary TB patients cough, sneeze, speak, or sing, producing airborne droplets that may remain suspended and be inhaled by others.(33,34) Untreated active TB cases may infect 10–15 people each year, and transmission is affected by environmental and host factors.(35,36,37) TB may present as pulmonary, post-primary, miliary, or extrapulmonary disease.(2,4,7,11,12,13,33) Diagnosis depends on clinical suspicion, sputum smear microscopy, culture, tuberculin skin testing, interferon-gamma release assays, and radiological investigations.(11,13,15)

Management requires prolonged multidrug therapy because of the biological characteristics of *M. tuberculosis*.(38,39,40) Directly observed therapy is recommended to improve adherence, ensure correct drug intake, reduce default, and support patients through family, community, and healthcare involvement.(41,42,43,44,45) Prevention and control depend on BCG vaccination, early detection, proper treatment, contact screening, and public-private collaboration.(9,12,13,24,33,36) Stigma remains an important barrier, causing delayed treatment, poor adherence, secrecy, and social isolation.(46,47) Prognosis depends on immune status,

reactivation risk, reinfection, recurrence, and treatment access.(23,24,49,50)

This study aimed to determine the knowledge of primary school teachers about tuberculosis and to identify their attitudes and practices toward TB in Basra city center.

METHODS

This descriptive cross-sectional study was conducted to assess the knowledge, attitudes, and practices of primary school teachers regarding tuberculosis (TB) in the center of Basra city. The study was carried out over a six-month period extending from the beginning of February to the end of July 2016. Data were collected from teachers working in primary schools using a specially designed questionnaire prepared by the researcher for the purpose of the study.

The study population was selected to represent all primary school teachers in Basra city center. A systematic random sampling technique was used to select 20 primary schools, after which a convenience sample of teachers within these schools was included in the study. The inclusion criteria involved all primary school teachers regardless of age group, while secondary schools and rural schools were excluded from the study.

Before initiation of data collection, official approval to conduct the study was obtained from the Ministry of Education. A pilot study was conducted on 30 teachers using group interviews in order to evaluate the feasibility and clarity of the questionnaire, estimate the time required for data collection, and identify potential difficulties that might arise during the study process. Based on the pilot study findings, several modifications were made to improve the applicability and acceptability of the questionnaire.

The sample size was calculated using the standard statistical formula for prevalence studies with a 95% confidence interval, an estimated prevalence of 0.5, and a precision level of 5%. The calculated sample size was 380 participants; however, additional participants were included to increase the study power and compensate for possible non-participation. During the study period, teachers were interviewed only once, and the questionnaire was completed by the researcher himself.

The questionnaire form used for data collection included three main sections. The first section assessed socio-demographic characteristics such as age, sex, educational level, marital status, residency, and place of living. The second section evaluated teachers' knowledge regarding TB, including source of information, causes, signs and symptoms, methods of transmission, prevention, severity, and treatment of the disease. The third section assessed participants' attitudes and practices toward TB, including healthcare-seeking behavior and perceptions regarding the disease.

Statistical analysis was performed using the Statistical Package for Social Sciences (SPSS) version 20. Data were presented as

frequencies, percentages, and tables. A p-value of less than 0.05 was considered statistically significant.

RESULTS

A total of 400 primary school teachers from 20 schools in Basra city center participated in the study. Most participants were females, married, and aged between 36–50 years. Teachers who graduated from teachers' institutes represented the largest educational group.

Table 1. Socio-demographic characteristics of the study population

Characteristic	Frequency	Percentage
Age group (years)		
20–35	114	28.5%
36–50	211	52.8%
51–65	72	18.0%
≥65	3	0.8%
Gender		
Male	54	13.5%
Female	346	86.5%
Education		
Teachers institute	249	62.3%
College of education	118	29.5%
Dar	23	5.8%
Training course	10	2.5%
Marital status		
Married	316	79.0%
Unmarried	66	16.5%
Divorced/Widow	18	4.5%

The findings demonstrated universal awareness about TB among teachers. Media was the most common source of information, followed by family and friends. More than half correctly identified bacteria as the cause of TB, while a considerable proportion believed pollution was responsible.

Table 2. Sources of information and knowledge about the cause of tuberculosis

Variable	Frequency	Percentage
Heard about TB	400	100%
Source of information		
Media	212	53.0%
Family/Friends	123	30.8%
Doctor/Health center	27	6.8%
Personal experience	13	3.3%
Multiple sources	25	6.3%
Cause of TB		
Bacteria/germs	205	51.2%
Pollution	163	40.8%
Severe hotness/coldness	27	6.8%
Other/Don't know	5	1.2%

Most teachers demonstrated good knowledge regarding TB symptoms and transmission. Chronic cough with bloody sputum was the most recognized symptom, and most participants understood that TB is transmissible. However, misconceptions regarding the route of transmission were still present.

Table 3. Knowledge about symptoms and transmission of tuberculosis

Variable	Frequency	Percentage
Knowledge of symptoms		
Chronic cough with bloody sputum	316	79.0%
Fever/night sweats/weight loss	46	11.5%
Both symptoms	10	2.5%
Don't know	28	7.0%
TB is transmissible		
Yes	368	92.0%
No	10	2.5%
Don't know	22	5.5%
Method of transmission		
Airborne transmission	206	55.9%
Touching patient belongings	153	41.5%
Contaminated surfaces	9	2.6%

Knowledge regarding TB prevention and treatment was generally satisfactory. Most participants knew that TB is preventable and curable. Vaccination and good ventilation were recognized as preventive methods, while most participants correctly identified modern drugs as the main treatment option.

Table 4. Knowledge about prevention, treatment, and severity of tuberculosis

Variable	Frequency	Percentage
TB is preventable		
Yes	390	97.5%
No/Don't know	10	2.5%
Method of prevention		
Vaccination	215	55.1%
Ventilation/nutrition	137	35.1%
Both methods	20	5.2%
Don't know	18	4.6%
TB is curable		
Yes	389	97.0%
No/Don't know	11	3.0%
Treatment method		
New drugs	360	92.5%
Surgical treatment	11	2.8%
Home rest	10	2.5%
Arabic medicine	8	2.2%
Severity of TB		
Dangerous disease	345	86.3%
Not dangerous	23	5.8%
Don't know	31	7.8%

The majority of teachers demonstrated positive healthcare-seeking practices regarding TB. Most participants stated that they would seek medical care immediately if symptoms appeared and preferred consulting healthcare facilities rather than self-medication or delaying consultation.

Table 5. Practices of primary school teachers regarding tuberculosis

Variable	Frequency	Percentage
Practice if symptoms appear		
Consult health facility	380	95.0%
Pharmacy consultation	7	1.8%
Waiting	6	1.5%
Arabic medicine	1	0.3%
Others	6	1.5%
Timing of consultation		
Immediately after symptoms	373	93.3%
After symptoms worsen	27	6.8%
Consult primary healthcare center		
Yes	365	91.3%
No	33	8.3%

The study showed generally positive attitudes toward TB and healthcare consultation. Nearly half of the participants reported that they would seek medical advice if diagnosed with TB, although fear, shame, sadness, and hopelessness were still reported by a considerable proportion.

Table 6. Attitudes of primary school teachers toward tuberculosis and healthcare consultation

Variable	Frequency	Percentage
Reaction if diagnosed with TB		
Seek medical advice	185	46.3%
Fear and shame	112	28.0%
Sadness/loss of hope	93	23.3%
Religious orientation	5	1.3%
Shock	5	1.3%
Reasons for not consulting healthcare center		
Prefer private clinic	21	6.4%
Distrust healthcare workers	9	2.0%
Transportation difficulties	1	0.3%
Dislike staff behavior	2	0.6%

No statistically significant association was found between educational level and participants' knowledge, attitudes, or practices regarding tuberculosis, as all p-values were greater than 0.05.

Table 7. Association between educational level and knowledge, attitudes, and practices regarding tuberculosis

Variable	P-value
Knowledge about cause of TB	0.976
Knowledge about symptoms	0.696
Knowledge about transmission	0.371
Knowledge about prevention	0.835
Knowledge about treatment	0.436
Knowledge about severity	0.554
Timing of medical consultation	0.058
Consultation of healthcare center	0.595

DISCUSSION

Tuberculosis (TB) remains a major global public health problem despite being both preventable and curable. Low levels of awareness regarding TB may negatively influence healthcare-seeking behavior and contribute to continued disease transmission within the community. Therefore, the present study was conducted to assess the knowledge, attitudes, and practices of primary school teachers regarding TB in Basra city center. The study included 400 teachers from primary schools in Basra and assessed their knowledge, attitudes, and practices using a structured questionnaire during the period from March to April 2016.

The socio-demographic characteristics of the participants showed that most teachers were aged between 36 and 50 years (52.8%), while 28.5% were aged between 20 and 35 years. Females constituted the majority of the study population (86.5%). Most participants had graduated from teachers' institutes (62%), were married (79%), Muslims (99.5%), and residents of the city center (95.3%). These findings differed from a study conducted in the Somali region, where male respondents constituted the majority and younger age groups were more represented.(52)

The present study demonstrated a high level of awareness regarding TB, as all participants (100%) had heard about the disease. Similar findings were reported in studies conducted in the Somali region, South East Nigeria, and Kudat District, Sabah, where awareness levels ranged between 93.2% and 96%.(52,53,54) Media sources such as television, radio, and the internet were the main source of information for participants (53%), followed by family members and friends. These findings were consistent with a Nigerian study in which radio represented the primary information source.(53) However, they differed from a Malaysian study where healthcare workers represented the major source of information.(54)

Regarding knowledge about the etiology of TB, 51.2% of participants correctly identified bacteria as the causative agent, while many participants incorrectly believed that pollution was responsible for the disease. These findings were better than results reported from Somalia and Pakistan, where knowledge regarding bacterial causation was limited.(52,55) Adequate knowledge regarding the infectious nature of TB may positively affect health-

seeking behavior and encourage early medical consultation rather than dependence on traditional treatment methods.

Most participants demonstrated acceptable knowledge regarding the signs, symptoms, and transmission of TB. Chronic cough with hemoptysis for more than two weeks was recognized by 79% of teachers as a major symptom, while 92% understood that TB could be transmitted from person to person. Airborne transmission through coughing and sneezing was identified by 55.9% of respondents, whereas 41.5% believed that sharing patients' belongings could transmit the disease. Similar observations were reported in studies from Pakistan, India, and Kudat.(54,56,57) This level of awareness may contribute positively to TB control by reducing delays in diagnosis and treatment.

Knowledge regarding prevention and treatment was generally satisfactory. Most participants (97.5%) believed that TB is preventable, and 55.1% identified vaccination as a preventive measure, while 35.1% mentioned good nutrition and proper ventilation. Furthermore, 90% recognized that TB transmission can be prevented, and 56.8% considered patient isolation important for prevention. Similar findings were reported in Ethiopia and Pakistan.(56,58,59) In contrast, a Malaysian study found limited knowledge regarding TB prevention and transmission.(54)

The present study also showed high awareness regarding TB treatment and prognosis. Most participants (97%) believed that TB is curable, and 92.5% correctly identified modern drugs as the appropriate treatment. Similar findings were reported in the Somali region study, although the results were higher than those reported in some Ethiopian studies.(52,59,60) Nevertheless, some respondents still associated TB treatment with traditional healers or self-treatment approaches, which has also been reported in Ethiopian studies.(59) This may reflect delayed recognition of TB symptoms until severe manifestations such as weight loss and hemoptysis appear.(61)

The majority of teachers considered TB to be a serious disease (86.3%), which was similar to findings from the Somali region study.(52) However, no significant association was found between educational level and knowledge, attitudes, or practices regarding TB, which differed from studies conducted in Somalia and Kudat where higher educational levels were associated with better TB knowledge.(52,54) On the other hand, similar findings were reported in Nigeria and Southwest Ethiopia.(58,59)

Regarding healthcare-seeking practices, 95% of respondents stated that they would seek medical care if they developed symptoms suggestive of TB, and 93.3% reported that they would seek medical advice immediately after recognizing symptoms. These findings were consistent with results from the Somali region but differed from studies in Ethiopia and Kenya, where self-treatment and herbal remedies were more common.(52,61,62)

Concerning attitudes toward TB, 46.3% of participants stated that they would seek medical consultation if diagnosed with TB, whereas 28% reported feelings of fear and shame, and 23.3%

expressed sadness and hopelessness. These findings suggest that TB-related stigma still exists within the community. Similar observations were reported in studies conducted in Kudat, Pakistan, and Somalia.(52,54,55,56) Fear of TB may be related to perceptions regarding disease severity, prolonged treatment duration, mortality, and symptoms such as hemoptysis, which may lead individuals to compare TB with incurable diseases such as cancer.

Most participants (91.3%) preferred consulting primary healthcare centers if infected with TB, while only a small proportion preferred private clinics. This finding suggests a generally positive perception toward primary healthcare services in the study area.

CONCLUSIONS AND RECOMMENDATIONS

The present study concluded that primary school teachers in Basra city center had generally good awareness regarding tuberculosis (TB), particularly concerning its symptoms, severity, prevention, and treatment. Most participants obtained their information through mass media such as radio, television, and the internet. However, important gaps in knowledge were identified, especially regarding the causative agent and the correct mode of transmission, as a considerable proportion still believed that pollution causes TB and many were unaware of airborne transmission. Although most participants demonstrated positive attitudes and healthcare-seeking practices toward TB, fear and stigma related to the disease were still present among some respondents. No significant association was found between socio-demographic characteristics and knowledge, attitudes, or practices toward TB. Therefore, greater efforts are required to improve teachers' understanding of TB through structured health education programs focusing on the causative agent, transmission, prevention, and curability of the disease. Public awareness campaigns through media, seminars, exhibitions, and annual tuberculosis awareness activities should be strengthened regularly to reduce stigma and improve community knowledge. In addition, healthcare workers should receive continuous training to enhance their educational role in schools and communities, while further studies on knowledge, attitudes, and practices regarding TB are recommended to support and strengthen TB control programs.

FUNDING AND FINANCIAL SUPPORT

The study funded by the researchers.

DATA CONFIDENTIALITY AND STORAGE

The data will be processed with a higher degree of confidentiality and privacy.

CONFLICTS OF INTEREST

The researchers did not report any conflicts of interest.

REFERENCES

1. Mahboub BH, Vasts MKG. *Tuberculosis: Current Issues in Diagnosis and Management*. 2nd ed. 2016. p. 147-451.
2. Zaidan AS. *Tuberculosis in Children National Management Guideline*. Iraqi Ministry of Health, Chest and Respiratory Disease Center; Iraq; 2015.
3. Paulman PM, Paulman AA, Harrison JD. Tuberculosis: General Principles. In: *Taylor's Manual of Family Medicine*. 3rd ed. 2011. p. 354.
4. Davies PDO, Gordon SB, Davies G, editors. *Clinical Tuberculosis*. 5th ed. Boca Raton: CRC Press Taylor and Francis Group; 2014. p. 4-130.
5. World Health Organization. Early detection of tuberculosis. Available from: www.who.org/htm/stb/psi/2011.21 [Accessed 17 March 2012].
6. Joshua S, Eric N. Tuberculosis. In: Nilsson KR, Piccini JP, editors. *The Osler Medical Handbook*. 2nd ed. Philadelphia: Saunders Elsevier; 2006. p. 640-649.
7. Rakel RE, Rakel DP. *Textbook of Family Medicine*. 8th ed. Elsevier; 2011.
8. Iseman M, Raviglione M, Rieder L. Tuberculosis. In: Braunwald F, Hauser K, Loscalzo J, editors. *Harrison's Internal Medicine*. 17th ed. New York: McGraw-Hill; 2008. p. 765-812.
9. Zaidan AS. *Public-Private Mix Guideline National Tuberculosis Control Program*. 1st ed. Iraqi Ministry of Health, Chest and Respiratory Disease Center; Iraq; 2015. p. 6-9.
10. World Health Organization. *The Stop TB Strategy: Building on and Enhancing DOTS to Meet the TB-Related Millennium Development Goals*. Geneva: WHO; 2006.
11. Zaidan AS. *National Tuberculosis Management Guideline*. 5th ed. Iraqi Ministry of Health, Chest and Respiratory Disease Center; Iraq; 2015. p. 8-13.
12. Kasper D, Fauci A, Hauser S, Longo D, Jameson J, Loscalzo J. *Harrison's Principles of Internal Medicine*. 19th ed. New York: McGraw-Hill Education; 2015. p. 1522-1540.
13. Innes JA. *Davidson's Essentials of Medicine*. Edinburgh: Churchill Livingstone Elsevier; 2016. p. 293-294.
14. Heemskerk D, Caws M, Farrar J. *Tuberculosis in Adults and Children*. 3rd ed. Springer Briefs in Public Health; 2015. p. 3-4.
15. Benjamin IJ, Griggs RC, Wing EJ, Fitz G. *Andreoli and Carpenter's Cecil Essentials of Medicine*. 9th ed. Saunders; 2016. p. 256.
16. World Health Organization. *Global Tuberculosis Report*. Available from: http://www.who.int/tb/publications/global_report/en [Accessed 7 July 2015].

17. Iseman MD, Afdhal NH, Akhter M. Epidemiology of tuberculosis. In: *Cecil Medicine*. 23rd ed. 2007. p. 345.
18. Haweel MG, Ali FA, Abass MR, Marzook AA, Zaidan AS. *The Epidemic of Tuberculosis: Tuberculosis Annual Report NTP 2012*. Republic of Iraq, Ministry of Health, Chest and Respiratory Disease Specialized Center; 9th ed. p. 6-10.
19. National Tuberculosis Control Program. *Vision, Goals and Stop TB Strategy: Burden of Tuberculosis in Iraq*. Iraq.
20. World Health Organization. *The Sixteenth Global Report on Tuberculosis*. Geneva: WHO; 2011.
21. World Health Organization. *Global Tuberculosis Control: Surveillance, Planning, Financing*. WHO Report 2006.
22. Chaisson RE, Martinson NA. Tuberculosis in Africa—combating an HIV-driven crisis. *N Engl J Med*. 2008;358(11):1089-1092.
23. Gibson PG, Abramson M, Wood-Baker R, Volmink J, Hensley M, Costabel U, editors. *Evidence-Based Respiratory Medicine*. 1st ed. BMJ Books; 2005. p. 321.
24. Lawn SD, Zumla AI. Tuberculosis. *Lancet*. 2011;378(9785):57-72.
25. Griffith D, Kerr C. Tuberculosis: disease of the past, disease of the present. *J Perianesth Nurs*. 1996;11(4):240-245.
26. ATS/CDC Statement Committee on Latent Tuberculosis Infection. Targeted tuberculin testing and treatment of latent tuberculosis infection. *MMWR Recomm Rep*. 2000;49(RR-6):1-51.
27. van Zyl Smit RN, Pai M, Yew WW, Leung CC, Zumla A, Bateman ED, et al. Global lung health: the colliding epidemics of tuberculosis, tobacco smoking, HIV and COPD. *Eur Respir J*. 2010;35(1):27-33.
28. Restrepo BI. Convergence of the tuberculosis and diabetes epidemics: renewal of old acquaintances. *Clin Infect Dis*. 2007;45(4):436-438.
29. Möller M, Hoal EG. Current findings, challenges and novel approaches in human genetic susceptibility to tuberculosis. *Tuberculosis*. 2010;90(2):71-83.
30. Jindal SK, editor. *Textbook of Pulmonary and Critical Care Medicine*. New Delhi: Jaypee Brothers Medical Publishers; 2011. p. 525.
31. Niederweis M, Danilchanka O, Huff J, Hoffmann C, Engelhardt H. Mycobacterial outer membranes: in search of proteins. *Trends Microbiol*. 2010;18(3):109-116.
32. Parish T, Stoker N. Mycobacteria: bugs and bugbears (two steps forward and one step back). *Mol Biotechnol*. 1999;13(3):191-200.
33. Kelly EB, Wilker I, Ambrose M. *Tuberculosis and Super Bugs: Examining TB and Bacterial Infectious Diseases, Disorders, Symptoms*. 2015. p. 11-47.
34. Nicas M, Nazaroff WW, Hubbard A. Toward understanding the risk of secondary airborne infection: emission of respirable pathogens. *J Occup Environ Hyg*. 2005;2(3):143-154.
35. World Health Organization. Tuberculosis Fact Sheet No. 104. Geneva: WHO; 2010.
36. Wilson M, McHugh TD. *Tuberculosis Laboratory Diagnosis and Treatment Strategies*. 2nd ed. Advances in Molecular and Cellular Microbiology; 2013. p. 67-243.
37. Mayo Clinic. Causes of Tuberculosis. Mayo Clinic; 21 December 2006.
38. Brennan PJ, Nikaido H. The envelope of mycobacteria. *Annu Rev Biochem*. 1995;64:29-63.
39. Centers for Disease Control and Prevention. *Core Curriculum on Tuberculosis: What the Clinician Should Know*. 5th ed. CDC; 2011. p. 24.
40. Menzies D, Al Jahdali H, Al Otaibi B. Recent developments in treatment of latent tuberculosis infection. *Indian J Med Res*. 2011;133(3):257-266.
41. Mainous AG III. *Management of Antimicrobials in Infectious Diseases: Impact of Antibiotic Resistance*. Totowa, NJ: Humana Press; 2010. p. 69.
42. World Health Organization. *The Stop TB Strategy: Building on and Enhancing DOTS to Meet the TB-Related Millennium Development Goals*. Geneva: WHO; 2006.
43. South Africa Department of Health. *National TB Infection Control Guidelines*. South Africa; 2007.
44. Santha T, Garg R, Frieden TR, Ganapathy S. Risk factors associated with default, failure and death among tuberculosis patients treated in a DOTS programme in Tiruvallur District, South India. *Int J Tuberc Lung Dis*. 2002;6:780-788.
45. Santha TN, Lonnroth K. Initial defaulting in the National Tuberculosis Programme in Ho Chi Minh City, Vietnam: a survey of extent, reasons and alternative actions taken following default. *Int J Tuberc Lung Dis*. 2003;8:735-741.
46. Kielstra P. Ancient enemy, modern imperative – A time for greater action against tuberculosis. *Economist Insights*. 2014.
47. Courtwright A, Turner AN. Tuberculosis and stigmatization: pathways and interventions. *Public Health Rep*. 2010;125(Suppl 4):34-42.
48. Mason PH, Roy A, Spillane J, Singh P. Social, historical and cultural dimensions of tuberculosis. *J Biosoc Sci*. 2015;1-27.
49. Kumar V, Abbas AK, Fausto N, Mitchell RN. *Robbins Basic Pathology*. 8th ed. Saunders Elsevier; 2007. p. 516-522.
50. Lambert M, et al. Recurrence in tuberculosis: relapse or reinfection? *Lancet Infect Dis*. 2003;3(5):282-287.
51. Wang JY, Lee LN, Lai HC, Hsu HL, Liaw YS, Hsueh PR, et al. Prediction of the tuberculosis reinfection proportion

- from the local incidence. *J Infect Dis.* 2007;196(2):281-288.
52. Tolossa D, Medhin G, Legesse M. Community knowledge, attitude, and practices towards tuberculosis in Shinile town, Somali regional state, eastern Ethiopia: a cross-sectional study. 2014.
 53. Onyeonoro UU. Assessment of tuberculosis-related knowledge, attitudes and practices in Enugu, South East Nigeria. 2011.
 54. Koay TK. Knowledge and attitudes toward tuberculosis among the people living in Kudat District, Sabah. 2004.
 55. Khan AJ, Irfan M, Zaki A, Beg M, Hussain FS, Rizvi N. Knowledge, attitude and misconception regarding tuberculosis in Pakistani patients. *J Pak Med Assoc.* 2006.
 56. Mushtaq UM, Shahid U, Abdullah MH, Saeed A, Omer F, Shad AM, et al. Urban-rural inequities in knowledge, attitudes and practices regarding tuberculosis in two districts of Pakistan's Punjab province. *Int J Equity Health.* 2011;10:8.
 57. Yadav PS, Mathur LM, Dixit KA. Knowledge and attitude towards tuberculosis among sandstone quarry workers in desert parts of Rajasthan. *Indian J Tuberc.* 2006;53:187-195.
 58. Melaku S, Sharma RH, Alemie AG. Pastoralist community's perception of tuberculosis: a quantitative study from Shinille area of Ethiopia. *Tuberc Res Treat.* 2013.
 59. Deribew A, Abebe G, Apers L, Jira C, Tesfaye M, Shifa J, et al. Prejudice and misconceptions about tuberculosis and HIV in rural and urban communities in Ethiopia: a challenge for the TB/HIV control program. *BMC Public Health.* 2010.
 60. Abebe G, Deribew A, Apers L, Woldemichael K, Shiffa J. Knowledge, health-seeking behaviour and perceived stigma towards tuberculosis among tuberculosis suspects in a rural community in southwest Ethiopia. *PLoS One.* 2010.
 61. Gele AA, Sagbakken M, Abebe F, Bjune AG. Barriers to tuberculosis care: a qualitative study among Somali pastoralists in Ethiopia. *BMC Res Notes.* 2010.
 62. Liefoghe R, Baliddawa BJ, Kipruto ME, Vermeire C, De Munynck AO. From their own perspectives: a Kenyan community's perception of tuberculosis. *Trop Med Int Health.* 1997.

AUTHORS

Raghad Samir Lazim
Family Medicine Specialist

Zainab Ahmed Abdulzahraa
Family Medicine Specialist

Mariam Abdul-Jalil Muhsin
Family Medicine Specialist