Original Article

Prevalence of Tuberculosis Infection and Treatment Outcome in Babylon Province of Iraq: A Retrospective Study

Taif Saad Jasim, Amer Hayat Khan[1], Nada Khazal K. Hindi[2]

Departments of Microbiology, Universiti Sains Malaysia, Penang, Malaysia, [1]Department of Clinical Pharmacy, School of Pharmaceutical Sciences, Universiti Sains Malaysia, Penang, Malaysia, [2]Department of Basic and Medical Science, College of Nursing, Babylon University, Hilla, Iraq

Abstract

Background: Tuberculosis (TB) mainly affects the lungs (pulmonary TB) and also can impact other parts of the body (extrapulmonary TB). **Objectives:** The main purpose of this study was to experience the prevalence of tuberculosis and the treatment outcome rate in Babylon, Iraq. **Materials and Methods:** A cohort retrospective study was carried out at the health center for asthma and allergies from January 2016 to March 2021 in the Babylon Province, Iraq. This study sighted on the characteristics of TB patients; age, sex, site of tuberculosis, and treatment outcome. **Results:** There were 1774 cases of TB registered in the medical records of the health center in Babylon, Iraq. As a result, we found that female patients represented 53.4% of patients, as compared with male patients who constituted 46.6% of patients. The age group between 61 years old and older recorded the highest percentage (n = 359; 20.2%) and the less percentage of those who are <10 years old (n =122; 6.9%). Site of infection, pulmonary tuberculosis (n = 992; 56.0%), and extrapulmonary tuberculosis (n = 782; 44.0%). Treatment outcomes include treatment complete (63.7%), cure (24.1%), death (3.1%), default (0.5%), fail (0.3%), transfer (0.1%), and other (8.1%). Which has a successful treatment percentage (87.8%) and an unsuccessful treatment (12.1%). **Conclusions:** This study concluded that females were more likely to be infected with tuberculosis than males. Additionally, the success rate of treatment was (87.8%), while the unsuccessful rate was (12.1%). While age group that the highest percentage was noted among those 61 years old and older (n = 359; 20.2%).

Keywords: Babylon province, Iraq, Prevalence, Treatment outcome, Type of tuberculosis

Introduction

Tuberculosis (TB) is still a prominent general health issue globally and the main cause of morbidity and mortality. Approximately 1.7 billion (26%) are ill with *Mycobacterium tuberculosis* in the world's population.[1] It is estimated that 1/3 of the world's inhabitants are infected with tuberculosis. It is the preponderance without symptoms of this state of a disease named latent.[2] About 10% of those latently affect developing active tuberculosis, and the prevalence (90%) will remain asymptomatic.[3]

TB is an intracellular bacterial infectious illness produced by *M. tuberculosis*. It essentially influences the lungs and also impacts other areas of the body (extrapulmonary TB).[4] Tuberculosis spreads through individuals who are sick with active pulmonary TB disease released in the atmosphere through coughing, sneezing, or talking and then inhaled by another person.[5] A cough with sputum or blood, chest pains, fever, weight loss, and night sweats are all indicators of active pulmonary TB.[6]

Tuberculosis infection rates in Iraq are 42 per 100,000 people, according to the WHO's Eastern Mediterranean Region (WHO-EMR).[7]

Most infections of TB develop in adults (about 90%), and infection is more increased in males than females.[8] Additionally, the male-to-female ratio of 1.6:1, worldwide.[9] Additionally, about 10.4 million recent issues were internationally detected, of which (90%) were

Access this article online

Quick Response Code:

Website: www.medjbabylon.org

DOI: 10.4103/MJBL.MJBL_336_22

Address for correspondence: Prof. Dr. Nada Khazal K. Hindi, Department of Basic and Medical Science, College of Nursing, Babylon University, Hilla 51001, Iraq.
E-mail: nadakhazal@yahoo.com

Submission: 17-Dec-2022 **Accepted:** 09-Jan-2023 **Published:** 27-Apr-2023

How to cite this article: Jasim TS, Khan AH, Hindi NKK. Prevalence of tuberculosis infection and treatment outcome in Babylon Province of Iraq: A retrospective study. Med J Babylon 2023;20:194-200.

grownups, (65%) were males, and children aged (<15 years) consist of (6.9%) of the notified new tuberculosis cases in 2016.[10]

TB is also defined multisystemic disease and infects several organ systems. The organ most frequently influenced incorporate the ventilatory apparatus, the digestive apparatus, the lymph reticular apparatus, the skin, the central nervous apparatus, the musculoskeletal apparatus, the genital apparatus, and the liver[11,12]

Although tuberculosis management and the decrease in both new cases and fatality, tuberculosis stays a challenge, especially in low-income governments. Especially maturing countryside with 6 nations, India, Indonesia, China, Nigeria, Pakistan, and South Africa, accounted for 60% of TB death in 2015.[7,13] In this study, we will focus on who is more likely to have TB by age, gender, and site of TB, while the main purpose of this study is to experience the prevalence of tuberculosis and the treatment outcome rate in Babylon of Iraq.

Materials and Methods

Research design

A cohort descriptive study is achieved to explore the prevalence of tuberculosis and treatment outcome rate from January 2016 to March 2021 to detect tuberculosis cases in the Babylon province of Iraq.

Sample size and data collection

This study is based on the data available retrospectively. The number of cases (1774) of TB patients that were diagnosed and collected through using medical records for the year 2021. The collection of the data from medical records retrospectively TB patients. We got this data from the health center for asthma and allergies in the Babylon province of Iraq. The medical records include information on the TB patient's [age, gender, and site of disease (pulmonary or extrapulmonary) and case category (new, relapse, treatment after default, and treatment after failure)].

Data analysis

Data were investigated and processed using SPSS version 23.0 (SPSS, IBM Company, Chicago, IL 60606, USA). IBM SPSS Statistic is a software package used for descriptive and bivariate analysis and numerical outcome predictions. Data were conducted for categorical variables as means with standard deviations and a t-test was used to quantify correlations between variables. Pearson correlation was used to assess the relationship between two continuous variables. The statistical significance was determined at a P-value < 0.05.

Ethical approval

The study was conducted in accordance with the ethical principles that have their origin in the Declaration of Helsinki. It was carried out with patients' verbal and analytical approval before the sample was taken. The study protocol and the subject information and consent form were reviewed and approved by a local ethics committee, according to the document number 661 dated in 12/01/2016 to get this approval.

Results

Figure 1 represents the distribution of the study sample by their age in terms of frequencies and percentages. Out of 1774 the mean age M ± SD = 39.99 ± 21.013, the age group between 61 years old and older registered the highest rate (n = 359; 20.2%), then followed by 21–30 years old (n = 323; 18.2%), 41–50 years old (n = 264; 14.9%), 31–40 years old (n = 256; 14.4%), 10–20 years old (n = 238; 13.4%), 51–60 years old (n = 212; 12.0%), and followed by those who are <10 years old (n =122; 6.9%).

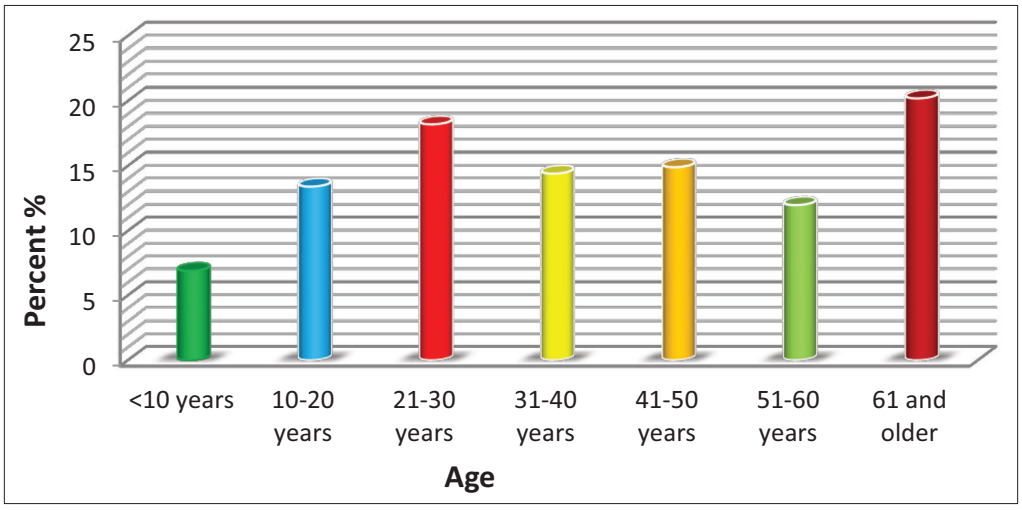

Figure 1: Relationship between the age of patients with TB

The results of the frequency of participants dependent on gender revealed that out of 1774 study participants, the majority were female (n = 948; 53.4%), as compared with those who are male patients (n = 826; 46.6%).

The results also revealed that percentage for the site of TB. EP: extrapulmonary of tuberculosis (44%), PTB: pulmonary tuberculosis (56%).

The results of Table 2 showed lymph nodes (n = 317; 40.6%) were the most common of EPTB.

Figure 3 shows the organs infected with extrapulmonary TB, while Figure 4 shows a decline in infection among TB patients during (2016, 26.2%–2021, 3.2%).

The Pearson correlation analysis demonstrates that there is a positive correlation between the patient's age and the site of TB infection (r = 0.169; P = 0.001). There was a positive correlation between the patient's age and symptoms (r = 0.176; P = 0.001). There was a reverse correlation between patients' age and EP subdiagnosis (r = –0.074; P = 0.002). There was no significant correlation between patients' age and TTT outcome (r = –0.006; P = 0.800).

Independent sample t test revealed there are significant differences in patients' gender with regard the site of TB infection (M ± SD = 1.61 ± 0.488) for males and (M ± SD = 1.51 ± 0.500) for females. There are significant differences in patients' gender with regard to symptoms (M ± SD = 1.64 ± 0.481) for males and (M ± SD =1.54 ± 0.498) for females. There are significant differences in patients' gender with regard EP subdiagnosis (M ± SD = 2.26 ± 2.200) for males and (M ± SD = 2.61 ± 2.402) for females. There are significant differences in patients' gender with regard X-ray (M ± SD = 1.29 ± 0.499) for males and (M ± SD = 1.41 ± 0.532) for females. There are significant differences in patients' gender with regard TTT outcome (M ± SD = 1.87 ± 0.840) for males and (M ± SD = 1.95 ± 0.747) for females.

The treatment outcome of TB: the successful treatment percentage (is 1558; 87.8%), while the unsuccessful treatment percentage (is 216; 12.2%) as shown in Figure 5.

Discussion

In this current study, the documents of TB patient cases registered at the health center for asthma and allergies from January 2016 to March 2021 (retrospective study) in the Babylon province of Iraq are analyzed for the evaluation of the prevalence of TB infection and treatment outcome rate using SPSS 26 version. Out of 1774, the mean age M ± SD = 39.99 ± 21.013. Therefore, this present research displayed that the rate of TB is most elevated in the productive age group (10–61, and older) as shown in Table 1, and this is in arrangement with the results of studies conducted in Ethiopia.[14-16] These findings can be because of the great movement of this age group for financial and social reasons or historic diseases or a poor immune system.

We also found that infection of TB related to gender, a majority of the study participants were female (n = 948; 53.4%), as compared with those who are male patients (n = 826; 46.6%) as shown in Figure 2, which is in disagreement with the reports of WHO 16[9] and in India.[29] But we found our results agree with a study conducted in Erbil, Iraq.[30] This may be due to fear or low education and awareness from health institutions or distance from patients to health care.

Related to the site of tuberculosis, the findings showed that the rate of the infection EPTB (44%), compared with PTB (56%) is the expected result because TB infects mainly the lung, according to Table 3, while extrapulmonary TB can infect as pleural effusions, lymph nodes, meningitis, stomach and intestine, skin, bone, and joints.[17] These results are in agreement with various studies that the percentage of infection PTB is more than EPTB.[18-20] In contrast, this study disagreement with the study in Saudi

Table 1: Frequency of study participants according to age

Age (years)	Age groups	No (%)
M ± SD = 39.99 ± 21.013	<10 years	122 (6.9)
	10–20 years	238 (13.4)
	21–30 years	323 (18.2)
	31–40 years	256 (14.4)
	41–50 years	264 (14.9)
	51–60 years	212 (12.0)
	61 and older	359 (20.2)
	Total	1774 (100.0)

Table 2: Type of tuberculosis cases

Site of TB	Frequency	%
EP	782	44
PTB	992	56
Total	1774	100

EP = extrapulmonary tuberculosis, PTB = pulmonary tuberculosis

Table 3: Extrapulmonary tuberculosis cases

EPTB	Frequency	%
Bone and vertebrae	132	17.0
Endocardium	12	1.5
Genitourinary	16	2.0
Lymph nodes	317	40.6
Meningitis	42	5.4
Pleural effusion	120	15.4
Skin	27	3.4
Stomach and intestines	57	7.3
Other	58	7.4
Total	781	100%

Arabia was the percentage of EPTB was 57.5% compared with PTB 42.5%.[21]

These results that showed lymph nodes (n = 317; 40.6%) are the most common of EPTB as shown in Table 4. It is in agreement with studies in Nepal[22] and Turkey.[20] In contrast, it is not in agreement with a study in Iraq[23] and Iran[24] that pleural infection was the most common site in EPTB patients, and also in Hong Kong where the skin and genitourinary were the most common of EPTB.[25] In the United States, most common sites of EPTB are bones and joints.[26]

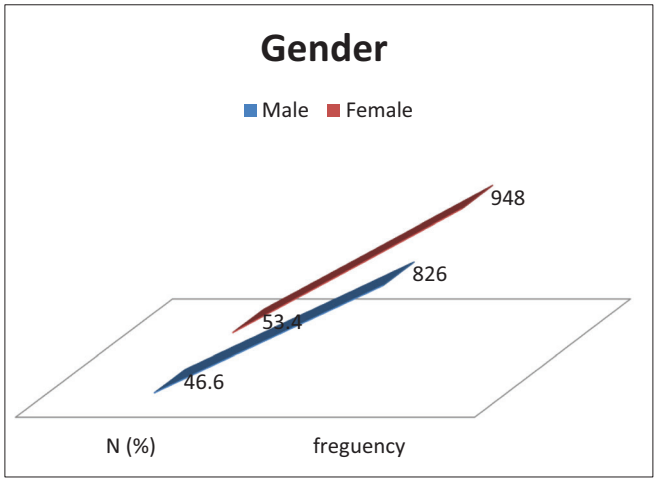

Figure 2: Relationship between patients of TB in gender

Through these results, we found that successful treatment outcomes included complete (63.7%) and cure (24.1%), which successful treatment percentage (87.8%), but while unsuccessful treatment outcomes included death (3.2%), default (0.5%), fail (0.3%), transfer (0.1%), and other (8.1%), which unsuccessful treatment percentage (12.2%) as shown in Table 6. Which is in agreement with a study in Bale Zone, Southeast Ethiopia.[27] The reason is this successful the reason that patients become more aware of the treatment regimen, use drugs regularly, and visit the health center to check their status.

During the Pearson correlation analysis, treatment outcome and patient age did not show a significant correlation (r = –0.006; P = 0.800), and the respect to the site

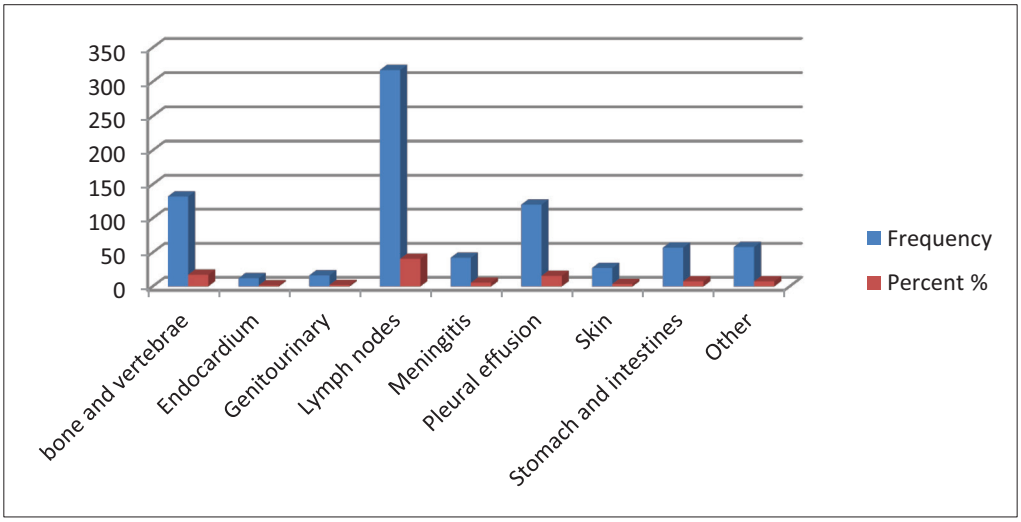

Figure 3: Organs infected with extrapulmonary TB

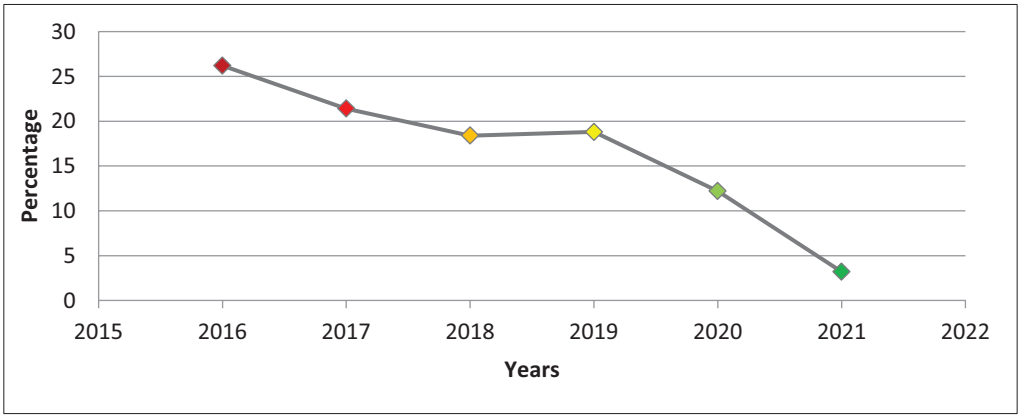

Figure 4: The prevalence rate of tuberculosis

Table 4: Correlation between patients' age with regard to site of TB, symptoms, EP sub-diagnosis, X-ray, and TTT outcome

Age	Pearson correlation (*r*)	Number	Sig. (2-tailed)	Assessment
Site of TB	0.169**	1774	0.001	Highly sig.
Symptoms	0.176**	1774	0.001	Highly sig.
EP subdiagnosis	–0.074**	1774	0.002	Significance
X-ray	–0.157**	1774	0.001	Highly sig.
TTT outcome	–0.006	1774	0.8	Non-sig.

r: Pearson correlation

*Correlation is significant at the 0.05 level (2-tailed)

**Correlation is significant at the 0.01 level (2-tailed)

Table 5: Differences in patients' gender with regard to site of TB, symptoms, EP subdiagnosis, X-ray, and TTT outcome

Variables	Gender	Mean (SD)	*t*-value	d.f	$P \leq 0.05$ (sig.)	Assessment
Site of TB	Male	1.61 (0.488)	4.151	1772	0.001	Highly sig.
	Female	1.51 (0.5)				
Symptoms	Male	1.64 (0.481)	4.052	1772	0.001	Highly sig.
	Female	1.54 (0.498)				
EP subdiagnosis	Male	2.26 (2.2)	3.177	1772	0.001	Highly sig.
	Female	2.61 (2.402)				
X-ray	Male	1.29 (0.499)	5.096	1772	0.001	Highly sig.
	Female	1.41 (0.532)				
TTT outcome	Male	1.87 (0.84)	2.043	1772	0.001	Highly sig.
	Female	1.95 (0.747)				

M: mean, SD: standard deviation, *t*: *t* test, df: degree of freedom, Sig: significance, *P*: probability value, S: significant

P-value is highly significant at the 0.001

Table 6: Treatment outcome of tuberculosis cases

Treatment outcome	Frequency	%
Complete	1130	63.7
Cure	438	24.1
Death	55	3.2
Default	9	0.5
Fail	6	0.3
Transfer	2	0.1
Other	144	8.1
Total	1774	100.0

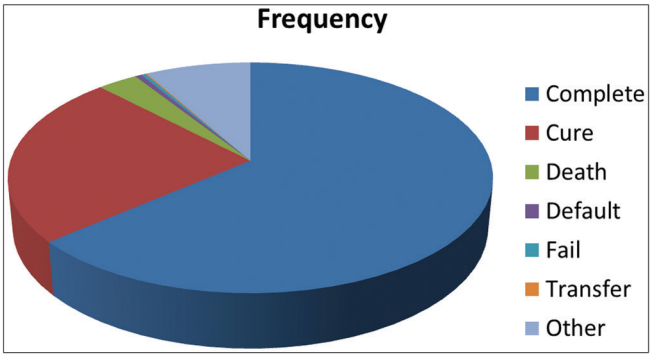

Figure 5: Frequency for treatment outcome of TB; complete (1130), cure (428), death (55), default (9), fail (6), transfer (2), and other (144)

of TB, there is a positive correlation between the patient's age and the site of TB infection ($r = 0.169$; $P = 0.000$) as shown in Table 4. There is a significant difference in gender patients with regard to the site of TB infection based on an independent sample *t* test ($M \pm SD = 1.61 \pm 0.488$) for males and ($M \pm SD = 1.51 \pm 0.500$) for females. While in treatment outcomes there is a difference significant with regard to patients' gender ($M \pm SD = 1.87 \pm 0.840$) for males and ($M \pm SD = 1.95 \pm 0.747$) for females, as shown in Table 5. Based on a study conducted by Addis Ababa, Ethiopia, the mean treatment success rate of all recorded PTB patients was 82.6%. Gender, age, and type of TB had no significant impact on the rate of success.[28]

Figure 4 shows the prevalence, incidence of tuberculosis infection from 2016 to 2021. We notice that the highest percentage in 2016 of people infected with tuberculosis ($n = 26.2\%$) compared with other years. A decline in infection among TB patients (2016, 26.2%–2021, 3.2%). This might be due to the use of drug regiment regularly, surveillance correctly among patients with TB, and visiting people to health centers to check their status, or the opposite might be because of the fear or little people on a visit to health centers.

The limitation of the study is that it is based on routinely recorded data. Although this had the advantage of allowing the study to be completed rapidly and at a low cost. The data of this study were the quality of low in addition to another limitation of this study is that recorded

information was limited to a few key characteristics of people infected with TB.

Conclusions

In terms of age group, the highest percentage was noted among those 61 years old and older (n = 359; 20.2%) and <10 years old were recorded with the lowest percentage (n = 122; 6.9%). While respect to gender, female patients constituted more than half of the study sample (n = 948; 53.4%), as compared with those who are male patients (n = 826; 46.6%). And respect to treatment outcome, the successful treatment percentage (n = 1558; 87.8%), while the unsuccessful treatment percentage (216; 12.2%). Then we found in this study that the percentage site of tuberculosis were extrapulmonary tuberculosis (n = 782; 44%) and pulmonary tuberculosis (n = 992; 56%), and the most site common EPTB is lymph nodes (n = 317; 40.6%). The surveillance activities, early diagnosis, preventative treatments, and determinants of tuberculosis will be a part of the post-2021 strategy to control tuberculosis, which will be the key to accelerating the decline in the incidence. Furthermore, we also recommend exploring risk factors that were not checked by the current study.

Acknowledgments

We would like to thank all the administrative staff of the health center for asthma and allergies in the Babylon Province of Iraq for their support throughout the study period.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

References

1. Khan M, Ntoumi F, Aklillu E, Mwaba P, Kapata N, Mfinanga S, *et al*. Global tuberculosis report 2020—Reflections on the global TB burden, treatment and prevention efforts. Int J Infect Dis 2021;113:S7-S12.
2. Dorhoi A, Reece ST, Kaufmann SHE. For better or for worse: The immune response against *Mycobacterium tuberculosis* balances pathology and protection. Immunol Rev 2011;240:235-51.
3. Lee SW, Wu LSH, Huang GM, Huang KY, Lee TY, Weng TY. Gene expression profiling identifies candidate biomarkers for active and latent tuberculosis. BMC Bioinformatics 2016;17:27-9.
4. Wang L, Zhang Z, Yan Q, Lu J, Gao B, Zhao Y, Pang Y, *et al*. Diagnostic dilemma of pulmonary tuberculosis among adults with severe mental illness in Beijing, China. BMC Infect Dis 2017;17:1-6.
5. Tiemersma EW, van der Werf MJ, Borgdorff MW, Williams BG, Nagelkerke NJD. Natural history of tuberculosis: Duration and fatality of untreated pulmonary tuberculosis in HIV negative patients: A systematic review. PLoS ONE 2011;6:e17601.
6. W. H. Organization, Global Tuberculosis Report 2013. World Health Organization, 2013. books.google.com.
7. Merza MA. A 5-year experience characterizing the demographic and clinical profile and directly observed treatment short-course treatment outcome in National Tuberculosis Center of Duhok province, Iraqi Kurdistan. SAGE Open Med. 2019;8:205031212092105.
8. Tiemersma EW, van der Werf MJ, Borgdorff MW, Williams BG, Nagelkerke NJD. Natural history of tuberculosis: Duration and fatality of untreated pulmonary tuberculosis in HIV negative patients: A systematic review. PLoS ONE 2011;6:e17601.
9. Marçôa R, Ribeiro AI, Zão I, Duarte R. Tuberculosis and gender-factors influencing the risk of tuberculosis among men and women by age group. Pulmonology 2018;24:199-202.
10. World Health Organization. Global Tuberculosis Report. WHO/HTM/TB/2015.22. Geneva, Switzerland: World Health Organization; 2015.
11. Mbuh TP, Ane-Anyangwe I, Adeline W, Thumamo Pokam BD, Meriki HD, Mbacham W. Bacteriologically confirmed extra pulmonary tuberculosis and treatment outcome of patients consulted and treated under program conditions in the littoral region of Cameroon. BMC Pulm Med 2019;19:1-7.
12. Mathiasen VD, Andersen PH, Johansen IS, Lillebaek T, Wejse C. Clinical features of tuberculous lymphadenitis in a low-incidence country. Int J Infect Dis 2020;98:366-71.
13. Pan Z, Zhang J, Bu Q, He H, Bai L, Yang J, *et al*. The gap between global tuberculosis incidence and the first milestone of the WHO End tuberculosis strategy: An analysis based on the global burden of disease 2017 database. Infect Drug Resist 2020;13:1281-6.
14. Addis Z, Birhan W, Alemu A, Mulu A, Ayal G, Egash H. Treatment outcome of tuberculosis patients in Azezo health center, North West Ethiopia. Int J Biomed Adv Res 2013;4:167161-173, .
15. Gebrezgabiher G, Romha G, Ejeta E, Asebe G, Zemene E, Ameni G. Treatment outcome of tuberculosis patients under directly observed treatment short course and factors affecting outcome in southern Ethiopia: A five-year retrospective study. PLoS ONE 2016;11:e0150560.
16. Datiko DG, Tulloch O, Markos P, Aschalew M, Shargie EB, Yassin MA, *et al*. Innovative community-based approaches doubled tuberculosis case notification and improve treatment outcome in Southern Ethiopia. PLoS ONE 2013;8:e63174.
17. Ahmed ST, Ali RM, Shihab BA. Prevalence of tuberculosis infection among Iraqi patients. World J Pharm Res 2018;7:1383-94.
18. Sharma SK, Mohan A. Multi drug-resistant tuberculosis: A menace that threatens to destabilize tuberculosis control. Chest 2006;130:261-72.
19. AL-Kareemi KK. Epidemiological Study on the Resistance of Mycobacterium tuberculosis to Antimicrobials and the Effect of Diacetyl. A Thesis, College of Medicine, Baghdad University; 2008.
20. Gunal S, Yang Z, Agarwal M, Koroglu M, Arıcı ZK, Durmaz R. Demographic and microbial characteristics of extrapulmonary tuberculosis cases diagnosed in Malatya, Turkey, 2001–2007. BMC Public Health 2011;11:1-8.
21. Al-Otaibi F, el Hazmi MM. Extra-pulmonary tuberculosis in Saudi Arabia. Indian J Pathol Microbiol 2010;53:227-31.
22. Sreeramareddy CT, Panduru K, Verma SC, Joshi HS, Bates MN. Comparison of pulmonary and extrapulmonary tuberculosis in Nepal—A hospital-based retrospective study. BMC Infect Dis 2008;8:1-7.
23. Karadakhy K, Othman N, Ibrahimm F, Saeed AA, Amin AA-AH. Tuberculosis in Sulaimaniyah, Iraqi Kurdistan: A detailed analysis of cases registered in treatment centers. Tanaffos 2016;15:197.
24. Safdari H, Sadeghi A, Ghazvini K, Mohammadi S, Derakhshan M. Prevalence of *Mycobacterium tuberculosis* in the samples referred to the tuberculosis research laboratory in Mashhad Ghaem Hospital during 2005–2006. Iran J Microbiol 2009;1:20-2.
25. Noertjojo K, Tam CM, Chan SL, Chan-Yeung MMW. Extra-pulmonary and pulmonary tuberculosis in Hong Kong. Int J Tuberc Lung Dis 2002;6:879-86.
26. Peto HM, Pratt RH, Harrington TA, LoBue PA, Armstrong LR. Epidemiology of extrapulmonary tuberculosis in the United States, 1993–2006. Clin Infect Dis 2009;49:1350-7.

27. Woldemichael B, Darega J, Dida N, Tesfaye T. Treatment outcomes of tuberculosis patients and associated factors in Bale Zone, Southeast Ethiopia: A retrospective study. J Int Med Res 2021;49:03 00060520984910300060520984916.
28. Getahun B, Ameni G, Medhin G, Biadgilign S. Treatment outcome of tuberculosis patients under directly observed treatment in Addis Ababa, Ethiopia. Braz J Infect Dis 2013;17:521-8.
29. Adhikary M, Phukan JP, Debnandi A, Sinha A, Das S, Lath A. Prevalence of rifampicin-resistant *Mycobacterium tuberculosis* by CBNAAT in a tertiary care hospital of West Bengal, India. Med J Babylon 2022; 19:362.
30. Hussein ZS. Pulmonary tuberculosis: Impact of clinical and radiological presentations on mortality. Med J Babylon 2022; 19:288.