SJIF Impact Factor: 5.464

WORLD JOURNAL OF ADVANCE HEALTHCARE RESEARCH

ISSN: 2457-0400
Volume: 7.
Issue: 12
Page N. 201-206
Year: 2023

Original Article www.wjahr.com

EPIDEMIOLOGICAL CHARACTERISTICS OF TUBERCULOSIS IN IRAQ, MOSUL CITY AFTER ISIS INVASION

Dr. Farah Ghalib Al-Sultan*[1], Dr. Mohammed Assi Jasim[2], Dr. Jeehan Shaker Hassan[3], Dr. Bashar Hashim Abbass[4] and Raghad Ghalib Alsultan[5]

[1]FETP Resident.
[2,3,4]M.B.Ch.B. FICMS/CM, Public Health Specialist, Public Health Department / Nineveh Directorate of Health.
[5]Northern Technical University, Mosul Technical Institute.

Article Received date: 22 October 2023 **Article Revised date:** 12 November 2023 **Article Accepted date:** 02 December 2023

***Corresponding Author: Dr. Farah Ghalib Al-Sultan**

FETP Resident.

ABSTRACT

Background: leading to the destruction of health system infrastructure including the national tuberculosis program (NTP). Mosul city is one of the largest cities in Iraq. Which was badly invaded by ISIS (2014-2017), And since Tuberculosis (TB) is one of the major communicable diseases worldwide and one of the leading causes of death from a single infectious agent. So, this study was established to estimate TB prevalence and to describe the epidemiological profile and treatment outcomes of TB in Mosul city after the ISIS invasion. **Methods:** a descriptive retrospective study of drug-susceptible TB patients in the National Tuberculosis Program Center(NTP) of Ninawa. The Recording data were reviewed during 2018patient's demographic, clinical, and laboratory characteristics were analyzed and treatment outcomes were -2021. Information on the determined. **Results:** A total of 840 tuberculosis patients were recorded. the incidence rate per 100,000 population in Mosul city was 10.8, 13.8, 11.1 and, 10.3 for the years 2018,2019, 2020 The age group 15–34 years were most affected with a percentage of 37%. The female patients were and 2021, respectively. predominant. The treatment outcomes for the study period were as follows: treatment success of about 95%, 1.7. **Conclusion: %** death rate,2.3%lost to fo The incidence of TB is within the Acceptable rate during the study period. the most commonly llow-up, with zero treatment failure rate. affected age group was 15-34, with satisfactory treatment outcomes. The female incidence rate was predominanmobilizing support to eliminate underlying risk factors and assure gendert, with a high percentage of extrapulmonary tuberculosis (EXTB). So, we recommended -equitable access, including gender sensitive services for TB prevention, diagnosis, treatment, care and support.

INTRODUCTION

Tuberculosis (TB) is a communicable disease that is a major cause of ill health and one of the leading causes of death worldwide.[1] Until the coronavirus (COVID- 19) pandemic, TB was the leading cause of death from a single infectious agent.[2] TB is curable and preventable but can be lethal if not treated effectively.[3] Despite high expectations regarding the elimination of TB, the disease's incidence is increasing in some parts of the world.[4] Annually, about 10 million people become ill with TB and 1.5 million people die from the disease worldwide – making it the world's top infectious killer.[5] According to the World Health Organization(WHO), an estimated 134 per 100,000 populations suffered from TB in 2020, resulting in about 1.6 million deaths among TB cases.[6] In the Eastern Mediterranean Region (EMR), the TB incidence rate was 112 per 100,000 populations which accounts for about 8% of all global TB cases and there were 83 000 deaths in the region among TB patients.[7] In Iraq, the TB incidence rate was 24 per 100,000 population, which is considered one of the seven highest TB burden countries in the EMR, constituting 3% of the total TB patients while the disease resulted in about 1000 deaths among TB cases.[6,8]

The WHO End TB Strategy is an 80% reduction in the TB incidence rate and a 90% reduction in the annual number of TB deaths rate by 2030.[2]

This study was conducted in Mosul City; the center of Nineveh Governorate in the north of Iraq which is the 2nd largest city in Iraq,[9] that is badly invaded by ISIS during 2014-2017 which lead to the destruction of the surveillance system including the TB program and a sequel of this invasion, the situation of TB has not been

well analyzed and unpackaged. Against this background, the present study was carried out.

The present study aims to calculate the incidence of TB according to type, age, sex and residence in Mosul city during the period 2018-2021 and its epidemiological profile.

METHODOLOGY

a. Study design

It was a cross-sectional study of all drugsusceptible TB patients in Mosul city. The Electronic Nominal Recording Reporting System (ENRS) data of TB patients were reviewed from January 2018– December 2021. Information on the demographic, clinical characteristics of the patients, and treatment outcomes for the mentioned years were analyzed.

b. Setting

The national tuberculosis program (NTP) also called the Respiratory and Chest Diseases clinic (RCDC), specialized center for managing and following up all forms of drug-susceptible TB patients. It is provided with a laboratory, radiology unit (chest X-ray (CXR)) and pharmacy unit mainly for providing anti-TB drugs. In Ninawa Governorate, there are eleven tuberculosis management units (TBMUs) responsible for monitoring the treatment of the patients in PHCCs at the peripheral level, These TBMUs are under the direct supervision of RCDC. All TB patients underwent human immunodeficiency virus (HIV) testing by the enzyme-linked immunosorbent assay (ELISA) technique as a part of the routine evaluation of such patients. Anti-TB drugs were provided free of charge for TB patients.[10]

In this study, we analyze data from Mosul city which contain two health district right and left. The right health district has 22 PHCCs and the left health district has 20 PHCCs.

District Year Total 2018, 2019, 2020 and 2021. The crude population of Mosul city is 1810371, 1788163, 1834903 and 1882896 which were obtained from the Statistics Division in the Nineveh Directorate of Health.

c. Data collection tools

The demographic and clinical profile of the TB records were collected according to age, gender, residence, site and treatment outcome of all forms of drug-susceptible TB patients. The descriptive purposes of the study were determined in numbers and percentages, and the incidence of TB according to type, age groups (0-4, 5-14,15-24, 25-34, 34-44, 45-54, 55-64, and 65+), sex and residence were calculated. Also, the treatment success rate, failure rate, mortality rate, and case fatality rate, were calculated for the years 20182021.

d. variable definition the following case definitions: (Pulmonary tuberculosis (PTB), extrapulmonary tuberculosis (EPTB), drug-susceptible TB patient, cured, treatment complete, treatment failed, died, lost to follow-up (LFUP), not evaluated, treatment success, smear-positive, smear-negative and not applicable(NA)) was according to NTP.[10]

e. Statistical analysis

The raw information of the patients had entered into a Microsoft Excel sheet for statistical analysis. The statistical calculations were performed in Microsoft Excel 2016 and Statistical Package for Social Sciences version 26 (SPSS 26; IBM Corp., USA).

The categorical data were analyzed using Pearson's chi-square test. The p- value of <0.05 was considered statistically significant.

f. Ethical approval

The study was based on recorded data; hence, approval from the Nineveh Directorate of Public Health was taken. All personal information was kept confidential.

RESULT

A total of 840 patients were diagnosed with active TB at the RCDC of Mosul city during the period 2018-2021, the highest incidence rate was in 2019.

The study revealed that 517 TB patients with an incidence rate of 13.4/ 100,000 population during the study period were from the left district. Hence, the female incidence rate was higher, with a higher Pulmonary tuberculosis incidence rate (Table 1).

Table 1: The incidence rate of drug-susceptible TB patients in Mosul city over 2018–2021 (n=840) according to gender, residence and types of TB.

Variable	Years, n. (IR)*				Total
	2018	2019	2020	2021	
Sex Male	93 (11.2)	121 (13.3)	96 (10.2)	87 (9.0)	397 (10.9)
Female	103 (10.5)	126 (14.4)	108 (12.0)	106 (11.5)	443 (12.1)
Residence Right district	92 (10.7)	93 (11.0)	67 (7.7)	71 (7.9)	323 (9.3)
Left district	104 (10.9)	154 (16.4)	137 (14.2)	122 (12.3)	517 (13.4)
Type of TB PTB	120 (6.6)	132 (7.4)	120 (6.5)	128 (6.8)	500 (6.8)
EXPT	76 (4.2)	115 (6.4)	84 (4.6)	65 (3.5)	340 (4.6)
Total	196 (10.8)	247 (13.8)	204 (11.1)	193 (10.3)	840 (11.5)

* IR=incidence rate/100,000 population.

The highest percentage of patients was found among age groups 15–34 years which is (311, 37%)(**Error! Reference source not found.**).

Table 2: Distribution of drug-susceptible TB patients according to age groups over 2018-2021 (n=840).

Age groups (years)	Years, n. (%)				Grand Total
	2018	2019	2020	2021	
0-14	12 (6.1)	21 (8.5)	14 (6.9)	16 (8.3)	63 (7.5)
15-24	46 (23.5)	51 (20.6)	43 (21.1)	44 (22.8)	184 (21.9)
25-34	26 (13.3)	34 (13.8)	26 (12.7)	41 (21.2)	127 (15.1)
35-44	31 (15.8)	36 (14.6)	27 (13.2)	15 (7.8)	109 (13.0)
45-54	30 (15.3)	37 (15.0)	32 (15.7)	25 (13.0)	124 (14.8)
55-64	27 (13.8)	30 (12.1)	32 (15.7)	31 (16.1)	120 (14.3)
65+	24 (12.2)	38 (15.4)	30 (14.7)	21 (10.9)	113 (13.5)
Total	**196**	**247**	**204**	**193**	**840**

Error! Reference source not found. represents the clinical Profile of drug- susceptible patients in Mosul city over 2018-2021, the PTB patients were 500 (59.5%), for EPTB patients the lymphatic TB (24.4%) and pleural TB (21.0) were the most predominant EPTBs during the study period.

Table 3: Clinical Profile of drug-susceptible TB patients in Mosul city over 2018-2021.

BT site	Years, n (%)				Total
	2018	2019	2020	2021	
PTB	**120 (61.2)**	**132 (53.4)**	**120 (58.8)**	**128 (66.3)**	**500 (59.5)**
Smear positive	58 (29.6)	42 (17.0)	52 (25.5)	58 (30.1)	210 (25.0)
Smear negative +NA	60 (30.6)	90 (36.4)	57 (27.9)	36 (18.7)	243 (28.9)
Missing	2 (1.0)	0 (0.0)	11 (5.4)	34 (17.6)	47 (5.6)
EXTB	**76 (38.8)**	**115 (46.6)**	**84 (41.2)**	**65 (33.7)**	**340 (40.5)**
Lymph node	17 (8.7)	40 (16.2)	34 (16.7)	114 (59.1)	205 (24.4)
Pleural	27 (13.8)	39 (15.8)	11 (5.4)	99 (51.3)	176 (21.0)
Osteoarticular	11 (5.6)	12 (4.9)	7 (3.4)	47 (24.4)	77 (9.2)
Meningitis	4 (2.0)	8 (3.2)	4 (2.0)	22 (11.4)	38 (4.5)
Gastrointestinal tract	2 (1.0)	8 (3.2)	0 (0.0)	20 (10.4)	30 (3.6)
Pericarditis	6 (3.1)	2 (0.8)	0 (0.0)	9 (4.7)	17 (2.0)
Genito-urinary	3 (1.5)	0 (0.0)	3 (1.5)	6 (3.1)	12 (1.4)
Others	6 (3.1)	6 (2.4)	6 (2.9)	23 (11.9)	41 (4.9)
Total	196	246	195	203	840

On studying the association between TB sites with gender, it was statistically significant p=0.04, Pearson ChiSquare value 33.673 and degree of freedom (df) 1. the association between TB site and age groups was statistically significant p=0.000, with Pearson Chi-Square value 33.7 with df =6(TableTable).

Table 4: Comparison of PTB and EXTB patients with gender and age groups (n=840).

Variable		Site of TB n. (%)			p-value*
		PTB	EXTB	TOTAL	
Gender	Male	251 (50.2)	146 (42.9)	397 (47.3)	0.04
	Female	249 (49.8)	194 (57.1)	443 (52.7)	
Age group	0-14	20 (4.0)	43 (12.6)	63 (7.5)	0.000
(years)	15-24	111 (22.2)	73 (21.5)	184 (21.9)	
	25-34	81 (16.2)	46 (13.5)	127 (15.1)	
	35-44	53 (10.6)	56 (16.5)	109 (13.0)	
	45-54	77 (15.4)	47 (13.8)	124 (14.8)	
	55-64	80 (16.0)	40 (11.8)	120 (14.3)	
	65+	78 (15.6)	35 (10.3)	113 (13.5)	
Total		500	340	840	

Also, the study revealed that most of the drug-susceptible TBs patients within Mosul city over 2018-2021 were treated successfully 791(94.4%), with case fatality rate and failure rate (2.4% and 2.7%), respectively. (Table 5).

Table 5: Treatment outcome of TB patients of Mosul city over 2018-2021 (n=840).

Outcome	Years, n. %				Total
	2018	2019	2020	2021	
Treatment success	181 92.3%	241 97.6%	201 98.5%	174 90.2%	797 94.9%
Death*	6 3.1%	3 1.2%	0 0.0%	5 2.6%	14 1.7%
LFUP	7 3.6%	2 0.8%	3 1.5%	7 3.6%	19 2.3%
Not evaluated	2 1.0%	1 0.4%	0 0.0%	7 3.6%	10 1.2%
Total	196	247	204	193	840

Case fatality rate

The mortality rates for the study years were 0.5/ 100,000 population in 2018, 0.2/ 100,000 population in 2019, 0.1/ 100,000 population in 2020 and 0.3/ 100,000 population in 2021.

DISCUSSIONS

Tuberculosis is considered a major global cause of disability and death, especially in developing countries. However, the burden of TB in Mosul City had not been well analyzed. And for this reason, this study has been performed to show demographic and clinical profiles and treatment outcomes in the city.

In this study, the highest registered TB cases for the years 2018, 2019, 2020 and 2021was in the year 2019, due to the restoration of the surveillance system after four years of interruption of management and treatment of TBs patients due to the ISIS invasion. In addition, in these years, there was a peak of war by ISIS forcing internally displaced people (IDP) to flee their homes in Mosul and reside in IDP camps, which markedly increased the number of TB patients within the governorate. TB patients reported from the two districts of Mosul; showed that the highest count of 517 with a total incidence rate of 13.4/100,000 populations was from the left district as its location attracted the highest population density in comparison with other districts.

After 2019, the number of TB patients had been slowly declining, which indicates improving the TB control program in Mosul city as well as the physical distancing interventions to limit the transmission of COVID-19, could result in lowering TB transmission.[11,12] Although there was a slight drop in the incidence rate, it is not meeting the WHO goal of establishing a decline at a rate of 4%–5% per year by 2020 to achieve TB elimination.[4] The incidence rate of TB patients for the study period was 11.5/100,000 population. The rate is more than the total Ninawa rate which was 7/100,000.[13] NTP in Ninawa during that time functioned only in 5 districts out of 11dictrict, the other 6 districts didn't report any TB cases that's why the overall rate is lower. the reported rate is less than the Iraq rate of 15/100,000. In comparison with neighbouring governorates, the present study revealed a rate higher than that of Salah-Aldin, Duhok, and Sulaymaniyah with an incidence rate of (10,8 and 11) /100,000 respectively. On the other hand, the rate was lower than that reported from Baghdad Rusafa (26/100,000), Kirkuk (13/100,000), and Erbil (13/100,000) according to data obtained from the Iraqi NTp.[13]

The most commonly affected age group was the young age, which was a similar finding in most developing and Arab countries.[14] This was an expected finding as TB transmission mainly affects people who are in concurrent work.[15] In contrast, the elderly are the most affected age group in developed countries, this difference had multiple reasons, particularly the increase of latent TB in the elderly.[16] The present study revealed a predominance of female incidence rate on male incidence rate (12.1 vs 10.9)/100,000 population for the 4-years study period. For the PTB patients, the male percentage is more than the female percentage. This finding was similar to the finding in several studies.[4,17] and in keeping with the 2021 global TB report for WHO.[2] Kherad O, et al. explain that sex difference is related to higher smoking rates among male patients and other factors restricting females such as access to healthcare facilities and socioeconomic and cultural factors.[18] In contrast, few studies from the EMR demonstrate the high rate in females.[19]

The study estimates the EXTB incidence rate 4.6/ 100,000 population, considered lesser than that of Iraq (7 /100,000),[13] with a percentage of 40.5% of total TBs patients. According to the recent WHO report,[2] EPTB represents 24% of the WHO-EMR. Although a high percentage of EPTB in the current study, there were no HIV co-infected reported patients. The most common extra-pulmonary clinical manifestations were Lymphatic TB followed by pleural TB. This finding was parallel to other studies where the majority of EPTB was affecting lymph nodes.[16,18,20]

Furthermore, to address the association of certain variables with EPTB, female gender and age group of 15–24 years were found to be statistically significant. This finding is in agreement with other studies.[4,21] EPTB is associated with low immunity; hence, it is more common in children as their immune system is not completely developed.[22] Therefore, young adult females should be targeted properly whenever there is suspicion of EPTB.

The treatment success rate was about 95% among all drug-susceptible TB patients, which is considered higher than the WHO End TB Strategy goal of the recommended 90% target treatment success before 2030.[2] In 2021, Iraq reported approximately similar treatment success rate (94%),[13] which is higher than that reported from neighbouring countries, 81% in Turkey, 84% in Iran, 90% in Saudi Arabia and 91% in Syria.[23] in A study from Ethiopia presented a lower success rate by 88.2% and a higher rate of LTFU by 6.6%, death by 4.8%, in comparison with our study[24] In comparison to other research, the treatment outcome was generally excellent.[18,25] This high treatment success rate indicated that the medical staff at the institution put in a lot of effort to monitor TB patients and their adherence to their anti-TB regimen. Additionally, the negative-HIV infection in this study improved the success rate because it is a known risk factor for treatment failure.

The treatment failure for 4 years study was zero, which is considered lower than that of Iraq which is 1%.[13] hence, the low failure rate in our study could be due to excellent patient compliance with therapy and the success of the DOTS strategy. Also, TB control and preventive measures such as prophylactic therapy for high- risk patients enhance the reduction of TB incidence.

The limitation of our study is using secondary data to estimate the incidence rate; hence, there may be an underestimation of the true incidence because of missing or undiagnosed patients, also a lack of the kits for GeneXpert which might be a source of missing TB patients in the RCDC unit.

CONCLUSION AND RECOMMENDATION

TB is still a public health problem in Mosul city

The most commonly affected age group was 1534 with 37%, with satisfactory treatment outcomes. The female incidence rate was predominant, with a high percentage of EXTB about 57%. So, we recommended mobilizing support to remove underlying risk factors and assure gender-equitable access, including gendersensitive services for TB prevention, diagnosis, treatment, care and support.

REFERENCES

1. Abdulkareem FN, Merza MA, Salih AM. First insight into latent tuberculosis infection among household contacts of tuberculosis patients in Duhok, Iraqi Kurdistan: using tuberculin skin test and QuantiFERONTB Gold Plus test. International Journal of Infectious Diseases, 2020 Jul 1; 96: 97–104.
2. GLOBAL TUBERCULOSIS REPORT 2021 [Internet], 2021. Available from: http://apps.who.int/bookorders.
3. Basic TB Facts | TB | CDC [Internet]. [cited 2022 Oct 19]. Available from: https://www.cdc.gov /tb/topic/basics/defaul t.htm
4. 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, 2020 Jan; 8: 205031212092105.
5. Tuberculosis [Internet]. [cited 2022 Oct 21]. Available from: https://www.who.int/health-topics/tuberculosis#tab=tab_1
6. TB profile [Internet]. [cited 2022 Nov 19]. Available from: https://worldhealthorg.shinyapps.io/tb_profiles/?_inputs_&entity_type=%22country%22&lan=% 22EN%22&iso2=%22AF%22
7. WHO EMRO | Epidemiological situation | Epidemiological situation | Tuberculosis [Internet]. [cited 2022 Oct 19]. Available from:

https://www.emro.who.int/tuberculosi s/epidemiological- situation/index.html
8. Tofik S, Balaky J, Mawlood AH, Shabila NP. Survival analysis of patients with tuberculosis in Erbil, Iraqi Kurdistan region. [cited 2022 Nov 22]; Available from: https://doi.org/10.1186/s12879-019-4544-8
9. Mohammad Assi Jassim, Asma Ahmad Al-Jawadi. Epidemiological trends of tuberculosis in Mosul City, Iraq, (2006 2011). [Mosul]: University of Mosul, 2012.
10. National specialized center for chest and respiratory disease, editor. national tuberculosis management guideline. In: sixth. Iraq: Iraqi ministry of health, 2018.
11. Rani B S, Gopinath S, Gowda C, Kumar S, Nair GC, Iyengar K. A study to assess impact of COVID-19 on trends of TB prevalence in Tumkur district. The Journal of Community Health Management, 2022; 9(1).
12. Hogan A, Jewell B, Sherrard-Smith E, Vesga J, Watson O, Whittaker C, et al. Report 19: The potential impact of the COVID-19 epidemic on HIV, TB and malaria in low-and middleincome countries, 2020.
13. Iraqi ministry of health / environment. annual statistical report, 2020.
14. Mokdad AH, Jaber S, Aziz MIA, AlBuhairan F, AlGhaithi A, AlHamad NM, et al. The state of health in the Arab world, 1990–2010: an analysis of the burden of diseases, injuries, and risk factors. The Lancet, 2014; 383(9914): 309–20.
15. McQuaid CF, McCreesh N, Read JM, Sumner T, Houben RMGJ, White RG, et al. The potential impact of COVID-19-related disruption on tuberculosis burden. European Respiratory Journal, 2020; 56(2).
16. Jappar SB, Low SY. Tuberculosis trends over a five-year period at a tertiary care university- affiliated hospital in Singapore. Singapore Med J., 2015; 56(9): 502.
17. Ali ZA, Al-Obaidi MJ, Sameer FO, Mankhi AA, Misha'al KI, Jassim IA, et al. Epidemiological profile of tuberculosis in Iraq during 2011–2018. Indian Journal of Tuberculosis, 2022 Jan 1; 69(1): 27–34.
18. Kherad O, Herrmann FR, Zellweger JP, Rochat T, Janssens JP. Clinical presentation, demographics and outcome of tuberculosis (TB) in a low incidence area: a 4-year study in Geneva, Switzerland. BMC Infect Dis., 2009; 9(1): 1–8.
19. Dogar OF, Shah SK, Chughtai AA, Qadeer E. Gender disparity in tuberculosis cases in eastern and western provinces of Pakistan. BMC Infect Dis., 2012; 12(1): 1–7.
20. Rodriguez-Takeuchi SY, Renjifo ME, Medina FJ. Extrapulmonary tuberculosis: pathophysiology and imaging findings. Radiographics, 2019; 39(7): 2023–37.
21. Forssbohm M, Zwahlen M, Loddenkemper R al, Rieder HL. Demographic characteristics of patients with extrapulmonary tuberculosis in Germany. European respiratory journal, 2008; 31(1): 99–105.
22. Fiske CT, Griffin MR, Erin H, Warkentin J, Lisa K, Arbogast PG, et al. Black race, sex, and extrapulmonary tuberculosis risk: an observational study. BMC Infect Dis., 2010; 10(1): 1–8.
23. https://worldhealthorg.shinyapps.io/tb_profile
24. Abebe G, Bonsa Z, Kebede W. Treatment outcomes and associated factors in tuberculosis patients at Jimma University Medical Center: a 5year retrospective study. Int J Mycobacteriol, 2019; 8(1): 35.
25. Baltussen R, Floyd K, Dye C. Cost effectiveness analysis of strategies for tuberculosis control in developing countries. Bmj., 2005; 331(7529): 1364.