e-ISSN: 0975-5160, p-ISSN: 2820-2651

Available online on www.ijtpr.com

International Journal of Toxicological and Pharmacological Research 2024; 14(11); 138-145

Original Research Article

Cross- Sectional Study on Clinical and Laboratory Profile of the Tuberculosis Patient Admitted in a Tuberculosis Hospital in Tamil Nadu

Elamparithi Sankaralingom[1], Jeyaganesh[2], Sulochana[3], Prabhakaran Rathinam[4]

[1]Associate Professor, Department of Respiratory Medicine, Madurai Medical College
[2]Senior Resident, Department of Respiratory Medicine, Madurai Medical College
[3]Senior Resident, Government Medical College, Virudhunagar
[4]Professor, Department of Respiratory Medicine, Madhuri Medical College

Received: 18-08-2024 / Revised: 21-09-2024 / Accepted: 26-10-2024
Corresponding author: Dr. Prabhakaran Rathinam
Conflict of interest: Nil

Abstract:

Introduction: COVID -19 pandemic had a significant impact on both mortality and morbidity of many diseases with no exception on Tuberculosis. This study was done to describe the clinical and laboratory profile of tuberculosis patient and to estimate the prevalence of malnutrition.

Materials and Methods: The cross-sectional study was done in the TB hospital attached to the tertiary care hospital, in Madurai among all 226 TB patients admitted during March-May 2024. Data on clinical and laboratory profile was collected using predesigned semi-structured questionnaire. Data analysis done using SPSS and descriptive statistics was used

Results: Among 226 TB patients 78% of them did not have any co-morbidity. Most common comorbidity was Diabetes seen in 15%, 5.8% were reactive for HIV. Smokers and alcoholics were 55.3% and 63.3% respectively. 93.4% were severely malnourished and 94.2% of their BMI fell into underweight category. For 57.5% of the individuals haemoglobin was more than 10g/dl and 97.8% of them had normal temperature. 62.8% and 58% had urea and creatinine within the normal range respectively. Nearly 84% of them had abnormal WBC total count. Majority of them had respiratory rate 18-24 per min (62.8%) and Spo2 >93% (84.1%). Mean TN-KET score was 6.8. Extra pulmonary TB was among 3.9% and 5.3% had drug resistant TB.

Conclusion: TB is more prevalent among male population, 40-50 years age group. Infection leads to other secondary problems like anaemia and malnutrition and most common co-morbidity associated is Diabetes.

Keywords: tuberculosis, malnutrition, cross-sectional study, clinical and laboratory profile, TN-KET score.

This is an Open Access article that uses a funding model which does not charge readers or their institutions for access and distributed under the terms of the Creative Commons Attribution License (http://creativecommons.org/licenses/by/4.0) and the Budapest Open Access Initiative (http://www.budapestopenaccessinitiative.org/read), which permit unrestricted use, distribution, and reproduction in any medium, provided original work is properly credited.

Introduction

Tuberculosis which is the easily curable and treatable disease is caused by the acid- fast bacilli Mycobacterium tuberculosis and spreads through droplet infection when the bacilli is expelled out from infected person while coughing, sneezing etc. Globally it is the commonest cause of both mortality and morbidity. [1] In 2022 TB is the second leading cause of death due to a single infectious agent worldwide following COVID-19.

Death due to TB is even twice more than that of HIV/AIDS. 7.5 million TB cases are notified in 2022 and total number of deaths is 1.30 million. Worldwide from 2018 to 2022, 34 million adults and 2.5 million have received TB treatment; nearly eight lakh adults and 21,600 paediatric TB patients have received muti drug resistance regimen. So, a target to end global TB by 2030 was included in the sustainable development goal. [2,3,4]

Among total number of new cases developed yearly nearly 90% are adults and affects more number of males than females. [5,6] Emerging drug resistance is the huge challenge in the treatment.7 Tuberculosis infection and TB deaths is significantly associated with Human immune deficiency Viruses (HIV) co-infection, smoking and diabetes. [8-10]

Cough, fever, haemoptysis, anorexia and unintentional weight loss are common presentations.8 Presentation also varies depending upon site of infection and multiple host factors. [11]

According to global TB report of WHO in 2023, India has improved remarkably in case finding and impact of COVID-19 pandemic on National TB program has also reversed. [4] Incidence of TB in India has also fallen from 237 per lakh population in 2015 to 199 per lakh population in 2022 and

mortality rate had declined from 28 per lakh population in 2015 to 23 per lakh population in 2022. There was a significant rise in the case notification rate during the year of 2023, it was 179 cases per lakh population. Under National Tuberculosis elimination program 1.89 crore sputum smear tests and 68.3 lakh nucleic acid amplification tests (NAAT) were done throughout the nation in 2023. [12]

Many newer initiatives like - TB preventive treatment (TPT); Direct Benefit Transfer (DBT) under the Ni-kshay Poshan Yojana not only for TB patients but also for ASHA (Accredited Social Health Activist) workers, TB Vijeta's (TB champions) and Ni-kshay SAATHI (Family caregiver model); recruitment of 1.5 lakh Ni-kshay Mitras under Pradhan Mantri TB Mukt Bharat Abhiyaan scheme are established.

At the current situation describing a clinical, laboratory and diagnostic profile of the TB patients in a dedicated TB treatment hospital mostly covering the rural population may throw light on the trend and patten of the disease distribution after newer initiatives introduced.

Even though many such studies were done prior to COVID, no such study was done after COVID -19 pandemic in the particular geographical area. COVID -19 pandemic had a significant impact on both mortality and morbidity of many diseases with no exception on Tuberculosis. Hence the need of the study. The study was done with following objectives.

Objectives

1. To describe the clinical profile of tuberculosis patient admitted in a TB hospital.
2. To estimate prevalence of malnutrition and underweight among tuberculosis patient.
3. To describe the laboratory profile among the tuberculosis patient.

Materials and Methods

The cross-sectional study was done in the TB hospital attached to the tertiary care hospital, in Madurai. The hospital was initially started as the TB sanitorium attached with the tertiary care hospital but latter it was converted into the centre of excellence with 210 beds. it is a 100-acre hospital with all the needed basic amenities including recreational facilities.

All the TB patients admitted during our study period of 3 months from March 2024 till May 2024 were included in the study. No specific sampling technique was followed. Patients who were not willing to participate and who did not give written informed consent were excluded from the study. Out of 243 patients admitted during the study period final sample size of 226 was derived after applying exclusion criteria.

Institutional ethical clearance was got. Data were collected after getting the written informed consent and patients were assured that their confidentiality would be maintained throughout the study.

Data were collected with the help of predesigned semi-structured validated questionnaire. It had questions regarding basic details like name, age, gender, nikshay ID ect, It also had questions regarding symptoms, co-morbidities, general conditions, anthropometry, laboratory parameters, and TN-KET score (Tamil Nadu Kasanoi eilla Tamizhagam score)

TN-KET scoring was done based on 16 parameters. It was done to grade the severity of the illness. Score more than one requires admission and score more than 3 requires admission in high dependency unit. Figure 1 shows the Scoring of in TN-KET.

As soon as the patient was admitted, they were evaluated by through history taking, clinical examination and investigation.TN-KET score was calculated and the questionnaire was interview filled. Data were entered in the Microsoft excel and statistical analysis was done using SPSS software version 23. Descriptive statistics were used to find the frequencies and percentages.

Results

Out of 226 patients admitted in the TB hospital majority of them i.e 28.3% (64) belonged to the age group of 40 to 50 years and most of the study population, nearly 82.3% were males. Table 1 shows the age and sex of the tuberculosis patients.

Criteria	Considered to Be Emergency[c]	Scoring Criteria	Score Assigned[d]
Pulse rate per minute		<60	2
		>100 (persistent after 30 minutes)	2
BMI, kg/m^2	Yes (<14)	<14	1
		<16 with pedal edema	1
		>40	1
MUAC, cm		<16	1
Temperature, Celsius	Yes (<35, >41)	<35	2
		>41	2
Blood pressure, mmHg	Yes	Hypertension (≥140/90)	2
		Hypotension (diastolic <60)	2
Respiratory rate, breaths/minute	Yes (>24)	18–24	1
		25–30	2
		>30	3
Oxygen saturation, %	Yes (<94)	90–93	1
		85–89	2
		<85	3
Hemoglobin, g/dL	Yes (<7)	<7	2
Icterus		Present	1
Pedal edema		Present	1
General condition	Yes (if unable to walk, drowsy, unconscious)	Inability to walk but conscious and oriented	1
		Conscious, not oriented	2
		Drowsy	3
HIV		Positive and on ART	1
		Positive and not on ART	2
Random blood sugar, mg/dL		<70	2
		>200	2
Total WBC count, WBC/microliter		Total count >11,000	1
		Total count <4,000	1
Chest radiograph	Yes (massive pneumothorax, hydropneumothorax)	Hydropneumothorax	3
		Bilateral consolidation	2
Hemoptysis	Yes	Present	3

Figure 1: parameters for TN-KET scoring

Table 1: Age and sex distribution of the study population (n = 226)

Age in years	Sex		Total
	Female	Male	
<20	10	1	11
	4.4%	0.4%	4.9%
21-30	9	14	23
	4.0%	6.2%	10.2%
31-40	5	43	48
	2.2%	19.0%	21.2%
41-50	9	55	64
	4.0%	24.3%	28.3%
51-60	2	38	40
	0.9%	16.8%	17.7%
>60	5	35	40
	2.2%	15.5%	17.7%
Total	40	186	226
	17.7%	82.3%	100.0%

Table 2 shows the distribution of co-morbidity, smoking and alcoholism among the tuberculosis patients. Nearly 78% of them did not have any co-morbidity. Most common comorbidity was diabetes seen in 15% of the patients followed by HIV. 5.8% of the patients were reactive for HIV. Majority of the study population were smokers and alcoholic, 55.3% and 63.3% respectively.

Table 2: Distribution of co-morbidity, smoking and alcoholism among the tuberculosis patients. (n=226)

Co-morbidities	Frequency	Percentage
No Co-morbidity	175	77.4%
CKD	5	2.2%
COPD	3	1.3%
DM	34	15%
DM with HT	5	2.2%
HIV	13	5.8%
Smoking	125	55.3%
Alcohol	143	63.3%

Figure 2 shows the presence of various signs among the patients, other than fever and cough most common sign found was icterus. It was seen 4% of the study population

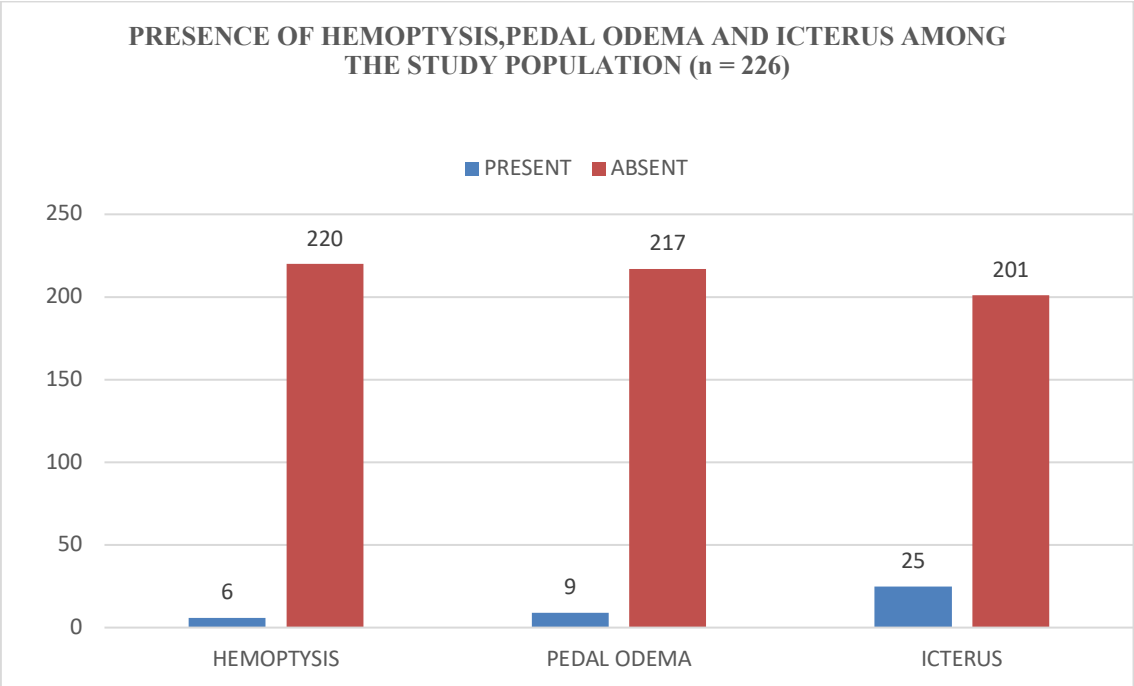

Figure 2: Presence of hemoptysis, pedal odema and icterus among the study population (n = 226)

Table 3 shows the distribution of nutritional status, mid arm circumference and body mass index of the study population. Most of them that is 93.4% were severely malnourished and 22.6% of them had mid arm circumference less than 16 cm and 94.2% of their BMI fell into underweight category.

Table 3: Distribution of nutritional status, mid arm circumference and body mass index of the study population. (n = 226)

Nutritional status	**Frequency**	**Percentage**
Normal	9	4%
Severely malnourished	6	2.7%
Very severely malnourished	211	93.4%
Total	226	100%
Mid arm circumference	**Frequency**	**Percentage**
<16 cm	51	22.6%
>=16 cm	175	77.4%
Total	226	100%
Body mass index	**Frequency**	**Percentage**
Underweight	213	94.2%
Normal	9	4%
Overweight	3	1.3%
Obese	1	0.4%
Total	226	100%

Table 4 shows the vitals and laboratory parameters of the TB patients' majority of them had pulse rate more than 100 beats/min. For 57.5% of the individuals haemoglobin was more than 10g/dl and 97.8% of them had normal temperature. Most of them that is 62.8% and 58% had urea and creatinine within the normal range respectively. Nearly 84% of them had abnormal WBC total count. Majority of them had respiratory rate 18-24 per min (62.8%) and Spo2 >93% (84.1%)

Table 4: Vitals and laboratory parameters of the TB patients (n =226)

Pulse rate	**<60 or >100 beats/min**	**60-100**	**Total**		
	176 (77.9%)	50 (22.1%)	226		
Haemoglobin	**7 g/dl**	**7-10**	**>10**		**Total**
	11 (4.9%)	85 (37.6%)	130 (57.5%)		226
Temperature	**<35 or >41 degree Celsius**	**35-41**	**Total**		
	5(2.2%)	221(97.8%)	226		
Urea	**<20 or >40mg/dl**	**20-40**	**Total**		
	84 (37.2%)	142(62.8%)	226		
Creatinine	**<0.7 or > 1.4 mg/dl**	**0.7-1.4**	**Total**		
	95(42%)	131(58%)	226		
Total WBC count	**<4000 or >11000 cells**	**4000-11000**	**Total**		
	190 (84.1%)	36 (15.9%)	226		
Random blood sugar	**<70 or >200 mg/dl**	**70-200**	**Total**		
	31 (13.7%)	195 (86.3%)	226		
Respiratory rate	**<18/min**	**18-24**	**25-30**	**>30**	**Total**
	56(24.8%)	142(62.8%)	26(11.5%)	2(0.9%)	226
Spo2	**>93 %**	**90-93**	**85-89**	**<85**	**Total**
	190(84.1%)	19(8.4%)	11(4.9%)	6(2.7%)	226

Figure 3 shows the TN-KET Score among the study population mean score was 6.8 and standard deviation was 2.3 with minimum score of 1 and maximum score of 16. All of them had score more than 1 requiring admission. Figure 4 represents the diagnosis of the study population. Majority of them had pulmonary TB and drug sensitive TB, only 3.9% had extra pulmonary TB and 5.3% had drug resistant TB

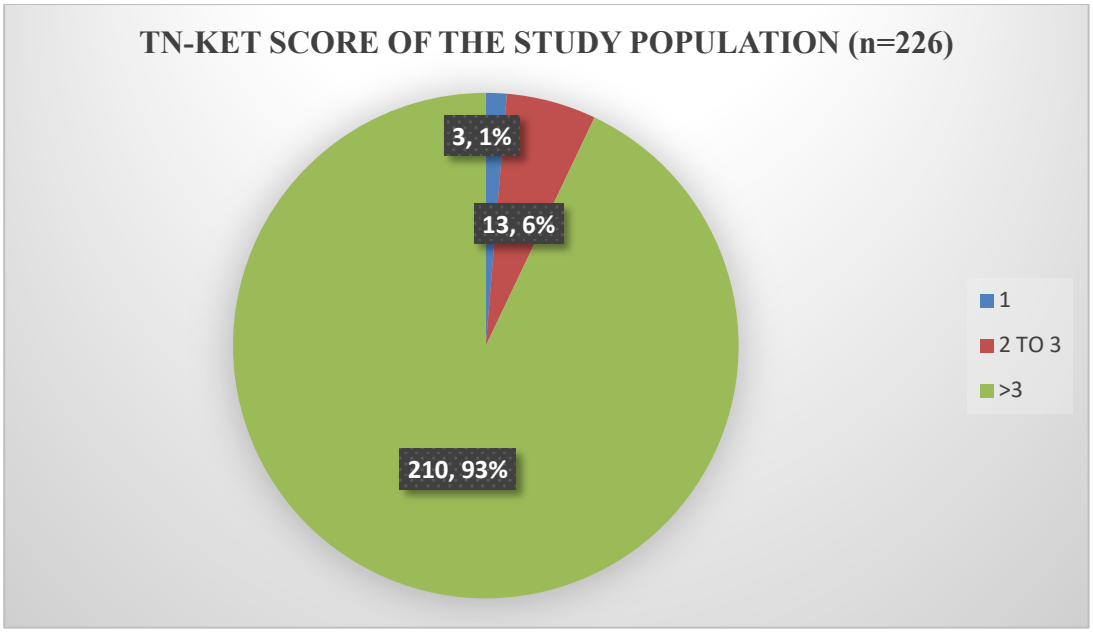

Figure 3: TN-KET score of the study population (n=226)

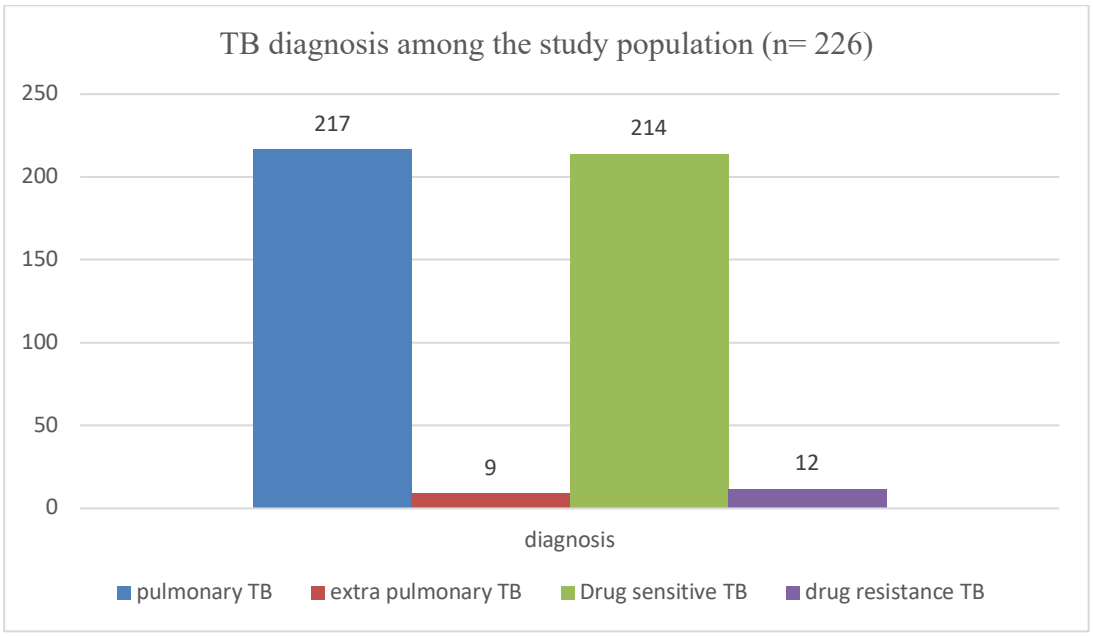

Figure 4: TB diagnosis among the study population (n= 226)

Discussion

Out of 226 patients admitted in the TB hospital majority of them i.e 28.3% (64) belonged to the age group of 40 to 50 years and most of the study population, nearly 82.3% were males. This was similar to the other study done by Sriram et al where highest prevalence of 31.8% was seen among the age group 31 – 45 years. [13]

The present study result was relatively higher than the other study done by Mujtaba et al in Pakistan, where 60% of cases were male and 40% were females. [14] In a study done by Sriram et al prevalence was nearly equal in males (50.8%) and in females (49.2%). [13] These differences may be due to difference in the socio-cultural and environmental factors. In the present study nearly 78% of them did not have any co-morbidity. Most common comorbidity was diabetes seen in 15% of the patients, followed by HIV. 5.8% of the patients were reactive for HIV. In another study done by Bhattacharya et al in North East India found out that comorbidity was prevalent among 53.17% of the TB patients which was comparatively higher than the present study and the most common co-morbidity in that study was diabetes followed by hypertension. [15] This may be due to decrease in immunity in diabetic patients, decrease in IFN-Gamma, IL-8 and IL-2 which reduces antigen presentation to macrophages there by affecting TB

clearance. [16-20] Majority of the study population were smokers and alcoholic, 55.3% and 63.3% respectively. This is comparatively very much higher than other study done by Mujtaba et al where the proportion of smokers among TB patients was only 21.3%. [14] This may be because of difference in cultural factors and behaviour, since majority of the affected patients were males in the present study who have the behavioural pattern of smoking. Smoking promotes the adherence of bacteria by changing the mucociliary function of bronchi and exacerbating pulmonary inflammation and oxidative stress which contributes to increased lung damage and cavitation with pulmonary TB and in some studies is reported to increase the risk of TB recurrence. [21] Other than fever and cough which were most predominant signs in the study, most common sign found was icterus. It was seen in 4% of the study population. This was similar to the study done by Bhattacharya et al where Fever (61.27%) was the most common presentation, followed by cough (54.33%) and breathlessness (32.94%). [15] Most of them that is 93.4% were severely malnourished and 22.6% of them had mid arm circumference less than 16 cm and 94.2% of their BMI fell into underweight category. Where as in the other study done by Mujtaba et al median BMI was 18.2. [14] Individuals with low BMI have low adipose tissue and visceral fat there by decreasing the pro-inflammatory cytokines like decreased TNF and decreasing T cells there by decreasing immunity, leading to TB infection. [22,23] TB infection intern leads to loss of appetite leading to malnutrition. Majority of them had pulse rate more than 100 beats/min. For 57.5% of the individual's haemoglobin was more than 10g/dl and 97.8% of them had normal temperature. But nearly 50% of the study population were anaemic this was higher than another study done by Lee SW et al where it was only 31.9%. [24] The proinflammatory milieu could have reduced production of erythropoietin, suppressed response of bone marrow to erythropoietin, and altered iron metabolism, which in turn could have impaired erythropoiesis. [25]

Most of them that is 62.8% and 58% had urea and creatinine within the normal range respectively. Nearly 84% of them had abnormal WBC total count. Majority of them had respiratory rate 18-24 per min (62.8%) and Spo2 >93% (84.1%). In another study done by Rohini et al mean WBC count was 7325 ± 1888.53. In tuberculosis WBCs increase during infection, due to the increased polymorphonuclear leukocytes and macrophages as a part of the body's immune defence mechanism to combat the invading bacterial population. [26] Majority of them had pulmonary TB and drug sensitive TB, only 3.9% had extra pulmonary TB and 5.3% had drug resistant TB. This is in contradictory to other study done by Hamida et al where prevalence of extra pulmonary TB was 55.5%. The major limitation of the study is it is a onetime cross-sectional study aimed to collect data at the time of diagnosis before initiating the treatment, so it did not look the change in the clinical and laboratory profile during the course of the treatment. But how-ever this baseline data may act as the road way for future follow up studies after post COVID pandemic.

Conclusion

TB is more prevalent among male population and between 40-50 years old people. Infection leads to other secondary problems like anaemia and malnutrition and most common co-morbidity associated is Diabetes. So, the patients with these risk factor can be targeted for primary prevention.

References

1. Kyu HH, Maddison ER, Henry NJ, Ledesma JR, Wiens KE, Reiner R, et al. Global, regional, and national burden of tuberculosis, 1990-2016: results from the Global Burden of Diseases, Injuries, and Risk Factors 2016 Study. The Lancet Infectious Diseases. 2018; 18(12):1329–49. doi: 10.1016/S1473-3099(18) 30625-X
2. Sustainable Development Goals [website]. New York: United Nations; 2022, Available at: https://sdgs.un.org/.
3. Global strategy and targets for tuberculosis prevention, care and control after 2015 (Resolution WHA67.1, Agenda item 12.1). Geneva: World Health Assembly; 2014, available at: http://apps.who.int/gb/ebwha/pdf_ files/WHA67/A67_R1-en.pdf.
4. Global tuberculosis report 2023. Geneva: World Health Organization; 2023. Licence: CC BY-NC-SA 3.0 IGO, Available at: https:// www.who.int/publications/i/item/9789240083 851
5. Emery JC, Richards AS, Dale KD, McQuaid CF, White RG, Denholm JT, Houben RM. Self-clearance of Mycobacterium tuberculosis infection: implications for lifetime risk and population at-risk of tuberculosis disease. Proc Biol Sci. 2021; 288(1943):20201635. (https:// doi.org/10.1098/rspb.2020.1635).
6. Behr MA, Edelstein PH, Ramakrishnan L. Is Mycobacterium tuberculosis infection life long? BMJ. 2019; 367:l5770 (https://doi.org/ 10.1136/bmj.l5770).
7. Nguyen L. Antibiotic resistance mechanisms in M. tuberculosis: an update. Archives of Toxicology. 2016; 90(7):1585–604.
8. Rohini K, Surekha Bhat M, Srikumar PS, Mahesh Kumar A. Assessment of Hematological Parameters in Pulmonary Tuberculosis Patients. Indian Journal of

Clinical Biochemistry. 2016; 31(3):332–5. doi: 10.1007/s12291-015-0535-8.
9. Oni T, Berkowitz N, Kubjane M, Goliath R, Levitt Naomi S, Wilkinson RJ. Trilateral overlap of tuberculosis, diabetes and HIV-1 in a high-burden African setting: implications for TB control. European Respiratory Journal. 2017; 50(1):1–10. doi: 10.1183/13993003.00004-2017.
10. Ministry of Health and Population of Nepal. National Tuberculosis Management Guidelines. Thimi, Bhaktapur National Tuber culosis Center: 2019. Available from: https://nepalntp.gov.np/wp-content/uploads/2019/10/National-Tuberculosis-Management-Guidelines-2019_Nepal.pdf
11. Kulchavenya E. Extrapulmonary tuberculosis: are statistical reports accurate? Therapeutic Advances in Infectious Disease. 2014; 2(2):61–70. doi: 10.1177/2049936114528173.
12. Indian TB report 2024, Available at : https://tbcindia.mohfw.gov.in/wp-content/uploads/2024/10/TB-Report_for-Web_08_10-2024-1.pdf
13. S Selvaraju B Velayutham R Rao K Rade Prevalence and factors associated with tuberculosis infection in IndiaJ Infect Public Health20231612205865
14. Mujtaba MA, Richardson M, Shahzad H, Javed MI, Raja GK, Shaiq PA, Haldar P, Saeed S. Demographic and Clinical Determinants of Tuberculosis and TB Recurrence: A Double-Edged Retrospective Study from Pakistan. J Trop Med. 2022 Nov 28; 2022:4408306. doi: 10.1155/2022/4408306. PMID: 36478977; PMCID: PMC9722313.
15. Bhattacharya P, Talukdar K, Barman B, Jamil M, Phukan P, Mobing H, War G, Nonglait PL, Murti S, Prithviraj K Sr, Sangma B. Clinical Spectrum and Medical Comorbidities in Tuberculosis: A Hospital-Based Study in Northeast India. Cureus. 2020 Sep 21; 12(9):e10580. doi: 10.7759/cureus.10580. PMID: 33110716; PMCID: PMC7580495.
16. Kumar Nathella P., Babu S. Influence of diabetes mellitus on immunity to human tuberculosis. Immunology. 2017; 152(1):13–24. doi: 10.1111/imm.12762.
17. Calvet H. M., Yoshikawa T. T. Infections in diabetes. Infectious Disease Clinics of North America. 2001; 15(2):407–421. doi: 10.1016/s0891-5520(05)70153-7.
18. Magee M. J., Trost S. L., Salindri A. D., Amere G., Day C. L., Gandhi N. R. Adults with Mycobacterium tuberculosis infection and pre-diabetes have increased levels of QuantiFERON interferon-gamma responses. Tuberculosis. 2020;122 doi: 10.1016/j.tube.2020.101935.101935
19. Stalenhoef J. E., Alisjahbana B., Nelwan E. J., et al. The role of interferon-gamma in the increased tuberculosis risk in type 2 diabetes mellitus. European Journal of Clinical Microbiology & Infectious Diseases. 2008; 27:97–103. doi: 10.1007/s10096-007-0395-0.
20. Cheng P., Wang L., Gong W. Cellular immunity of patients with tuberculosis combined with diabetes. Journal of Immunology Research. 2022; 2022:12. doi: 10.1155/2022/6837745.6837745
21. Feng Y., Kong Y., Barnes P. F., et al. Exposure to cigarette smoke inhibits the pulmonary T-cell response to influenza virus and mycobacterium tuberculosis. Infection and Immunity. 2011; 79(1):229–237. doi: 10.1128/IAI.00709-10.
22. Zhang H. H., Halbleib M., Ahmad F., Manganiello V. C., Greenberg A. S. Tumor Necrosis Factor-Stimulates Lipolysis in differentiated human adipocytes through activation of extracellular signal-related kinase and elevation of intracellular cAMP. Diabetes. 2002; 51(10) doi: 10.2337/diabetes.51.10.2929.
23. Ayyappan J. P., Ganapathi U., Lizardo K. Adipose tissue regulates pulmonary pathology during TB infection. 2019.
24. Lee SW, Kang YA, Yoon YS, Um SW, Lee SM, Yoo CG, et al. The prevalence and evolution of anemia associated with tuberculosis. J Korean Med Sci. 2006; 21(6):1028–1032. doi: 10.3346/jkms.2006.21.6.1028.
25. Weiss G, Goodnough LT. Anemia of chronic disease. N Engl J Med. 2005; 352(10):1011–1023. doi: 10.1056/NEJMra041809.
26. Rohini K, Surekha Bhat M, Srikumar PS, Mahesh Kumar A. Assessment of Hematological Parameters in Pulmonary Tuberculosis Patients. Indian J Clin Biochem. 2016 Jul; 31(3):332-5. doi: 10.1007/s12291-015-0535-8. Epub 2015 Nov 17. PMID: 27382206; PMCID: PMC4910852.
27. Hamida Kwas, Hayfa Rajhi, Harish Rangareddy, Clinical profile, laboratory characteristics and prognostic factors in patients with miliary tuberculosis, Indian Journal of Tuberculosis, 2024, ISSN 0019-5707.