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THE PREVALENCE OF PULMONARY TUBERCULOSIS AMONG PATIENTS WITH CHRONIC DISEASES AND THEIR CLOSE CONTACTS IN IRAQ

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ABSTRACT

Background: Tuberculosis (TB) remains a leading infectious cause of morbidity and mortality worldwide, particularly in low- and middle-income countries. Individuals with chronic diseases and close contacts of TB patients represent high-risk groups for infection. This study aimed to determine the prevalence of pulmonary TB and its association with sociodemographic and clinical factors. **Methods:** A cross-sectional descriptive study was conducted at Al-Muthanna Health Directorate between January and June 2025. A total of 225 participants, including suspected TB cases, patients with chronic diseases, and close contacts of confirmed TB patients, were enrolled. Data on sociodemographic variables, medical history, and risk factors were collected through structured questionnaires. Diagnostic evaluation included sputum smear microscopy for acid-fast bacilli (AFB), GeneXpert, culture when indicated, and radiological imaging such as chest X-ray (CXR) and computed tomography (CT). Statistical analysis was performed using chi-square tests, with $p < 0.05$ considered significant. **Results:** Of the 225 participants, 137 (60.9%) were TB positive and 88 (39.1%) were negative. Male patients (52.9%) slightly predominated, and most participants resided in rural areas (69.8%). TB positivity was significantly associated with age ($p = 0.04$) and education level ($p = 0.02$). Patients aged 20–29 years and ≥60 years, and those with lower education, were at greater risk. Radiological findings, especially CXR, showed a strong association with TB positivity ($p = 0.0001$). Gender, occupation, marital status, residence, contact history, and chronic disease were not significantly associated. **Conclusion:** TB prevalence was high among patients with chronic diseases and close contacts, particularly in younger adults and the elderly. Targeted screening, community education, and improved diagnostic strategies are essential to reduce TB burden in Iraq.

KEYWORDS: Prevalence, pulmonary, tuberculosis, contacts, chronic, diseases.

INTRODUCTION

Tuberculosis (TB) continues to be a major global health challenge, particularly in low- and middle-income countries where socioeconomic and health system limitations exacerbate its spread and impact. Despite significant progress in diagnosis and treatment, TB remains one of the top ten causes of mortality worldwide and the leading cause of death from a single infectious agent, surpassing HIV/AIDS.[1] In 2023, the World Health Organization (WHO) estimated 10.6 million new TB cases globally, with nearly 1.3 million deaths, reflecting the ongoing burden of this preventable and treatable disease.[2] The epidemiology of TB is strongly influenced by host-related factors such as age, gender, socioeconomic status, and comorbid conditions. Notably, individuals with chronic diseases such as diabetes mellitus, chronic kidney disease, and HIV infection are at higher risk of developing active TB due to immune dysregulation and increased susceptibility to Mycobacterium tuberculosis infection.[3,4] Diabetes mellitus alone has been shown to triple the risk of TB, and the interaction between these two diseases creates a double burden for healthcare systems, particularly in countries with high prevalence rates of both conditions.[5] Equally important is the role of close contacts of TB patients, who represent a critical group for targeted screening and preventive interventions. Household and close contacts are often exposed to prolonged airborne

transmission, making them a priority for surveillance programs. Studies have consistently reported higher rates of latent and active TB among contacts compared with the general population, reinforcing the importance of systematic contact investigation as a cornerstone of TB control strategies.[6,7] In Iraq and other countries in the Middle East, TB remains a significant public health concern, with challenges including underdiagnosis, delayed treatment initiation, and limited implementation of preventive strategies among high-risk groups.[8] Examining TB prevalence among patients with chronic diseases and their contacts can provide valuable insights into disease dynamics, inform screening policies, and support the development of targeted interventions to reduce morbidity and mortality. The current study aims to explore the prevalence of pulmonary tuberculosis among contacts of TB patients and among individuals with chronic diseases, with an emphasis on sociodemographic factors, clinical history, and diagnostic findings. By addressing these dimensions, the study contributes to understanding the interplay between TB, chronic illness, and social determinants, which is essential for designing evidence-based prevention and control strategies.

METHOD

This cross-sectional descriptive study was conducted between **January 2025 and June 2025** at Al-Muthanna health directorae, which serves as a referral center for tuberculosis (TB) diagnosis and management. The study population included all patients who attended the facility during the study period with suspected pulmonary tuberculosis, as well as individuals with chronic diseases who underwent TB screening. In addition, household and close contacts of confirmed TB patients were systematically evaluated to determine the prevalence of TB within this high-risk group. A total of **225 participants** were enrolled, comprising both suspected TB cases and contacts of index patients. Sociodemographic information including age, gender, residence, occupation, marital status, and educational level was obtained using a structured questionnaire. Relevant clinical history was documented, with particular focus on the presence of chronic illnesses such as diabetes mellitus, hypertension, or other long-standing conditions. Data regarding duration of illness, previous TB diagnosis, and recent onset of symptoms were also collected. All participants underwent standard diagnostic evaluation. Sputum samples were examined for **acid-fast bacilli (AFB)** using Ziehl–Neelsen staining, and additional diagnostic methods such as GeneXpert or culture were applied when necessary. Radiological investigations, including **chest X-ray (CXR)** and **computed tomography (CT)** scans, were performed in accordance with clinical indications. Cases were classified as “positive” or “negative” based on combined bacteriological and radiological findings. Data were entered and analyzed to explore the association between TB diagnosis and key sociodemographic and clinical variables. Statistical significance was assessed using chi-square tests, with a p-value <0.05 considered statistically significant. Results were presented in frequencies and percentages for categorical variables, while associations were displayed in cross-tabulated tables to highlight trends in risk factors and outcomes. This methodological approach ensured a comprehensive assessment of TB prevalence among both patients with chronic diseases and their close contacts, offering insights into the interplay between host factors, comorbidities, and disease transmission.

RESULTS

Sex: Out of 225 patients, 119 (52.9%) were males and 106 (47.1%) females, showing a slight male predominance. **Age**: The largest age group was ≥60 years (55, 24.4%), followed by 20–29 years (49, 21.8%), and 50–59 years (36, 16.0%). The least represented group was 40–49 years (23, 10.2%). **Residence**: Most patients resided in rural areas (157, 69.8%) compared with 68 (30.2%) from cities. **Occupation**: The majority were free job workers (89, 39.6%) and housewives (81, 36.0%), while 52 (23.1%) were unemployed and only 3 (1.3%) were employees. **Marital state**: Married patients comprised 137 (60.9%) while single patients were 88 (39.1%). **Education**: Nearly half had primary education (106, 47.1%), 90 (40.0%) were illiterate, and 29 (12.9%) had secondary education. **Chronic disease**: 56 (24.9%) had chronic diseases, while 169 (75.1%) did not. **Recent diagnosis**: 19 (8.4%) were recently diagnosed. **Duration of disease**: The highest group had 2 years (46, 20.4%), followed by 4 years (43, 19.1%) and 5 years (41, 18.2%). **Contact**: Most patients reported no contact with TB cases (214, 95.1%); only 11 (4.9%) reported contact. **Diagnosis tool**: AFB confirmed 144 (64.0%) cases, while other methods accounted for 81 (36.0%). **Radiology**: CXR was used for 190 (84.4%), CT & CXR for 31 (13.8%), and CT alone for 4 (1.8%). As in table 1.

Table 1: Demographic characteristics.

Variable	Category	No.	%
Sex	Female	106	47.1
	Male	119	52.9
Age (years)	<20	27	12.0
	20-29	49	21.8
	30-39	35	15.6
	40-49	23	10.2
	50-59	36	16.0
	60	55	24.4

Residence	City	68	30.2
	Rural	157	69.8
Occupation	Employee	3	1.3
	Free Job	89	39.6
	Housewife	81	36.0
	Unemployed	52	23.1
Marital state	Married	137	60.9
	Single	88	39.1
Education	ILLITRATE	90	40.0
	primary	106	47.1
	Secondary	29	12.9
Chronic disease	no	169	75.1
	yes	56	24.9
	Recent diagnosed	19	8.4
Duration of disease	1.	36	16.0
(years)	2	46	20.4
	3	40	17.8
	4	43	19.1
	5	41	18.2
Contact	No	214	95.1
	Yes	11	4.9
Diagnosis tool	AFB	144	64.0
	other	81	36.0
	CT	4	1.8
Radiology tools	CT&CXR	31	13.8
	CXR	190	84.4
Total			

Distribution of patients according to final results of TB diagnosis: Out of a total of 225 patients, 137 (60.9%) were TB positive, 88 (39.1%) were TB negative. The figure highlights that more than half of the studied population had confirmed TB, reflecting a high prevalence rate among the investigated groups (contacts and patients with chronic diseases). As in fig 1.

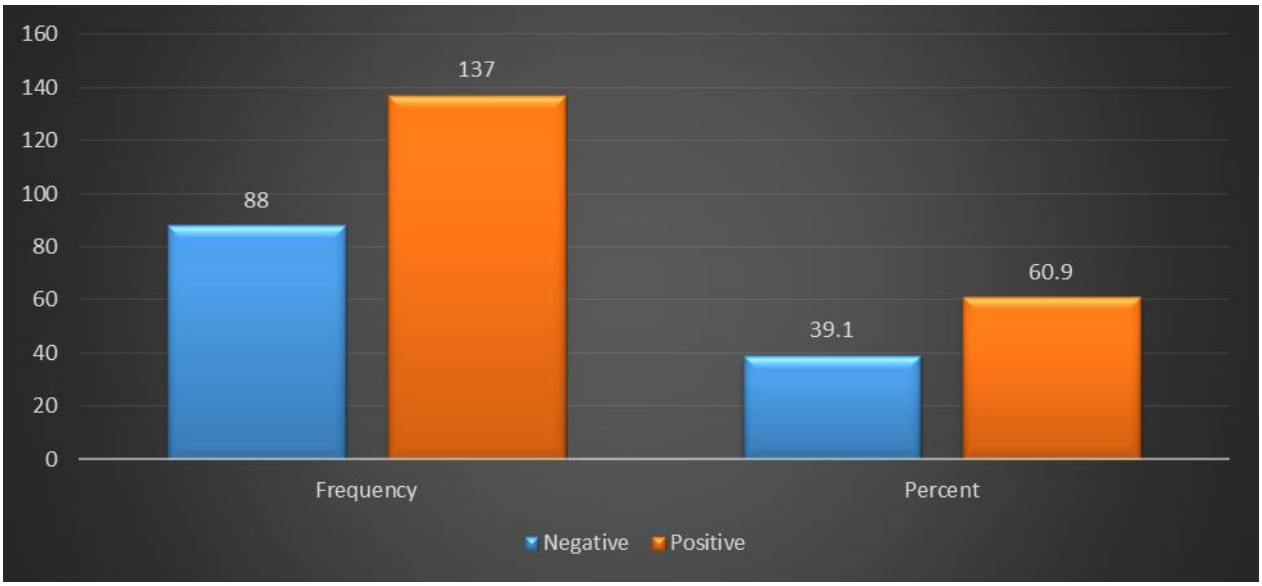

Fig 1: distribution of patients according to final results of TB diagnosis.

Association between outcome and sociodemographic variables: Age group: TB positivity was highest among 20–29 years (35, 25.5%) and ≥60 years (29, 21.2%), while lowest in 40–49 years (19, 13.9%). The association was statistically significant (p = 0.04). Gender: Males had higher positivity 76 (55.5%) compared to females 61 (44.5%), but the difference was not significant (p = 0.3). Occupation: Free job workers (61, 44.5%) and housewives (44, 32.1%) had the highest TB positivity. Employees had very few cases (3, 2.2%). The association

was not significant (p = 0.1). Marital state: Positivity was more frequent among married (78, 56.9%) than single (59, 43.1%), but not statistically significant (p = 0.2). Residence: Rural patients accounted for most positives 92 (67.2%) compared with city residents 45 (32.8%), not statistically significant (p = 0.3). Education: Primary education group showed the highest TB positivity 67 (48.9%), followed by illiterate (47, 34.3%). Secondary level accounted for 23 (16.8%). This association was significant (p = 0.02). Age and education level were significantly associated with TB diagnosis, while gender, marital status, occupation, and residence were not. As in table 2.

Table 2: association between outcome and studies variables.

TB diagnosis			
Age group	**Negative (No., %)**	**Positive (No., %)**	**P-value**
<20	14 (15.9%)	13 (9.5%)	
20–29	14 (15.9%)	35 (25.5%)	
30–39	13 (14.8%)	22 (16.1%)	0.04
40–49	4 (4.5%)	19 (13.9%)	
50–59	17 (19.3%)	19 (13.9%)	
≥60	26 (29.5%)	29 (21.2%)	
	TB diagnosis		
Gender	**Negative (No., %)**	**Positive (No., %)**	**P-value**
Female	45 (51.1%)	61 (44.5%)	0.3
Male	43 (48.9%)	76 (55.5%)	
	TB diagnosis		
Occupation	**Negative (No., %)**	**Positive (No., %)**	**P-value**
Employee	0 (0.0%)	3 (2.2%)	0.1
Free Job	28 (31.8%)	61 (44.5%)	
Housewife	37 (42.0%)	44 (32.1%)	
Unemployed	23 (26.1%)	29 (21.2%)	
	TB diagnosis		
Marital state	**Negative (No., %)**	**Positive (No., %)**	**P-value**
Married	59 (67.0%)	78 (56.9%)	0.2
Single	29 (33.0%)	59 (43.1%)	
	TB diagnosis		
Residency	**Negative (No., %)**	**Positive (No., %)**	**P-value**
City	23 (26.1%)	45 (32.8%)	0.3
Rural	65 (73.9%)	92 (67.2%)	
	TB diagnosis		
Education	**Negative (No., %)**	**Positive (No., %)**	**P-value**
Illiterate	43 (48.9%)	47 (34.3%)	**0.02**
Primary	39 (44.3%)	67 (48.9%)	
Secondary	6 (6.8%)	23 (16.8%)	
Total	88 (100.0%)	137 00.0%)	

Association between outcome and clinical variables: Chronic disease: TB positivity was almost identical between those with chronic disease 34 (24.8%) and those without 103 (75.2%) (p = 1.0). Duration of diagnosis: TB positivity increased with disease duration: highest at 2 years (30, 21.9%) and 5 years (27, 19.7%). No significant difference (p = 0.7). Contact history: Positive cases were slightly higher among those with contact 7 (5.1%), compared to no contact 130 (94.9%), but not significant (p = 1.0). Diagnosis tool: AFB detected most positives 92 (67.2%), while other tools identified 45 (32.8%) (p = 0.2). Radiological tools: Most positives were detected by CXR 132 (96.4%), compared with CT & CXR 5 (3.6%) and CT alone 0 (0.0%). This association was highly significant (p = 0.0001). Radiological tools (particularly CXR) were strongly associated with TB diagnosis, while chronic disease, duration, contact, and diagnostic method showed no significant association. As in table 3.

Table 3: association between outcome and studies variables.

TB diagnosis			
History of chronic diseases	**Negative (No., %)**	**Positive (No., %)**	**P-value**
No	66 (75.0%)	103 (75.2%)	1.000
Yes	22 (25.0%)	34 (24.8%)	
TB diagnosis			
Duration of diagnosis	**Negative (No., %)**	**Positive (No., %)**	**P-value**
Recently diagnosed	8 (9.1%)	11 (8.0%)	0.7
1 year	18 (20.5%)	18 (13.1%)	
2 years	16 (18.2%)	30 (21.9%)	
3 years	15 (17.0%)	25 (18.2%)	
4 years	17 (19.3%)	26 (19.0%)	
5 years	14 (15.9%)	27 (19.7%)	
TB diagnosis			
Contact	**Negative (No., %)**	**Positive (No., %)**	**P-value**
No	84 (95.5%)	130 (94.9%)	1.000
Yes	4 (4.5%)	7 (5.1%)	
TB diagnosis			
Diagnosis tool	**Negative (No., %)**	**Positive (No., %)**	**P-value**
AFB	52 (59.1%)	92 (67.2%)	0.2
Other	36 (40.9%)	45 (32.8%)	
TB diagnosis			
Radiological tools	**Negative (No., %)**	**Positive (No., %)**	**P-value**
CT	4 (4.5%)	0 (0.0%)	**0.0001**
CT & CXR	26 (29.5%)	5 (3.6%)	
CXR	58 (65.9%)	132 (96.4%)	
Total	88 (100.0%)	137 (100.0%)	

DISCUSSION

The present study investigated the prevalence and associated factors of pulmonary tuberculosis (TB) among patients with chronic diseases and close contacts, providing insights into demographic, clinical, and diagnostic determinants. Out of 225 participants, more than half were confirmed TB positive (137, 60.9%), highlighting a substantial disease burden in this population. This high positivity rate underscores the persistent challenge of TB in regions where socioeconomic vulnerabilities and comorbidities intersect to elevate risk. Demographic determinants showed that TB affected both sexes, with a slightly higher prevalence in males (55.5%) than females (44.5%), though the difference was not statistically significant. This finding aligns with global evidence showing men are disproportionately affected by TB, potentially due to occupational exposure, smoking, and delayed healthcare seeking.[9] However, the lack of statistical significance in our cohort may be due to comparable exposure risks across both genders.

Age was significantly associated with TB positivity, with peaks in the 20–29 years and ≥60 years groups. This bimodal distribution suggests vulnerability at younger adult ages, likely due to active social and occupational exposure, and again in older age groups due to waning immunity and higher comorbidity burden. Similar findings were reported in Ethiopia and India, where TB prevalence was highest among young adults and older individuals.[10,11] These results reaffirm the need for age-tailored screening and preventive strategies. Educational level was another significant determinant, with TB positivity highest among those with primary education (48.9%) and illiterates (34.3%). Limited health literacy may contribute to delayed diagnosis and poor treatment adherence. Previous studies in Pakistan and Nigeria similarly found that low educational attainment correlated with higher TB risk and worse treatment outcomes.[12,13] This highlights the importance of community health education as part of TB control programs. Contrary to expectations, chronic disease status was not significantly associated with TB positivity in this study. Although diabetes and other chronic illnesses are well-established risk factors for TB[14], the similarity between groups (24.8% vs. 25.0%) may be due to underreporting of comorbidities or the relatively small subgroup with chronic conditions. Nevertheless, evidence consistently demonstrates that diabetes nearly triples the risk of developing active TB[15], suggesting that more precise comorbidity assessments are warranted in future studies. Diagnostic modalities played a crucial role in identifying cases. CXR was the most reliable radiological tool, significantly associated with TB positivity ($p = 0.0001$), detecting 96.4% of positive cases. This is consistent with WHO guidance, which emphasizes chest radiography as an essential screening tool in high-risk populations.[16] While bacteriological confirmation remains the gold standard, radiology continues to serve as a rapid, accessible adjunct, especially in resource-limited settings. Our study's finding that 60.9% of participants were TB positive is

higher than regional reports from Iraq and neighboring countries, where prevalence rates among suspected or high-risk groups ranged between 30–50%.[17,18] The elevated rate may reflect the inclusion of high-risk contacts and patients with chronic diseases, populations known to have amplified susceptibility. Overall, our findings emphasize that TB remains a pressing public health issue with strong links to age, educational status, and diagnostic modality. Unlike some global studies, gender and chronic disease were not significant predictors, highlighting possible regional variations in risk profiles. Strengthening targeted screening in young adults, the elderly, and populations with limited education, along with improving radiological diagnostic capacity, may reduce the TB burden in Iraq and similar contexts.

CONCLUSION

This study revealed a high prevalence of pulmonary tuberculosis among patients with chronic diseases and close contacts, with significant associations noted for age, educational level, and diagnostic modality. Radiological evaluation, particularly chest X-ray, proved essential for case detection. Gender, residence, and chronic illness did not show significant associations, suggesting regional variations in risk factors. Strengthening targeted screening and improving diagnostic strategies are vital to reducing the TB burden in Iraq.

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