



Depression and anxiety in patients with pulmonary tuberculosis in Ciego de Ávila, 2014–2023

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ABSTRACT

Introduction: tuberculosis is a chronic infectious disease that mainly affects the lungs, although there is a high prevalence of psychological disorders such as depression and anxiety associated with it, which influence disease progression and treatment success.

Objectives: to analyze the influence of depression and anxiety on therapeutic failure and relapses in patients with pulmonary tuberculosis in Ciego de Ávila during 2014–2023.

Methods: an observational, analytical, retrospective cohort study was conducted from 2014 to 2023, with a population of 490 patients and a stratified sample of 150. The PHQ-9 and GAD-7 instruments were used to assess the severity of depression and anxiety.

Results: treatment failure and relapses were more frequent in men (82,35 % and 91,67 %) and in the 45–49 age group. The most common comorbidities were alcoholism and smoking. The probability of therapeutic failure increased significantly in patients with severe depression (RR: 9,42; 95 % CI: 2,06–43.1; $p=0,003$); while in those with moderate, moderately severe, and severe depression, an increased probability of relapse was reported ($p<0,05$). The probability of failure increased in patients with moderate anxiety ($p=0,006$) and severe anxiety ($p=0,008$), while relapses were more frequent in individuals with moderate anxiety (RR: 15,54 [95 % CI: 3.90–61,81]; $p<0,001$).

Conclusions: there is a significant relationship between depression, anxiety, and adverse treatment outcomes. Considering mental health in these patients is essential to improve success rates and reduce relapses.

Keywords: Anxiety; Depression; Recurrence; Treatment Outcome; Mental Health; Tuberculosis.

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INTRODUCTION

Tuberculosis (TB) is a chronic infectious disease caused mainly by the bacillus *Mycobacterium tuberculosis*, which mostly affects the lungs, although it can compromise other organs.⁽¹⁾ Through the centuries, this pathology has been recognized as one of the main causes of morbidity and mortality globally.⁽²⁾ TB transmission occurs fundamentally by the airborne route, through droplets expelled when coughing or sneezing, which favors its dissemination in populations with overcrowding conditions or those with a weakened immune system. This situation is aggravated in environments where access to health services is limited.⁽³⁾

According to data from the World Health Organization (WHO), in 2023 approximately 9.9 million new cases of TB were diagnosed worldwide.⁽⁴⁾ Globally, it is estimated that 1.5 million people lost their lives due to causes related to this disease. In Latin America, the situation is also alarming, with countries such as Brazil, Peru, and Haiti reporting high incidence rates.⁽⁵⁾

In contrast, Cuba has stood out for its efforts in implementing control programs that have shown positive results in the fight against this disease, although certain provinces, such as Ciego de Ávila, have recorded worrying incidence rates, reaching 10.5 per 100,000 inhabitants in 2023.⁽⁶⁾

Additionally, it has been identified that psychological disorders, such as depression and anxiety, are prevalent among patients with TB and can have a significant impact on disease progression, treatment success, and adherence to it.⁽⁷⁾ Depression manifests with symptoms such as persistent sadness, lack of interest in daily activities, and alterations in sleep and appetite. Anxiety, in turn, is characterized by a state of restlessness, nervousness, or fear, which can be triggered by the experience of living with TB and its implications.

Recent studies have revealed the interrelation between these mental disorders and adherence to treatment in patients with TB. Patients suffering from depression or anxiety tend to show lower rates of adherence to their treatment regimens, which can result in therapeutic failures and relapses. This is due, to a large extent, to how these conditions affect the patient's motivation and their ability to comply with medical indications, resulting in greater difficulty in managing their treatment and an increased risk of bacterial resistance and complications.⁽⁸⁾

The care model for TB control in Cuba has proven to be effective; however, it is imperative to consider a more comprehensive approach that includes not only clinical aspects but also psychosocial ones that can influence treatment.⁽⁹⁾ The high prevalence of depression and anxiety among patients with TB creates a vicious circle where the disease deteriorates the individual's emotional state and, in turn, this psychological deterioration hinders compliance with treatment.⁽¹⁰⁾

Therapeutic failure, which occurs when the patient does not respond to standard treatment due to causes such as abandonment or bacterial resistance, and relapse, which refers to the reappearance of the disease after a period of apparent cure, are intrinsically linked to psychological factors. Research in Latin American countries has shown that patients suffering from depression are 30 % more likely to abandon treatment, while those with anxiety show greater difficulty in following medical recommendations.⁽¹¹⁾

The present study aims to analyze the influence of depression and anxiety on therapeutic failure and relapses of patients with pulmonary TB in Ciego de Ávila in the period between 2014-2023. The results will contribute to the Territorial Project Strategy for patients with pulmonary TB and high probability of therapeutic failure in Ciego de Ávila province from 2024-2027, to reduce the associated morbidity and mortality rates in the province, aligning with the WHO objectives of eliminating the global threat of this disease by 2030.

An observational, analytical, retrospective cohort study was conducted in Ciego de Ávila province, during the period between 2014 and 2023. The study population consisted of 490 patients diagnosed with pulmonary TB in said interval, registered in the provincial epidemiological surveillance system.

Patients over 18 years of age with a confirmed diagnosis of pulmonary TB were included, according to the criteria established by the National Program for the Prevention and Control of Tuberculosis, and who had complete clinical information in their records. Patients with extrapulmonary forms of TB, those with incomplete clinical records that prevented obtaining the variables of interest, and those with documented history of severe psychiatric disorders prior to the diagnosis of the disease were excluded, in order to reduce possible confounding factors in the analysis.

The sample size consisted of 150 patients, calculated using the formula for estimating proportions in finite populations, with a 95 % confidence level and an acceptable precision error. Stratified random sampling was used to guarantee the representation of the different therapeutic outcomes studied. In this way, three groups were formed: patients with therapeutic failure ($n=17$), patients with relapses after having completed treatment ($n=48$), and patients with successful treatment, without evidence of relapses or therapeutic failure during the follow-up period ($n=85$).

For the GAD-7, anxiety levels were classified as mild (5-9 points), moderate (10-14 points), and severe (15-21 points). The application of these instruments allowed determining the frequency and severity of the emotional disorders present in the sample and exploring their possible association with the clinical outcomes of antituberculosis treatment.

The variables considered included age, sex, clinical condition regarding TB treatment (new cases, therapeutic failure, relapse, or successful treatment), as well as the levels of depression and anxiety determined by the PHQ-9 and GAD-7 instruments. These variables were selected for their epidemiological relevance and their potential influence on therapeutic adherence and the clinical evolution of patients.

Statistical analysis

The information collected was processed using the IBM SPSS Statistics software. For descriptive analysis, absolute frequencies and percentages were calculated for qualitative variables, as well as means and standard deviations for quantitative variables. The results were organized and presented in tables and graphs to facilitate their interpretation and understanding.

In order to evaluate the relationships between the variables studied, Pearson correlation tests were applied, in addition to the calculation of relative risk (RR) with their respective 95 % confidence intervals. The chi-square test was used to determine associations between categorical variables and analysis of variance (ANOVA) to compare the means of depression and anxiety scores between the different patient groups. Likewise, logistic regression models were developed to identify the independent influence of mental health disorders on the therapeutic outcomes of pulmonary TB. In all analyses, a level of statistical significance of $p<0.05$ was considered.

Ethical aspects

The research was developed in accordance with the ethical principles established in the Declaration of Helsinki of the World Medical Association and the recommendations of the World Health Organization Guide for Research Ethics Committees. The confidentiality of the information collected was guaranteed through the anonymization of the data and its exclusive use for scientific purposes. All participants gave their informed consent to be part of the study, respecting at all times the principles of autonomy, beneficence, non-maleficence, and justice.

RESULTS

The distribution of TB in Ciego de Ávila (Figure 1) in the period 2014-2023 by sex reveals differentiated clinical patterns. Therapeutic failure and relapses predominate in the male population, with percentages of 82,35 % and 91,67 %, respectively, compared with 17,65 % and 8,33 % recorded in the female group. In contrast, new cases are identified mostly in the opposite sex, reaching 69,41 % compared with 30,59 %.

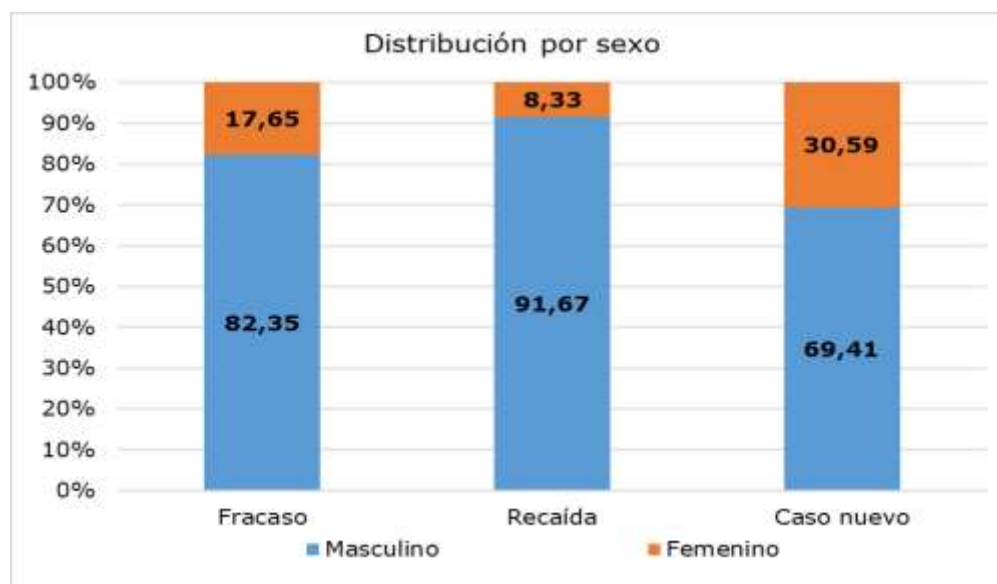


Fig. 1 Percentage distribution by sex in Ciego de Ávila province, 2014-2023.

The distribution of TB in Ciego de Ávila shows significant differences according to age groups (Table 1). In therapeutic failure, the age groups of 45-49 years (23,53 %) and 50-54 years (17,65 %) stand out, while no cases were reported in young adults (25-29 and 35-39 years) or in those over 55-59 or 70-74 years. For relapses, the highest percentages correspond to 45-49 years (20,83 %) and 50-54 years (16,67 %), contrasting with the minimum recorded in the 25-29 age group (2,08 %). In new cases, 45-49 years (17,65 %) and 40-44 years (12,94 %) stand out, compared with the lowest incidence in people aged 70-74 years (2,35 %).

Table 1. Distribution of tuberculosis cases by age groups.

Age	Failure		Relapse		New Case	
	No.	%	No.	%	No.	%
25-29	0	0	1	2,08	4	4,71
30-34	2	11,76	2	4,17	8	9,41
35-39	0	0	3	6,25	8	9,41
40-44	2	11,76	4	8,33	11	12,94
45-49	4	23,53	10	20,83	15	17,65
50-54	3	17,65	8	16,67	8	9,41
55-59	0	0	7	14,58	11	12,94
60-64	2	11,76	4	8,33	5	5,88
65-69	2	11,76	3	6,25	8	9,41
70-74	0	0	2	4,17	2	2,35
≥ 75	2	11,76	4	8,33	5	5,88

The distribution of comorbidities associated with TB (Figure 2) shows a heterogeneous risk profile. Among the conditions identified, Diabetes Mellitus leads with 34 % prevalence, followed by Smoking (28 %), Alcoholism (22 %), and HIV (16 %). These percentages reflect the critical influence of metabolic, immunological, and lifestyle factors on the progression of the disease.

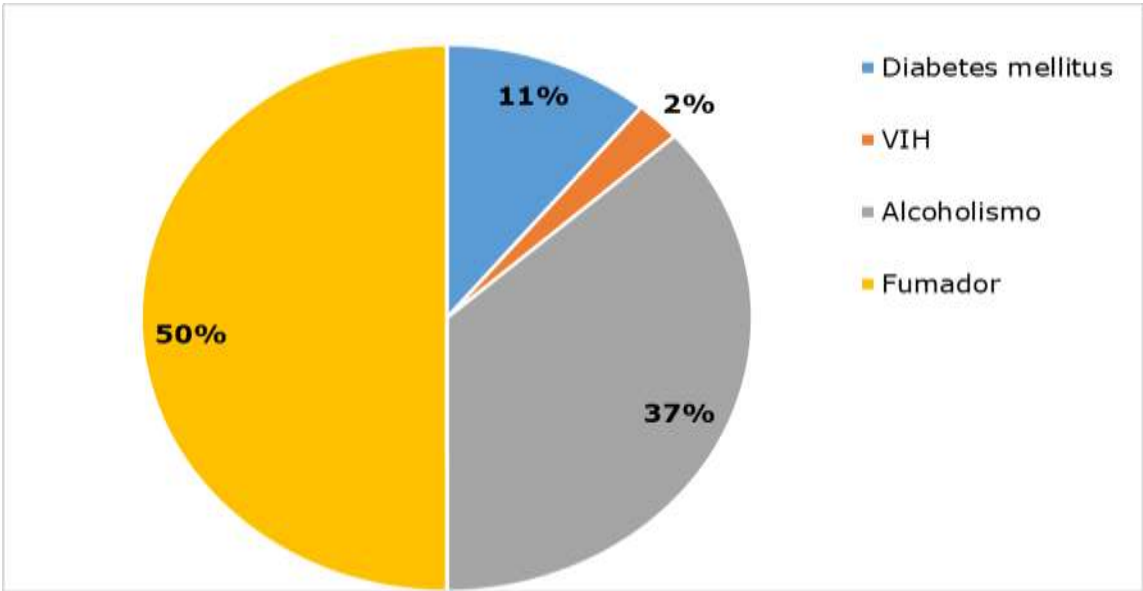


Fig. 2 Prevalence of comorbidities associated with TB.

Table 2 shows that the severity of depression is associated with unfavorable outcomes in patients with pulmonary TB. In the case of therapeutic failure, the risk increased progressively from mild depression (RR=1,26; p=0,729) to severe depression (RR=9,42; 95 % CI: 2,06-43,1; p=0,003), the latter being the only category with a statistically significant association. Regarding relapses, an even more marked relationship was observed, with significantly elevated risks in patients with moderate depression (RR=11,23; 95 % CI: 3,57-35,3; p<0,001), moderately severe (RR=12,87; 95 % CI: 4,25-39,05; p<0,001), and severe (RR=7,54; 95 % CI: 2,18-26,16; p=0,001). These results indicate that moderate and severe depressive symptoms constitute important risk factors for disease recurrence and treatment failure.

Table 2. Relative risk of therapeutic failure and relapse in tuberculosis according to level of depression.

Level of depression	Failure			Relapse		
	RR (95 % CI)	χ^2	p Value	RR (95 % CI)	χ^2	p Value
Mild	1,26 (0,18-8,53)	0,12	0,729	0,84 (0,15-4,76)	0,04	0,841
Moderate	4,59 (0,84-25,1)	3,41	0,065	11,23 (3,57-35,3)	17,89	<0,001
Moderately severe	3,71 (0,76-18,0)	2,67	0,102	12,87 (4,25-39,05)	19,74	<0,001
Severe	9,42 (2,06-43,1)	8,92	0,003	7,54 (2,18-26,16)	10,37	0,001

Table 3 shows a significant association between anxiety and unfavorable outcomes of pulmonary TB. In relation to therapeutic failure, mild anxiety did not show a statistically significant association (RR=0,86; 95 % CI: 0,13-5,88; p=0,887); however, the risk increased considerably in patients with moderate anxiety (RR=7,43; 95 % CI: 1,75-31,56; p=0,006) and severe anxiety (RR=10,0; 95 % CI: 1,77-56,49; p=0,008). Regarding relapses, even stronger associations were observed, with a 9,05 times greater risk in patients with mild anxiety (p=0,004), which rose to 15,54 times in those with moderate anxiety (95% CI: 3,90-61,81; p<0,001), constituting the highest value recorded. Severe anxiety also significantly increased the risk of relapse (RR=10,0; 95 % CI: 1,77-56,49; p=0,008), confirming that anxiety constitutes an important risk factor for the unfavorable clinical evolution of TB.

Table 3. Relative risk of therapeutic failure and relapse in tuberculosis according to level of anxiety.

Level of anxiety	Failure			Relapse		
	RR (95 % CI)	χ^2	p Value	RR (95 % CI)	χ^2	p Value
Mild	0,86 (0,13-5,88)	0,02	0,887	9,05 (2,23-36,71)	8,15	0,004
Moderate	7,43 (1,75-31,56)	7,52	0,006	15,54 (3,90-61,81)	15,28	<0,001
Severe	10 (1,77-56,49)	6,98	0,008	10 (1,77-56,49)	6,98	0,008

DISCUSSION

TB continues to be a critical public health challenge, particularly in contexts where psychosocial factors such as depression and anxiety interact with clinical barriers. The results of this research in Ciego de Ávila (2014-2023) revealed a significant association between high levels of depression/anxiety and the risk of therapeutic failure and relapses, findings that align with those shown by Requena-Herrera and collaborators,⁽¹²⁾ although with regional nuances.

The predominance of cases in the 45-49 age group coincides with Cuban studies such as that of Rodríguez Puga and collaborators,⁽¹³⁾ which identified a higher prevalence of work stress in the 50-59 age group. However, it contrasts with research in Europe, where incidence is higher in those over 60 years of age due to immunosenescence.⁽¹⁴⁾ In the Latin American context, Llanos-Tejada and Ponce-Chang,⁽¹⁵⁾ also reported a peak in the 40-55 age group, linked to internal migration and urban overcrowding.

The male predominance reflects global findings, such as those reported in Lima by Jonis-Jiménez and collaborators,⁽¹⁶⁾ who attribute this pattern to access to health establishments.⁽¹⁶⁾ However, in countries such as India, TB proportionally affects more women due to their role as caregivers in closed family environments.⁽¹⁷⁾ In Cuba, Charro Herrera and collaborators,⁽¹⁸⁾ corroborated this trend, noting that 68 % of cases in Guantánamo corresponded to men, linked to behavioral risk factors.

Comorbidities such as diabetes mellitus and HIV/AIDS significantly influence the prognosis and management of patients with TB, also affecting their mental health. Diabetes, by altering the immune system and deteriorating the inflammatory response, increases susceptibility to active infections and more severe forms of TB, in addition to complicating the metabolism of antituberculosis drugs, which can prolong treatment and increase toxicity. This situation generates a considerable psychological impact, since patients face a double burden of chronic diseases that affect their quality of life, generating anxiety, depression, and stress related to the uncertainty of treatment and social stigmatization. The coexistence of DM and TB can lead to a vicious circle where poor glycemic control aggravates the infection and TB, in turn, negatively affects metabolic control, exacerbating physical and emotional deterioration.^(19,20)

Researchers from Pusan University state that the main risk factors for TB include malnutrition, HIV infection, smoking, diabetes, and alcohol use disorder, reporting a direct correlation between alcoholism and pulmonary TB.⁽²¹⁾ On the other hand, HIV/AIDS, by seriously compromising the immune system, increases vulnerability to TB and other opportunistic infections, which aggravates the clinical picture and the complexity of treatment. This double infectious and chronic burden is associated with a high risk of mental disorders, including severe depression, anxiety, and post-traumatic stress disorder, which can affect therapeutic adherence and overall prognosis. Mental health in these patients is a critical component that must be comprehensively addressed, since social stigma, isolation, and uncertainty about the evolution of both diseases directly impact their psychosocial well-being.⁽²²⁾

The association between severe depression and treatment failure coincides with research in sub-Saharan Africa, developed by Aluko and collaborators,⁽²³⁾ who reported an RR of 8,9 in patients not treated for mental disorders. However, in India, Hans and Sharan,⁽²⁴⁾ show a lower RR (6,2), attributed to the integration of community psychological support programs, a strategy still incipient in Cuba.

On the other hand, moderate and moderately severe depression were associated with an elevated risk of relapse—results similar to those reported by Redwood et al.,⁽²⁵⁾ in Vietnam (RR=7,1 for relapses), though with greater magnitudes, possibly due to a lack of post-treatment psychological follow-up within the Cuban context. A study by Carmona Denis et al.,⁽²⁶⁾ indicated that 56 % of patients with TB exhibited signs of depression, which correlated with poor treatment adherence.

Regarding anxiety, the risk of therapeutic failure at moderate and severe levels mirrors findings reported by Navarro Quintero et al.,⁽²⁷⁾ who linked anxiety to the premature discontinuation of treatment resulting from unmanaged side effects. In contrast, Bonilla-Asalde et al.,⁽²⁸⁾ observed that only severe anxiety affected adherence, suggesting that cultural factors—such as the stigma surrounding mental health disorders—may influence these variations. As for relapses, even mild anxiety was associated with a high RR in the present study; this finding differs from that of Choctaya Choctaya et al.,⁽²⁹⁾ in whose study mild anxiety did not show a significant association.

In the authors' consideration, it is vital that TB control strategies in Cuba include measures that promote psychological well-being, complementing pharmacological ones. Only through a multidisciplinary approach that unites the clinical and psychological areas can a significant decrease in failure and relapse rates be aspired to.

Among the limitations of the present study is that its quality depends on the existing clinical records, which can introduce information biases and limit the capacity to establish direct causal relationships between variables. Likewise, although the sample was stratified and random, it may affect the generalization of the results to other populations or regions since the study was conducted in a specific province of Cuba, with particular epidemiological and social characteristics. Therefore, the results may not be extrapolable.

CONCLUSION

The findings of this study evidence a significant relationship between the presence and severity of anxiety and depression with adverse outcomes of antituberculosis treatment. It was observed that both therapeutic failure and relapses were considerably more frequent in patients who presented moderate to severe levels of depression and anxiety, increasing the relative risk of these events. Furthermore, this negative impact is accentuated in men and in the 45 to 49 age group. Therefore, the comprehensive consideration of mental health is essential to improve adherence to treatment, increase therapeutic success rates, and reduce disease recurrence.

Conflict of Interest

The authors declare that there is no conflict of interest regarding this study.

Author Contributions

MRC: Conceptualization, Data curation, Formal analysis, Research, Methodology, Project administration, Resources, Supervision, Validation, Visualization, Original draft writing, Writing-review and editing.

OLC: Conceptualization, Data curation, Research, Methodology, Resources. JCEc: Conceptualization, Research, Methodology, Resources.

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