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Original Article

Cost Analysis of Tuberculosis Disease in the Case of Tuberculosis Control Dispensary

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ABSTRACT

OBJECTIVE: To estimate the direct and indirect costs associated with tuberculosis (TB) prevention, control, and treatment activities conducted at a TB control dispensary in Türkiye and to assess the economic burden of TB at the patient level.

MATERIAL AND METHODS: Patient-level cost data for individuals treated in 2023 with International Classification of Diseases, 10th Revision diagnostic codes A15–A19 were analyzed from the perspective of the healthcare provider. Direct medical costs were calculated based on healthcare service utilization using reimbursement prices specified in the Turkish Social Security Institution's Health Implementation Communiqué. Indirect costs were estimated using patient-reported data and included productivity loss, time spent accessing healthcare services, transportation expenses, and other out-of-pocket expenditures. All costs were calculated as the average annual cost per patient.

RESULTS: The average annual direct cost per patient was $346.39 (9,271.59Ł), with prescribed medications constituting the largest component of direct costs. The average annual indirect cost per patient amounted to $1,087.80 (32,013.50Ł), mainly driven by productivity losses and time spent in healthcare facilities. Overall, the average annual cost per TB patient was estimated at $1,434.22 (41,285.09Ł), with indirect costs accounting for nearly three-quarters of the total economic burden.

CONCLUSION: The findings demonstrate that TB imposes a substantial economic burden on patients, primarily through indirect costs, even when TB-related healthcare services are covered by the social security system. These results underscore the need for TB control strategies that extend beyond medical care and incorporate social protection and economic support mechanisms to reduce productivity losses and financial vulnerability among patients.

KEYWORDS: Tuberculosis, health care cost, cost of illness, tuberculosis control, health expenditures

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INTRODUCTION

Tuberculosis (TB) is a respiratory disease caused by the bacillus *Mycobacterium tuberculosis*, typically affecting the lungs.[1] It has been stated that approximately 85% of patients can be treated with the treatment regimens recommended by the World Health Organization (WHO), but in cases where access to treatment is not possible, the mortality rate can be up to 70%.[1-3] For this reason, on a global scale, one of the United Nations Sustainable Development Goals (2016-2030) is to reduce deaths from TB by 90 per cent by 2030.[4]

WHO has stated that TB was the second leading cause of death from a single infectious agent worldwide in 2022, despite being a preventable and treatable disease. More than 10 million people are newly diagnosed with TB every year, and approximately 1.3 million individuals worldwide died due to TB in 2022.[1] The global incidence of TB in 2022 was

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133 per 100,000, and the estimated mortality rate was 19.7 per 100,000. According to the data for 2021, the incidence rate of TB in Türkiye is 15 per 100,000 and the estimated mortality rate is 0.55 per 100,000.[1,3] TB dispensaries play an important role in the outpatient follow-up and treatment of patients diagnosed with TB in Türkiye.

TB control activities in Türkiye date back to 1918, with the establishment of the Tuberculosis Control Society by Besim Ömer Akalın and the opening of the first TB dispensary in İstanbul in the early 1920s.[5] Today, tuberculosis control dispensaries (TCD) operate under the Ministry of Health at the provincial level, providing comprehensive services including diagnosis, contact tracing, directly observed treatment, and preventive care. As of the end of 2021, a total of 173 TCDs were actively providing services across the country.[3,6] In accordance with national regulations, anti-TB medications are financed by the Social Security Institution for patients with social security coverage and by the government for patients without social security coverage.

While the number of patients entering the records of TCDs in Türkiye in 2019 was 11,401, this number decreased to 8,925 in 2020. The TB case rate in 2020 was 10.7 per 100,000 for Türkiye overall and 13.9 per 100,000 for Balıkesir province. When the distribution of cases by gender was analyzed, it was found that males were more common in Türkiye and Balıkesir province (57.2% and 64.5%, respectively). When the distribution of cases by site of involvement was analyzed, the lungs were the most common site; the lung involvement rate was 58.4% for Türkiye overall and 66.9% for Balıkesir province. In addition, most cases occurred in individuals aged 65 years and over. The treatment success rate among patients treated at TCDs was 82.6% for new cases, 71.9% for previously treated cases, and 81.9% for total cases. One of the factors contributing to this success is the strategy of directly supervised treatment. The National Tuberculosis System was launched in 2018 to effectively collect data on TB in Türkiye.[3] TB imposes direct and indirect costs on individuals, society, and the health system.

Studies show that the economic burden of TB on the national economy is high.[1,7-9] In addition, TB treatment can be lengthy, ranging from 4–6 months to 1 year, and in Türkiye typically lasts between 6 months and 1 year.[6] As patients may be unable to work during treatment, they may require cash support. In order to benefit from these cash social aids in Türkiye, patients must be a Turkish citizen, be physically followed up at a TCD and receive TB treatment, be registered in the national TB system, adhere to TB treatment, undertake to comply with the treatment and take their medication every day under the supervision of health personnel, and be approved by the responsible physician of the TCD to receive this aid.[10]

Main Points

- The annual total cost per tuberculosis patient was calculated as $1,434.22, with 76% of this amount attributed to indirect costs.
- 38.6% of patients were identified as low-income, which significantly increases the disease's economic impact.
- Among direct cost components, prescribed medications represented the highest expense, at $240.47; Streptomycin, pyrazinamide, and rifampicin were the most costly medications.
- Acid-fast bacilli microscopy and culture tests were performed 24 times per year, constituting the largest laboratory expense.
- 61.4% of the patients had additional chronic illnesses, indicating a high risk of developing complications during the treatment process.

In addition to the high cost of TB treatment, indirect costs impose a substantial economic burden on families and can lead to catastrophic expenditures. In particular, loss of income and the costs of food and nutritional supplements beyond patients' regular diets are the main causes of catastrophic costs. These catastrophic expenditures have been found to impose a large economic burden on patients.[11,12] A systematic review and meta-analysis of the financial burden of TB diagnosis and treatment among patients with TB in Ethiopia found that 51% of patients faced catastrophic costs. Drug-resistant TB, TB-human immunodeficiency virus (HIV) co-infection and hospitalisation have been found to be associated with catastrophic costs.[7] Based on studies in the literature, it is important to determine the direct and indirect costs of treating TB patients at TB dispensaries. It was stated that the treatment and management costs of TB disease are among the basic inputs for economic evaluations to assess the cost-effectiveness of public health interventions and are important for determining health policies and making public health planning.[13] This study aimed to calculate the direct and indirect disease-related costs of patients who received outpatient treatment at the TCD in Bandırma district of Balıkesir province from 1 January to 31 December 2023. The aim was to calculate the costs of TB for primary health care services and patients, and to propose future TB prevention, control, and treatment policies.

MATERIAL AND METHODS

This cost-of-illness study was conducted at a TCD in Türkiye. In this study, annual follow-up data for TB patients with International Classification of Diseases, 10th Revision diagnosis codes A15–A19 in 2023 were used. All patients who received treatment at the TCD in 2023 were initially considered for inclusion. However, 12 patients were excluded based on predefined exclusion criteria, including (i) irregular adherence to treatment or follow-up schedules, (ii) discontinuation of treatment for any reason, (iii) incomplete service records that did not allow reliable estimation of direct and/or indirect costs, and (iv) failure to complete the follow-up period within the study timeframe. Accordingly, service data from 70 patients aged 18 years or older were analyzed. The study was conducted from a service provider perspective. Ethical approval for the study was obtained from the Bandırma Onyedi Eylül University Non-Interventional Research Ethics Committee on June 21, 2023, with the decision number 2023-98.

Retrospectively obtained data were used in this study. As this was a retrospective analysis based on routinely collected data, informed consent was not required. Cost data were derived from two primary sources and classified as direct and

indirect costs. Clinical characteristics of the patients were also reviewed; no cases of drug-resistant TB or HIV positivity were identified during the study period. All patients included in the study (n = 70, 100%) received directly observed therapy (DOT) in accordance with the national TB control program. Direct medical costs were obtained from patient service records maintained by the TCD and included physician examinations, laboratory tests, imaging procedures, and prescribed medications. These procedures were costed in accordance with the reimbursement prices specified in the Republic of Türkiye Healthcare Implementation Communique.[14] Indirect costs, derived from patient-reported data collected through a structured questionnaire administered voluntarily after completion of treatment, included productivity loss, transportation expenses, and other out-of-pocket expenditures related to TB care.

Average direct medical costs per patient were determined according to the level of utilisation of physician examinations, laboratory tests, imaging procedures, and prescribed medicines. Indirect costs were defined as productivity loss due to illness, productivity loss associated with time spent in healthcare facilities, transportation costs, and other out-of-pocket expenditures incurred during the treatment process, in line with standard cost-of-illness methodology.[15,16]

In determining the average costs of medicines prescribed during patient follow-up, the number of tablets or capsules and the retail prices per mg/mcg of the active ingredients were used as the basis. Cost calculations were performed using the formula Cost = $\sum$ (number of procedures) × (unit price) × (patient rate %), and pharmaceutical costs were valued based on retail prices in accordance with national reimbursement tariffs.

Indirect cost data were obtained using a structured questionnaire voluntarily administered to patients after completion of treatment. The questionnaire collected information on transportation expenses incurred due to healthcare visits, productivity loss associated with time spent within the healthcare system, and other out-of-pocket expenditures related to TB care.

Transportation costs were calculated based on the total number of healthcare visits for diagnostic, treatment, and follow-up purposes and the average round-trip transportation cost reported per visit and expressed as average annual transportation costs per patient. Productivity loss related to time spent in the healthcare system was estimated by determining the total number of days that patients spent attending medical examinations, diagnostic tests, treatment sessions, and follow-up visits, and multiplying this duration by a daily reference income. The national minimum wage for 2023 was used as the reference income, corresponding to 11,402Ł per month ($425.8) a nd 447.15Ł per day ($16.7), as determined by the Minimum Wage Determination Commission of the Ministry of Labour and Social Security of the Republic of Türkiye.[17] The use of the national minimum wage as a reference income represents a conservative and standardized approach commonly applied in cost-of-illness studies where income levels are heterogeneously defined.[15,18]

All indirect costs were calculated and reported as average annual costs per patient. Costs were converted to US dollars using the exchange rate of the Central Bank of the Republic of Türkiye effective on 1 September 2023 ($1 = 26.766Ł), consistent with the effective date of the Healthcare Implementation Communique tariff applied.[19]

RESULTS

Sociodemographic Profile

Of the TB patients included in the study, 68.6% were male and 31.4% were female. Regarding income status, 38.6% of patients reported monthly incomes of 5,001–10,000Ł, 31.4% reported 10,001–30,000Ł, and 30.0% reported 0–5,000Ł, indicating that most patients belonged to low- and middle-income groups. More than half of the patients (61.4%) reported having at least one comorbid chronic condition in addition to TB, and a substantial proportion (72.9%) did not have social security coverage.

With respect to disease status, 80.0% of patients were newly diagnosed cases of TB, while 20.0% were relapse cases. Most patients (85.7%) received treatment and follow-up services within the same city, whereas 14.3% accessed care from another city. Pulmonary TB was observed in 65.7% of patients, while 34.3% had extrapulmonary involvement. Body mass index (BMI) assessment showed that 52.9% of patients had a BMI in the 21–29 kg/m^2 range, 25.7% were classified as obese (30–42 kg/m^2), and 21.4% had a BMI in the 8–20 kg/m^2 range. These sociodemographic and clinical characteristics are summarized in Table 1.

Cost Findings

Examinations, tests, radiological imaging, and prescribed medications for patients with TB constitute the direct costs of the disease. Indirect costs include loss of labor due to disease or medical leave, time spent in healthcare institutions, and transportation costs.

Direct Costs

During TB treatment, patients attend examinations 14 times per year (on average every 25 days). Within the framework of the Ministry of Health HIC in Türkiye, the average annual physician examination cost for TB dispensaries —primary health care institutions under the Ministry of Health Health Implementation Communiqué— was determined to be $33.96 (908.88Ł), including normal and control examinations.

Various biochemical laboratory are performed during patients' annual follow-up. Among these tests: C-reactive protein test was performed 6 times with a total annual cost of $1.47 (39.30Ł); complete blood count (haemogram) test was performed 6 times with a total cost of $1.51(40.37Ł); lactate dehydrogenase test was also performed 6 times; the adenosine deaminase activity test was performed once a year with a total cost of $0.50 (13.45Ł); the procalcitonin test was performed 2 times with a total cost of $1.14 (30.51Ł); and the procalcitonin test was performed 2 times with a total cost of $2.14 (57.24Ł). Accordingly, the total annual cost for biochemistry laboratory tests was $6.76 (180.87Ł) (Table 2).

As part of microbiological examinations and culture tests, mycobacterial culture was performed nine times per year, at

Table 1. Sociodemographic and clinical characteristics of the patients

Characteristics	Variable	Number [percentage (%)]
Gender	Woman	22 (31.4)
	Man	48 (68.6)
Income status	0–5000Ł	21 (30.0)
	5001–10000Ł	27 (38.6)
	10001–30000Ł	22 (31.4)
Do you have any other chronic illnesses?	Yes	43 (61.4)
	No	27 (38.6)
Do you have social security?	Yes	19 (27.1)
	No	51 (72.9)
Case status	New	56 (80.0)
	Relapse	14 (20.0)
Do you provide transport for treatment/follow-up from another city?	Yes	10 (14.3)
	No	60 (85.7)
Site of disease	Pulmonary	46 (65.7)
	Non-pulmonary	24 (34.3)
Body mass index (kg/m^2)	8–20 kg/m^2	15 (21.4)
	21–29 kg/m^2	37 (52.9)
	30–42 kg/m^2	18 (25.7)

The information in Table 1 includes information on the sociodemographic and clinical characteristics of the patients included in the study

a total cost of $25.16 (673.32Ł). Direct microscopy for acid-fast bacilli was also performed nine times, incurring a total cost of $8.80 (235.42Ł). In addition, sputum culture testing was performed six times, with a total cost of $4.69 (125.40Ł). The total annual cost of microbiological examinations and culture tests was calculated to be $38.65 (1034.14Ł) (Table 2).

Within the scope of functional assessment tests, pulmonary function tests were performed once a year at a cost of $2.88 (77.21Ł), and bronchoalveolar lavage test was performed twice a year at a total cost of $17.89 (478.80Ł). The total annual cost of functional assessment was $20.77 (556.01Ł) (Table 2).

Within the scope of radiological imaging procedures, chest X-rays were performed 4 times a year at a total cost of $3.42 (91.54Ł). High-resolution chest computed tomography (CT) and non-contrast thorax CT tests were also performed, with total costs of $0.08 (2.06Ł) and $2.31 (61.73Ł), respectively. The total annual cost of radiological imaging procedures was $5.81 (155.33Ł) (Table 2).

Among the prescribed drugs, streptomycin ($86.63), pyrazinamide ($65.21), and rifampicin ($54.02) had the highest costs. Isoniazid ($31.17) and ethambutol ($3.44) were also among the important cost items. The total annual cost of prescribed drugs was $240.47 (6436.37Ł). In this context, total direct patient costs were determined to be $346.39 (9271.59Ł). Most of these costs are due to prescription drugs, microbiological tests, and laboratory tests. It is noteworthy that drug costs constitute the largest component of direct treatment expenditures.

Indirect Costs

This section presents patient-level findings on average annual indirect costs related to TB. Indirect costs consisted of productivity loss due to illness, loss of labour resulting from medical leave and from time spent in healthcare facilities, transportation expenses, and other out-of-pocket expenditures. These costs were estimated based on patient-reported data collected through a structured questionnaire administered after completion of treatment. Patients were reported to be on medical leave for an average of 40 days and to have spent 25 days in healthcare institutions during the annual treatment period. Accordingly, the average annual productivity loss due to illness was calculated at $607.75 (17,886Ł) per patient, while the labour loss associated with medical leave and time spent in healthcare facilities was estimated at $379.85 (11,178.75Ł) per patient. Regarding transportation costs, 85% of patients reported attending healthcare facilities alone, whereas the remaining patients were accompanied. Transportation costs were calculated based on the number of healthcare visits and the average round-trip cost reported by patients, resulting in an average annual transportation cost of $100.20 (2,948.75Ł) per patient. Overall, the average annual indirect cost per patient was $1,087.80 (32,013.50Ł). Indirect patient follow-up costs for TB in TCDs are presented in Table 3.

Cost of Illness (Direct and Indirect Costs)

In this section of the study, the direct and indirect costs associated with the treatment of patients with TB were analyzed. The total annual cost of routine physician examinations was USD 33.96 (TRY 908.88),while the total annual cost of biochemistry laboratory tests, microbiological examinations,

Table 2. Direct costs

HIC code	Transactions	Unit price (Ł)	Utilisation percentage (%)	Number of uses (n)	Total amount (Ł)	Total amount ($)
Examination						
520030	Normal physician examination	64.92	1	14	908.88	33.96
Biochemistry laboratory tests						
L101850	C-reactive protein	9.36	0.7	6	39.30	1.47
L107020	Complete blood count (haemogram)	11.21	0.6	6	40.37	1.51
L104920	Lactate dehydrogenase	3.74	0.6	6	13.45	0.50
L100230	Adenosine deaminase activity	38.14	0.8	1	30.51	1.14
L106240	Procalcitonin (serum/plasma)	95.41	0.3	2	57.24	2.14
Microbiological investigations and culture tests						
906160	Mycobacteria culture	74.81	1	9	673.32	25.16
906141	Mycobacteria search (ARB) direct microscopy	26.16	1	9	235.42	8.80
905671	Urine culture	20,90	1	9	188.10	7.03
905675	Sputum culture	20.90	1	6	125.40	4.69
Functional assessment						
701220	Pulmonary function tests	77.21	1	1	77.21	2.88
701080	Bronchoalveolar lavage	239.40	1	2	478.80	17.89
Radiological imaging						
801720	Lung X-ray	25.43	0.9	4	91.54	3.42
R100030	CT, lung, high resolution	205.77	0.01	1	2.06	0.08
R100450	CT, thorax, without contrast	205.77	0.3	1	61.73	2.31
Active ingredient of prescribed drugs						
	Izoniazid				834.25	31.17
	Rifampisin				1445.86	54.02
	Etambutol				92.19	3.44
	Pirazinamid				1745.30	65.21
	Streptomisin				2318.77	86.63
	Total				9271.59Ł	$346.39

The information in Table 2 includes the direct costs of tuberculosis
ARB: acid-fast bacilli, CT: computed tomography

Table 3. Annual indirect costs

Cost items	Total cost (Ł)	Total cost ($)
Lost productivity due to illness	17886Ł	$607.75
Lost productivity due to time spent in the health institution and health report	11178.75Ł	$379.85
Transport costs	2948.75Ł	$100.2
Total	32013.5Ł	$1087.8

The information in Table 3 includes the indirect costs of tuberculosis

functional assessments, and radiological imaging was USD 71.99 (TRY 1,926.35). Prescribed medications-particularly streptomycin, pyrazinamide, and rifampicin-constituted the highest cost components incurred by patients, with a total cost of USD 240.47 (TRY 6,436.37). Accordingly, total direct costs per patient amounted to USD 346.39 (TRY 9,271.59). The total indirect costs were calculated as USD 1,087.80 (TRY 32,013.50).

Consequently, the overall direct and indirect costs incurred by TB patients throughout the treatment period were estimated at USD 1,434.22 (TRY 41,285.09). These findings indicate that patients experience a substantial economic burden during the treatment process, driven not only by healthcare-related expenditures but also by indirect costs.

The catastrophic cost burden among TB patients was evaluated in accordance with the WHO definition, whereby catastrophic costs are defined as TB-related expenditures exceeding 20% of annual household income. Based on this criterion and using the midpoint of reported household income categories to estimate annual income, 68.6% of patients (48 out of 70) were identified as experiencing catastrophic total costs during the treatment period. Catastrophic costs were predominantly observed among patients in lower-income groups, indicating that despite the coverage of TB-related health services, the combined effect of direct and indirect costs imposes a substantial financial burden on households.

DISCUSSION

Primary healthcare services play a critical role in the prevention and control of TB.[20] The prolonged treatment duration, complexity of diagnostic procedures, and the use of multiple medications contribute to a significant economic burden associated with TB.[7,9] The study by Capeding et al.[21] revealed that, except for resistant cases and pediatric patients, the costs of TB follow-up care in hospitals are generally higher compared to primary healthcare facilities.

In this study, the annual direct cost for TB patients followed up as outpatients at a district TCD was, on average, $346.39 (9,271.59Ł). Medication costs accounted for the largest proportion of direct expenses, with an average cost of $240.47 (6,436.37Ł). A study conducted in the United States reported that the total per-person cost for drug-susceptible TB treatment over 4- or 6-month regimens was $23,000 and $34,600, respectively.[9,13] The same study indicated that outpatient visits cost approximately $400 per person, while resistant cases could incur costs up to $1,200. The average cost of laboratory and imaging tests was estimated at $1,500, rising to $4,200 in resistant cases. The cost of anti-TB medications was estimated to be $800 on average, but this increased to $30,400 for resistant cases. A study in South Africa found that the average cost of treating drug-susceptible TB in primary healthcare facilities was $141.29, with 44% of costs attributed to fixed expenditures, 30.7% to outpatient visits, 19.3% to medication, and 6% to laboratory tests.[22] In another study conducted in Malawi, the indirect costs of TB follow-up over 56 days were estimated at $8.47 per patient, with 5% of these expenses leading to catastrophic costs.[23]

In this study, the annual indirect costs incurred by patients followed up at the TCD were calculated as $1,087.8 (32,013.5Ł) per person. The largest component of these indirect costs was productivity loss due to illness, amounting to $607.75 (17,886Ł). The findings show that indirect costs are higher than direct costs. Similar results have been reported in the literature.[24-29] Studies conducted in low- and middle-income countries suggest that indirect costs for TB are generally high, reaching an average of $530 per patient.[25] A study in Ethiopia found that 70.6% of the total costs incurred by TB patients were indirect costs.[30] In rural India, the average indirect costs for TB patients treated in primary healthcare settings were $526.87.[27]

In this study, the total direct and indirect costs for TB treatment amounted to $1,434.22 (41,285.09Ł) per patient. John et al.[27] reported that the average total cost for TB treatment in primary healthcare settings was $562.66 per patient. Notably, these findings emerge in a setting with a long-established, well-functioning DOT short-course infrastructure, where diagnosis and treatment are widely accessible. Despite this strong healthcare delivery system, TB patients continue to experience a considerable economic burden, driven predominantly by indirect costs.

This contrast highlights that the financial impact of TB extends beyond medical expenditures and underscores the importance of early diagnosis and timely initiation of treatment to reduce productivity losses and hospitalization-related costs.[31,32] Given the high hospitalization costs observed, strengthening TB control within primary healthcare services through early detection and outpatient-based management may contribute to cost containment.[9,27,32-34]

Study Limitations

From a broader health policy perspective, these findings are closely aligned with the WHO's End TB Strategy, which emphasizes the elimination of catastrophic costs for TB-affected households.[4] The persistence of high indirect costs in a context of universal access to TB services suggests that achieving this goal will require not only effective clinical care but also strengthened social protection and economic support mechanisms.

This study has several limitations. First, catastrophic costs were estimated using the midpoint values of reported household income categories rather than exact household income data. This approach may have introduced some degree of estimation bias. Second, individual productivity losses were estimated based on the minimum wage rather than patients' self-reported income. This assumption was considered a limitation, as it may have led to an overestimation or underestimation of the actual costs.

CONCLUSION

This study demonstrates that TB imposes a substantial economic burden on patients, with indirect costs constituting the dominant component of total costs. The average direct medical cost per patient was calculated to be $346.39 (9,271.59Ł) and included physician examinations, laboratory tests, radiological imaging, and prescribed medications. In contrast, indirect costs amounted to $1,087.80 (32,013.50Ł) per patient, representing approximately 76% of the total cost burden.

Despite coverage of TB-related healthcare services by the social security system, patients continue to incur significant out-of-pocket expenditures and loss of income during treatment. The average annual cost per patient was estimated at $1,434.22 (41,285.09Ł), indicating that the financial burden of TB extends well beyond direct medical expenditures. Consistent with this finding, a substantial proportion of patients in this study experienced catastrophic total costs, defined as TB-related expenditures exceeding 20% of annual household income, highlighting the pronounced financial vulnerability of affected households.

The predominance of indirect costs and the high prevalence of catastrophic cost burden underscore the socioeconomic impact of TB, particularly among lower-income groups. These findings suggest that TB control strategies should not be limited to the provision of medical care alone but should also incorporate social and economic support mechanisms aimed at reducing indirect costs. Policies that promote early timely treatment initiation, improve access to healthcare services, and strengthen social protection programs for TB patients may play a critical role in mitigating the overall economic burden of the disease. Addressing both the medical and socioeconomic dimensions of TB is essential for achieving sustainable disease control and enhancing the efficiency and equity of healthcare systems.

Ethics

Ethics Committee Approval: Ethical approval for the study was obtained from the Bandırma Onyedi Eylül University Non-Interventional Research Ethics Committee on June 21, 2023, with the decision number 2023-98.

Informed Consent: As this was a retrospective analysis based on routinely collected data, informed consent was not required.

Footnotes

Authorship Contributions

Concept: D.Ö.Z., F.Ö., Design: D.Ö.Z., M.Z., F.Ö., Data Collection or Processing: D.Ö.Z., M.Z., Y.A., Analysis or Interpretation: İ.Ç., Literature Search: D.Ö.Z., M.Z., İ.Ç., Writing: D.Ö.Z., M.Z., İ.Ç., Y.A.

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