

# Rates and Reasons for Relapse of Pulmonary Tuberculosis in Adults — “Case of the MUYA Urban Health Zone”

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## Abstract

**Introduction:** This study aimed to contribute to reducing the rate of tuberculosis relapse among adults in the MUYA Urban Health Zone.

**Methodology:** In this study, we used a quantitative design. This is a cross-sectional study on a cohort of cured tuberculosis patients, which was carried out in the MUYA Urban Health Zone during the period from December 1 to 31, 2022. We chose the Urban Health Zone of MUYA because it is one of the Health Zones that records cases of tuberculosis, and it is among those that fight against this disease.

The population studied is made up of a series of people who suffered from tuberculosis (all forms combined) and who completed their therapeutic regimen according to the current approach, and who, at the end of the latter, were declared cured by the CSDT. Considering the period considered in this study, our population amounts to 143 subjects. This population is also our sample.

In this study, we used the cross-sectional survey method supported by the questionnaire, which allowed us to collect information from patients only once. To collect the data for the study, we used a questionnaire designed according to the variables, which consisted of asking questions to the study subjects.

**Results:** Patients who relapsed with tuberculosis represented a rate of 38%. It appears that the reasons for relapse: age ( $p=0.0511$ ), being able to make ends meet with one's income ( $p=0.0008$ ), and a balanced diet ( $p=0.0001$ ), have a statistically significant relationship with relapse to tuberculosis. According to our tests, the older the age, the more the relapse to BCT decreases. Those who cannot make ends meet relapse strongly to BBT. It is the same with the unbalanced diet, which increases the probability of relapse to BCT. Furthermore, for the other factors, the differences are not significant because the p-values are all above the threshold of 0.05. So the differences in numbers are a coincidence.

Organizational motives did not demonstrate a statistically significant relationship with BCT relapse. The p-values are all above the threshold of 0.05. So the differences in numbers are a coincidence.

Concerning the reasons linked to the patient ( $p = 0.0121$ ), only the fact of smoking during treatment demonstrated its probability of influencing relapse in BCT.

As for treatment, the probability of relapsing with BCT decreases with non-compliance with the medication schedule ( $p=0.0541$ ). The differences observed in compliance with the dosage are not significant.

**Conclusion:** Tuberculosis is a disease linked to poverty. It is experienced endemically throughout the world and is responsible for much human suffering in terms of morbidity and mortality. It is the leading cause of death for people suffering from HIV, while HIV infection constitutes the most important risk factor for the development of tuberculosis disease.

The consequences of poor compliance with treatment are serious for the individual and for the community: relapse, prolongation of the period of contagiousness, and the development of multi-resistant strains.

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## 1. Introduction

Tuberculosis remains a public health problem today, despite the implementation of numerous strategies to combat it. The World Health Organization (**WHO, 2019**) estimates that the number of new cases of tuberculosis amounts to 10 million and 1.4 million died from it worldwide in 2019. More than 95% of deaths due to tuberculosis occur in low-income countries (Southeast Asia, Africa, and the Western Pacific).

Currently, the problem of tuberculosis is far from being controlled; it is complicated by three main events: the emergence of the COVID-19 pandemic (**WHO, 2020**), the endemic of AIDS, and the relapse and appearance of resistant strains of *Mycobacterium tuberculosis*, or even multi-resistant to anti-tuberculosis drugs (**Redwane, S., 2016**).

According to **the WHO (2021)**, the prevalence of bacterial resistance is higher in patients already treated (relapsed) than in those never previously treated.

The consequences of poor compliance with treatment are serious for the individual and for the community: relapse, prolongation of the period of contagiousness, and the development of multi-resistant strains (**Panjabi, R, et al, 2007**).

The preliminary results of the national prevalence survey of resistance to anti-tuberculosis drugs organized in July 2015

by the DRC indicate that Mbujimayi is the site that has the most cases of multi-resistant tuberculosis, with a rate of 37%, and 17% of sick cases having relapsed (**PNLT, cited by Kalala S. 2018**).

The MUYA Urban Health Zone is one of 19 Health Zones in the Kasai-Oriental Province, and one of 10 Urban Health Zones in the City of Mbujimayi (capital of the province). For the year 2021, it recorded 1,799 cases of tuberculosis of all forms and 65 cases of relapse. Whereas the latter benefits from the support of the Provincial Coordination of the fight against Tuberculosis and Leprosy, it is one of the Zones of the Province which abounds, notifies, and also ensures the management of cases of tuberculosis. It should be noted that tuberculosis is one of the diseases that caused the most deaths in 2019 (3.4% of deaths) (**DPS/K. OR, 2019**).

Considering its position and the support it benefits from the Provincial Coordination of the fight against Tuberculosis and Leprosy, we asked ourselves the following questions:

- What are the factors associated with relapse of tuberculosis among adults in the MUYA Urban Health Zone?
- What relationships exist between sociodemographic, economic, cultural, organizational factors of service to patients, therapy, and relapse to tuberculosis?

## 2. Methodology

In this study, we used a quantitative design. This is a cross-sectional study on a cohort of cured tuberculosis patients, which was carried out in the MUYA Urban Health Zone during the period from December 1 to 31, 2022.

The size of our sample is proportional to the number of tuberculosis patients registered in the Centre de Santé, Diagnosis **and Treatment of Tuberculosis (CSDT) register**. for the period covered in this study. Thus, an exhaustive collection of data was highlighted. A total of 143 units were retained, including 55 cases of relapse and 88 cases of definitive recovery.

As for sampling, we used the non-probability convenience type sampling technique. In this study, we used the cross-sectional survey method supported by the questionnaire, which allowed us to collect information from patients only once.

To collect the data for the study, we used a questionnaire designed according to the variables, which consisted of asking questions to the study subjects.

## 3. Results

### 3.1. Descriptive analysis results

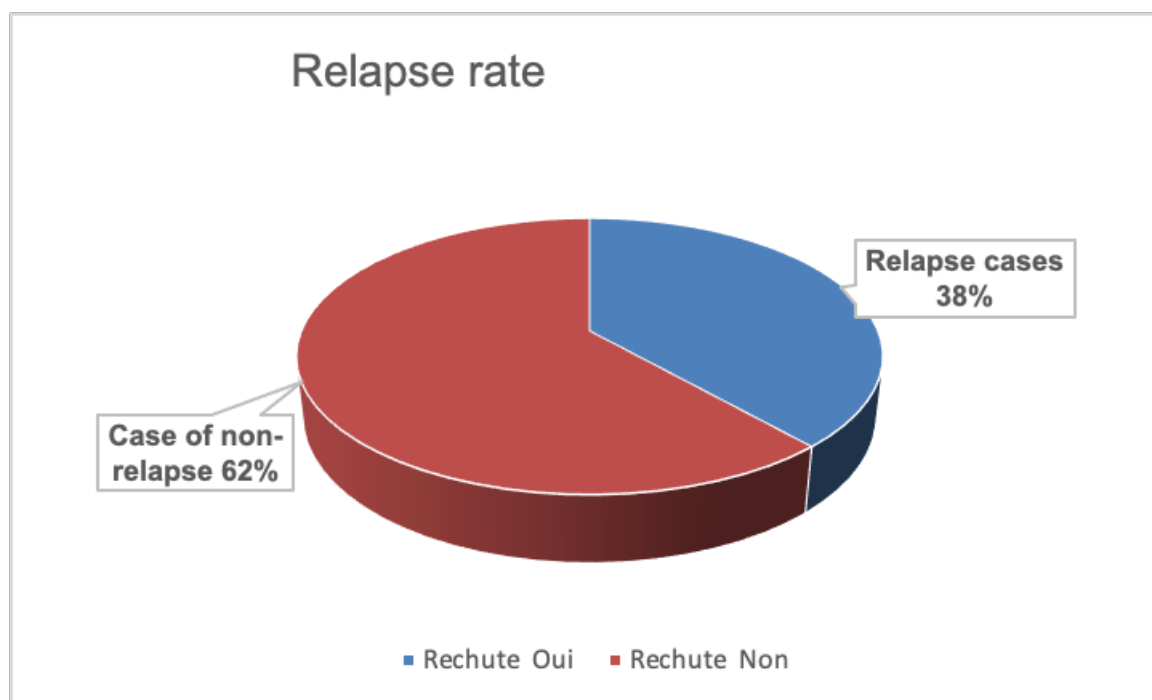


Figure 1. Relapse rate

It appears from this study that patients who relapsed with tuberculosis represent a rate of 38%.

**Table 2.** Distribution of subjects according to sociodemographic, economic, and cultural characteristics

Characteristics (n=143)	Effective	Percentage
Age		
18 to 30 years old	71	49.7
30 years and over	72	50.3
Sex		
Male	67	46.9
Feminine	76	53.1
Study Level		
< secondary	86	60.1
Secondary and above	57	39.9
Religion		
Christian	110	76.9
Others	33	23.1

	88	50.3
Marital status		
<b>Married</b>	84	58.7
<b>Bachelor</b>	59	41.3
Household size		
<b>≤ 6 people</b>	103	72
<b>≥ 6 people</b>	40	28
Monthly income		
<b>≤ 200,000 FC</b>	115	80.4
<b>&gt; 200,000 FC</b>	28	19.6
Tie the two ends of the month		
<b>Yes</b>	25	17.5
<b>No</b>	118	82.5
Balanced diet		
<b>Yes</b>	35	24.5
<b>No</b>	108	75.5

It appears from this table that most of the people who participated in our study were aged 30 and over, i.e., 50.3%, and that the female gender predominated, i.e., 53.1%. As for the level of study, a large number of participants did not reach the level of humanities, i.e., 60.1%. Concerning religion, the large number of participants were Christians, i.e., 76.9%. The marital status of the majority of participants was married, i.e., 58.7%. The household size of the latest interviewees was less than or equal to 6 people, or 72%. Monthly income, most of the participants in our study have an income less than or equal to 200,000 FC per month, i.e., 80.4%, and 118 subjects, i.e., 82.5%, have difficulty making ends meet with this income monthly. In the end, 108 subjects, or 75.5%, were unable to consume a balanced diet.

**Table 3.** Distribution of subjects according to reasons for abandonment linked to the organization of the service

Characteristics (n=143)	Effective	Percentage
Staff permanence at the Tuberculosis Diagnosis and Treatment Health Center (CSDT)		
Yes	129	90.2
No	14	9.8
Attitude of nursing staff towards patients/CSDT		
Good	127	88.8
Bad	16	11.2
Stock shortage of tuberculosis control inputs		
Yes	67	46.9
No	76	53.1

In this table, we note that 90.2% of the nursing staff were considered permanent at the CSDT; as for the attitude of the nursing staff, 127 subjects, or 88.8%, recognized that the latter had a good attitude. Concerning the stock shortage of TB inputs, 76 subjects, or 53.1%, claimed to have experienced the shortage.

**Table 4.** Distribution of subjects according to reasons for abandonment linked to patients

Characteristics (n=143)	Effective	Percentage
Alcohol consumption		
<b>Yes</b>	47 32.9	
<b>No</b>	96 67.1	
Alcohol consumption during treatment (n=47)		
<b>Yes</b>	34 72.34	
<b>No</b>	13 27.65	
Smoke		
<b>Yes</b>	35 24.5	
<b>No</b>	108 75.5	
Smoke during treatment (n=35)		
<b>Yes</b>	10 28.57	
<b>No</b>	25 71.42	
Suffers from other illnesses		
<b>Yes</b>	64 44.8	
<b>No</b>	79 55.2	
Received treatment information		
<b>Yes</b>	133 93	
<b>No</b>	10 7	

In this table, it turns out that 47 subjects interviewed, or 32.9%, drink alcohol and that 34 subjects out of 47, or 72.3%, continued during treatment.

As for cigarettes, 35 respondents, or 24.5%, smoke, while 10 out of 35, or 28.6%, continued during treatment. Other illnesses, 79 respondents, or 55.2%, did not suffer from other illnesses, compared to 64 cases, or 44.8%, who suffered from other illnesses. Regarding the information received on treatment, 133 respondents, or 93%, knew the importance of TB treatment, while there were 10 cases, or 7% of respondents, who were not informed about it.

**Table 5.** Distribution of subjects according to treatment-related factors

Characteristics (n=143)	Effective	Percentage
Respect of dosage		
Yes	33	23.1
No	110	76.9
Respecting the time of taking medication		
Yes	92	64.3
No	51	35.7

This table indicates that 110 respondents, or 76.9%, respected the dosage, while 33 cases, or 23.1%, did not comply. Regarding compliance with the schedule, 92 respondents, or 64.3%, respected the schedule, while 51 cases, or 35.7%, did not comply.

### 3.2. Bivariate analysis results

**Table 6.** Distribution of subjects according to sociodemographic, economic, cultural factors and the occurrence of TB relapse

Variables evaluated	Relapse		p-value	Interpretation
	No	Yes		
	n=88	n=55		
Age				
18 to 30 years old	38	33	0.0511	S
30 years and over	50	22		
Sex				
Feminine	48	28	0.6727	NS
Male	40	27		
Level of study				
< secondary	57	29	0.1537	NS
Secondary and Higher	31	26		
Religion				
Christian	68	42	0.9004	NS
Others	20	13		
Marital status				
Married	57	27		



<b>Bachelor</b>	31	28	0.0647	NS
Household size	62	41		
<b>≤6 people</b>	26	14	0.5972	NS
<b>6 persons</b>				
Monthly income	71	44		
<b>≤200,000 FC</b>	17	11	0.9206	NS
<b>&gt;200,000 FC</b>				
Tie the two ends of the month	8	17		
<b>Yes</b>	80	38	0.0008	S
<b>No</b>				
Balanced diet	12	23	0.0001	S
<b>Yes</b>	76	32		
<b>No</b>				

It appears from this table that the factors age ( $p=0.0511$ ), being able to make ends meet with one's income ( $p=0.0008$ ), and a balanced diet ( $p=0.0001$ ) have a statistically positive relationship with relapse to tuberculosis. According to our tests, the older the age, the more the relapse to BCT decreases. Those who cannot make ends meet relapse strongly to BBT. It is the same with the unbalanced diet, which increases the probability of relapse to BCT. Furthermore, for the other factors, the differences are not significant because the p-values are all above the threshold of 0.05. So the differences in numbers are a coincidence.

**Table 7.** Distribution of cases according to factors linked to the organization of the service and the occurrence of TB relapse

Variables evaluated	Relapse		p-value	Interpretation
	No	Yes		
	n=88	n=55		
<b>Permanent nursing staff at the CSDT</b>			0.7228	NS
Yes	80	49		
No	8	6		
<b>Staff attitude</b>				
Good	77	50	0.5306	NS
Bad	11	5		
<b>Case of stock shortage</b>				
Yes	39	28	0.4438	NS
No	49	27		

This table shows that none of the organizational factors demonstrated a statistically significant relationship with BCT relapse. The p-values are all above the threshold of 0.05. So the differences in numbers are a coincidence.

**Table 8.** Distribution of cases according to factors linked to the patient, and the occurrence of TB relapse

Variables evaluated	Relapse		p-value	Interpretation
	No	Yes		
	n=88	n=55		
<b>Alcohol consumption</b>				
Yes	32	15	0.2618	NS
No	56	40		
<b>Drinks alcohol during treatment</b>				
Yes	25	9	0.2001	NS
No	7	6		
<b>Smoke</b>				
Yes	26	9	0.0754	NS
No	62	46		
<b>Smoke during treatment</b>				
Yes	4	6	0.0121	S
No	22	3		
<b>Other diseases</b>				
Yes	40	24	0.8321	NS
No	48	31		
<b>Info on importance of treatment</b>				
Yes	81	52	0.8155	NS
No	7	3		

Regarding patient-related factors ( $p=0.0121$ ), only smoking during treatment demonstrated its probability of influencing BCT relapse.

**Table 9.** Distribution of cases according to treatment-related factors, and the occurrence of TB relapse

Variables evaluated	Relapse		p-value	Interpretation
	No	Yes		
	n=88	n=55		
<b>Respect of dosage</b>				
Yes	20	13	0.9004	NS
No	68	42		
<b>Respect of the schedule</b>				
Yes	62	30	0.0541	S
No	26	25		

As for treatment, the probability of relapsing with BCT decreases with non-compliance with the medication schedule ( $p=0.0541$ ). The differences observed in compliance with the dosage are not significant.

## 4. Discussion

### 4.1. Discussion of the Results of the Descriptive Analysis

Based on relapse, this study shows that patients who relapsed with tuberculosis represented a rate of 38%. This result slightly exceeds that found by **Ngalula N (2015)**, which is 30.4%. Contrary to the result of the **PNLAT/GUINEE medical report (2011)**, which shows that the failure rate of anti-tuberculosis treatment in Guinea increased from 1% in 2004 to 2% in 2011.

Regarding socio-demographic, economic and cultural characteristics, it appears that most of the people who participated in our study were aged 30 and over, i.e., 50.3%. This result is similar to that of **Ngalula N (2015)**, who found in his study that 73.2% of respondents were aged between 18 and 45 years. These data do not match those of **Sambou S (2009)**, showing that the age group most affected was that of 25 to 34 years old with 34.1%, followed by that of 14 to 15 years old. This could be explained by the fact that these two age groups represented the most active and productive segments of the population. These results are comparable to those of **Dagnoko S. Cited by Ngalula N (2015)**, who also recorded a predominance in the age groups of 25 to 34 years with 33.5%, from 35 to 34 years with 23.3 %.

Regarding gender, femininity predominated with 53.1%, compared to 46.9% for men. This result is not consistent with that found by **Sambou S (2009)**, who showed that the male predominance was 82% against 41% female.

As for the level of study, a large number of participants did not reach the level of humanities, i.e., 60.1%. This result is not the same as that of **Ngalula N (2015)**, who states that 60.1% of respondents had a secondary level of education. For

**Sambou S (2009)**, illiterates represented 37.4%. This could be explained not only by promiscuity in illiterate environments but also by ignorance of the mode of transmission of TB.

Concerning religion, the large number of participants were Christians, i.e., 76.9%. This situation is the same as that of **Mpunga S (2021)**, who shows in his study that the majority of respondents were Catholic Christians, with 56%.

By analyzing the data on marital status, this study shows that the marital status of most of the respondents was married, with 58.7%. This result is consistent with that found by **Sambou S (2009)**, who reports that during his study, 84 patients were married, or 68.3%, and 36 were single, or 29.3%.

Concerning household size, this study shows that 72% of people who participated in our study lived in a household of  $\leq 6$  people. For his part, **Ngalula N (2015)**, shows that 63% of tuberculosis patients lived in a family of more than 6 people.

Regarding monthly income, the study shows that 80.4% of respondents have a monthly income of less than 200,000 FC. This is a situation similar to that observed by **Ngalula N (2015)**, who for his study confirms that 69.6% of respondents had a monthly income of less than 50,000 FC.

On the subject of making ends meet, this study shows that 82.5% have difficulty making ends meet with their monthly income. This result is similar to that of **Benyi Tulunde Souzane (2022)**, who showed in his study that 79.1% of respondents abandoned care due to the high tax and the very low monthly income received. This is explained by the fact that the population does not use health services properly.

Regarding a balanced diet, 75.5% of respondents are unable to consume a balanced diet as required during treatment. While, **Ngalula N (2015)** found in his study that 52.9% of respondents declared having consumed a special diet during the illness, the consumption of cereal-based foods occurs in 43.5%, 73% are satisfied with the way they eat, and, on the other hand, 78.3% declared having skipped a day without eating during treatment.

It appears from this study that the majority of respondents recognized that the nursing staff were permanent at the CSDT, i.e., 90.2%, compared to 9.8% who said the opposite. This result is similar to that of **Maloba R (2020)**, which confirms that 50% or 2 nurses are in health training during employment and that 100% of the nurses in the departments are from the hospital sector.

Speaking about the attitude of the staff, it was good towards the patients, 127 out of 143 admitted, i.e., 88.8%, against 11.2%. This result is in the same vein as that of **Komangoya AD (2012)**, who reveals in his study that the collaboration of the CSDT staff was very favorable to the implementation of the study, namely the reception of the investigators and the making available to investigators the necessary supports, consultation registers, and tuberculosis patient files. This was thanks to the good perception of this staff of the usefulness of the results of the study for improving the quality of care for tuberculosis patients through proposals for strengthening the capacities of CSDTs.

Speaking about the stock shortage of anti-tuberculosis drugs at the CSDT, 53.1% of respondents did not recognize the shortage during their tuberculosis treatment. This result does not match that of **Mukendi S. (2019)**, which shows that 48.3% experienced a stock shortage of medications during their treatment. On the contrary, our study no longer meets

the vision of the basic principles of **PATI 5 (2015)**, for the management of TBC and the essential elements of treatment which stipulate that it is necessary to ensure: regularity of treatment, regular supply of good quality anti-tuberculosis drugs, and an appropriate treatment regimen.

In relation to patient-related factors, our study shows that 96 out of 143 respondents, or 67.1%, do not take alcohol compared to 47 out of 143, or 32.9%. This result does not match that of the study carried out by **Mukendi S. (2019)**, which shows that among its respondents, 68.99% took alcohol. While our study is almost in the same direction as that of **Ngalula N (2015)**, who, for her, among the subjects surveyed, 73.9% did not take alcohol. This result is similar to that of the **PNLT (2018)**, which mentions alcoholism, cigarettes, and drug addiction among the risk factors for TB.

As for cigarettes, the study showed that 75.5% of the subjects surveyed did not smoke. This result is in the same direction as **Ngalula N (2015)**, whose study showed that 81.9% of the subjects who participated in this study did not smoke. While the study conducted by **Mukendi S (2015)**, showed that 54.3% of the subjects surveyed smoked.

Concerning other diseases associated with TBC, 55.2% of respondents had no diseases other than TBC, compared to 7% of those who presented other diseases. Our conclusion is in the same direction as that of **Ngalula N (2015)**, whose interviewed subjects had a disease other than TBC and the proportion was estimated at 68.8%. The same is true for **Mukendi S. (2019)**, as his study showed that 65.5% of subjects suffered from other diseases.

As for information on the importance of TB treatment, 93% of subjects who participated in the study had the information. As well as **Ngalula N. (2015)**, who showed that 98.6% of the subjects who participated in his study had received sufficient explanations related to the disease. While, **Gini Williams (2005)** approaches in the same direction, the commitment of patients to respect the prescribed therapy is a determining factor in the success of the treatment. Nurses must listen to patients' concerns. They must inform and educate them in a way adapted to their needs. Scrupulous compliance with treatments and the patient's active engagement in this regard are vital for the success of the treatment.

Concerning the factors related to treatment, it was noted that compliance with the dosage is at 76.9%. While the study conducted by **Mukendi S. (2015)**, shows that 67.5% of respondents did not have the stability of many of the tablets. Respecting the schedule, 64.3% of the study participants showed that respecting the medication taking schedule was essential. This result is in the same direction as that of **NgalulaN. (2015)**, which, despite the significant gap between the two, has 80.4% for respecting the treatment time. While the result of the study by **Mukendi S. (2019)**, shows that 72.2% of the subjects who participated in the study recognized failure to respect the time when taking medication. **Gini Williams (2005)** approaches in the sense that our result, the public authorities must absolutely commit to organizing and managing their resources so as to ensure a constant supply of medicines, and this for two reasons: on the one hand, because it is imperative that patients with tuberculosis undergo complete and uninterrupted treatment to prevent the emergence of drug resistance; on the other hand, because we note that, in most countries, anti-tuberculosis drugs are purchased within the framework of national ordering and distribution systems.

## 4.2. Discussion of the Results of the Bi-variate Analysis

It appears from this table that the factors age ( $p=0.0511$ ), being able to make ends meet with one's income ( $p=0.0008$ ), and a balanced diet ( $p=0.0001$ ) have a statistically positive relationship with relapse to tuberculosis.

According to our tests, the older the age, the more the relapse to BCT decreases. Those who cannot make ends meet relapse strongly to BBT. It is the same with the unbalanced diet, which increases the probability of relapse to BCT. Furthermore, for the other factors, the differences are not significant because the  $p$  values are all above the threshold of 0.05.

These results are in opposition to those found by **Ngalula N. (2015)** showing that the low level of study ( $p=0.000$ ), the lack of sufficient explanations in relation to TB ( $p=0.019$ ), the long duration and difficulty in respecting the schedule and dosage ( $p=0.002$ ), and this could be explained by not eating enough, consumption (of alcohol, cigarettes, and other toxic substances), and cohabitation with a person infected, as well as the lack of knowledge of certain risk factors for tuberculosis, a household size of more than 6 people in a house, constitute factors which are statistically associated with the relapse of TBC. This situation is also confirmed by **Mishra (2005)**, who found that alcohol, drugs, human migration, and neglect are the explanatory factors for relapse to tuberculosis.

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