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EPIDEMIOLOGY OF TUBERCULOSIS CASES FROM 2013 TO 2023 IN THE STATE OF CEARÁ

EPIDEMIOLOGIA DE CASOS DE TUBERCULOSE DE 2013 A 2023 NO ESTADO DO CEARÁ

EPIDEMIOLOGÍA DE LOS CASOS DE TUBERCULOSIS DE 2013 A 2023 EN EL ESTADO DE CEARÁ

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ABSTRACT
Objective: To analyze the epidemiology of tuberculosis in Ceará between 2013 and 2023. **Methods:** This descriptive epidemiological study used secondary data from the Department of Informatics of the Unified Health System (DATASUS), collected in September 2024. All reported cases were included, segmented by region, race/color, incidence rate, and confirmed cases, excluding duplicates or incomplete records. **Results:** Ceará reported an annual average of 3,406 new cases of tuberculosis, with 70% concentrated in Fortaleza and an average of 50.75% of the state's incidence. The majority (76.8%) of cases occurred in mixed-race individuals and, between 2013 and 2023, deaths increased from 221 to 240. **Final considerations:** The number of new cases of tuberculosis remained above average in the period analyzed, evidencing challenges in control, with underreporting and treatment abandonment. Thus, epidemiological studies such as this one can help in decision-making for disease prevention and control.
Keywords: *Tuberculosis; Epidemiology; Public Health.*

RESUMO
Objetivo: Analisar a situação epidemiológica da tuberculose no Ceará entre 2013 e 2023. **Métodos:** Este estudo epidemiológico descritivo utilizou dados secundários do Departamento de Informática do Sistema Único de Saúde (DATASUS), coletados em setembro de 2024. Foram incluídos todos os casos notificados, segmentados por região, raça/cor, taxa de incidência e casos confirmados, excluindo duplicados ou incompletos. **Resultados:** O Ceará apresentou uma média anual de 3.406 novos casos de tuberculose, com 70% concentrados em Fortaleza e em média 50,75% da incidência estadual. A maioria (76,8%) dos casos ocorreu em pardos e, entre 2013 e 2023, os óbitos aumentaram de 221 para 240. **Considerações finais:** O número de novos casos de tuberculose permaneceu acima da média no período analisado, evidenciando desafios no controle, com subnotificação e abandono de tratamento. Dessa forma, estudos epidemiológicos como este podem auxiliar na tomada de decisões para prevenção e controle de doenças.
Descritores: *Tuberculose; Epidemiologia; Saúde Pública*.

RESUMEN
Objetivo: Analizar la epidemiología de la tuberculosis en Ceará entre 2013 y 2023. **Métodos:** Este estudio epidemiológico descriptivo utilizó datos secundarios del Departamento de Informática del Sistema Único de Salud (DATASUS), recopilados en septiembre de 2024. Se incluyeron todos los casos notificados, segmentados por región, raza/color, tasa de incidencia y casos confirmados, excluyendo duplicados. **Resultados:** Ceará presentó un promedio anual de 3.406 nuevos casos de tuberculosis, con el 70% concentrado en Fortaleza y el 50,75% de la incidencia estatal. La mayoría (76,8%) de los casos ocurrió en personas mestizas y, entre 2013 y 2023, los fallecimientos aumentaron de 221 a 240. **Consideraciones finales:** El número de nuevos casos de tuberculosis se mantuvo por encima del promedio en el período analizado, lo que evidencia desafíos en el control, con subregistro y abandono del tratamiento. Así, estudios epidemiológicos como este pueden ayudar en la toma de decisiones para la prevención y el control de enfermedades.
Descriptores: *Tuberculosis; Epidemiología; Salud Pública.*

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INTRODUCTION

Tuberculosis (TB) is an infectious disease related to the bacterium *Mycobacterium tuberculosis*, also known as Koch's bacillus, which mainly affects the lungs but can manifest in other organs, especially in individuals with some immune compromise, such as people living with HIV. The most common symptoms include persistent cough for three weeks or more, night sweats, afternoon fever, and weight loss. Due to its severity and high transmissibility through droplets expelled by the patient containing bacilli, both early identification and immediate treatment of TB are essential to reduce and interrupt the chain of transmission. Based on this, the BCG (bacillus Calmette-Guérin) vaccine, offered by the Unified Health System (SUS), is an important strategy for TB prevention[1].

Tuberculosis (TB) remains a significant global health challenge, despite being a disease that has been known for centuries, with an estimated 10 million people affected each year. In the Brazilian context, about 80 thousand new cases are reported and approximately 5.5 thousand deaths occur due to tuberculosis[1].

In addition, the stigma associated with TB is one of the main barriers that patients face, affecting both their social lives and their ability to access care and work opportunities[2].

In the state of Ceará, during the period from 2013 to 2023, 46,895 cases of tuberculosis were reported, with the city of Fortaleza having the highest urban number of cases[3]. However, in addition to the capital, other municipalities in Ceará have a high incidence of TB, which shows that the disease is still a problem to be faced in the state[4].

Knowledge about TB is still limited, especially with regard to underreporting, in addition to barriers to early diagnosis and treatment. Thus, although control strategies have contributed to the stabilization of cases, both the many cases of treatment abandonment and the increase in cases of multidrug-resistant tuberculosis indicate that current health interventions may not be sufficiently effective to address TB[5].

Hence the importance of conducting epidemiological studies, since they can contribute to management decision-making, in addition to monitoring and evaluating prevention and control strategies. Thus, the objective of this study is to analyze the epidemiological situation of tuberculosis in Ceará, between 2013 and 2023.

METHODS

This is an epidemiological, descriptive, cross-sectional study with a quantitative approach, through the extraction of secondary data, carried out in September 2024. The study used data from the Department of Informatics of the Unified Health System (DATASUS), which provides information to support health analyses, more specifically from SINAN and SIM, which, respectively, are the Notifiable Diseases Information System and the Mortality Information System. This is for the extraction and analysis of notified cases of tuberculosis and for the collection of data related to deaths in Ceará, and the use of IntegraSUS, which gathers relevant information on the tuberculosis scenario.

The population included all reported cases of tuberculosis in Ceará during the years 2013 to 2023. The sample was composed of the data available in the databases, segmented by macro-region, municipality, and race/color. The inclusion criteria were all cases of tuberculosis reported during the period under review, whereas the exclusion

criteria included duplicate cases or cases that did not have complete information for the variables of interest.

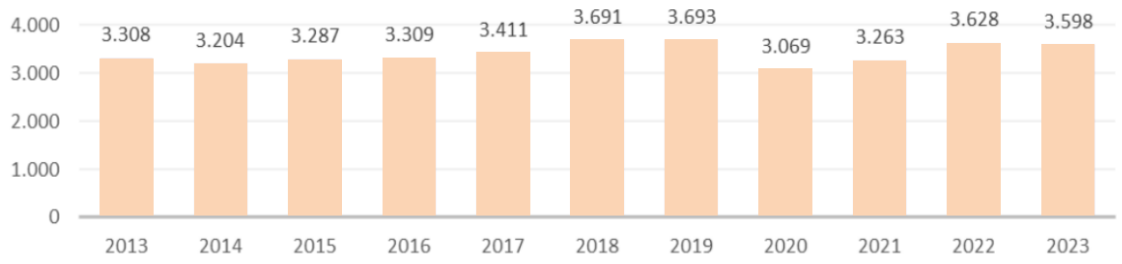
The data collection instruments consisted of reports and tables available on the DATASUS/SINAN and SIM platforms. The data were extracted in a systematic way, considering standardization, to ensure the quality and consistency of the information. Data analysis was performed using descriptive statistics, using incidence calculations, which were calculated based on the number of new cases per population at risk at X 100,000, in addition to absolute and relative frequency. Analysis references included epidemiological norms and guidelines for population studies.

All ethical procedures were respected, ensuring the confidentiality of the data and the responsible use of the information. The research followed the ethical principles established for research with secondary data.

RESULTS

It is observed that, between 2013 and 2023, Ceará registered an annual average of 3406 new cases of TB. In the years 2017, 2018, 2019, 2022 and 2023, the number of new cases remained above the state average for the period between 2013 and 2023[6].

Graph 1 - Number of new confirmed cases of tuberculosis. Ceará, 2013 to 2023.



Source: Prepared by the authors, 2024. DATASUS/SINAN - Notifiable Diseases Information System[6]

Table 1 shows the number and proportion of confirmed cases of tuberculosis by macro-region of notification in Ceará in the period from 2013 to 2023. It should be noted that, despite an exception in the years 2020 and 2021, the number of confirmed cases remained above 3000 from 2017 to 2023, with the Fortaleza region being responsible for more than 70% of the cases, except in 2013[6].

Table 1 - Number and proportion of confirmed cases of tuberculosis, by macro-region of notification. Ceará, 2013 to 2023

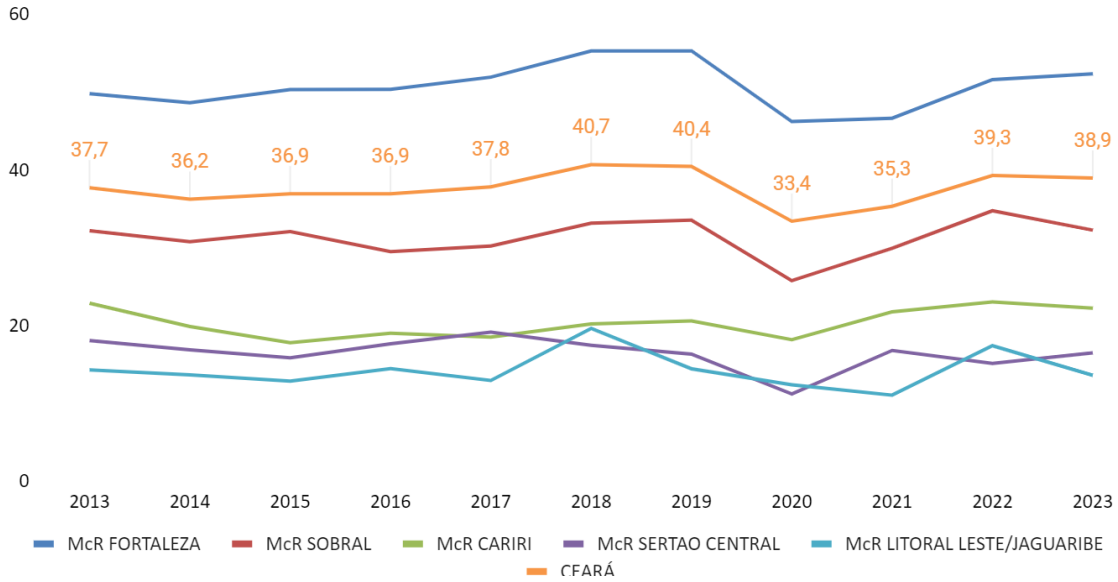
Macroreg.de Health of notification	2013		2014		2015		2016		2017		2018	
	n°	%	n°	%	n°	%	n°	%	n°	%	n°	%
2310 Fortaleza	2,829	69.8	2,737	70.6	2.914	72.6	2,937	72.6	3.150	73.4	3.326	72.8
2309 Sobral	607	15.0	597	15.4	587	14.6	555	13.7	576	13.4	630	13.8
2308 Cariri	387	9.5	336	8.7	300	7.5	326	8.1	332	7.7	347	7.6
2307 Central Hintlerland	143	3.5	118	3.0	124	3.1	136	3.4	148	3.4	137	3.0
2306 East Coast/Jaguaribe	86	2.1	87	2.2	83	2.1	86	2.1	84	2.0	126	2.8
Ignored	3	0.1	2	0.1	4	0.1	4	0.1	4	0.1	3	0.1
Ceará	4.055	-	3,877	-	4.012	-	4.044	-	4.294	-	4,569	-
	2019		2020		2021		2022		2023		Total	

Macroreg.de Health of notification	2013 n°	2013 %	2014 n°	2014 %	2015 n°	2015 %	2016 n°	2016 %	2017 n°	2017 %	2018 n°	2018 %
2310 Fortaleza	3.313	72.8	2,854	74.2	2,943	71.2	3,457	72.2	3,446	72.8	33,906	72.3
2309 Sobral	642	14.1	506	13.2	592	14.3	684	14.3	657	13.9	6.663	14.1
2308 Cariri	364	8.0	312	8.1	383	9.3	400	8.4	397	8.4	3,884	8.3
2307 Central Hintlerland	130	2.9	89	2.3	136	3.3	123	2.6	137	2.9	1,421	3.0
2306 East Coast/Jaguaribe	94	2.1	83	2.2	75	1.8	120	2.5	93	2.0	1.017	2.2
Ignored	5	0.1	0	0.0	4	0.1	2	0.0	3	0.1	34	0.1
Ceará	4,548	-	3,844	-	4.133	-	4,786	-	4.733	-	46,895	-

Source: Prepared by the authors, 2024. DATASUS/SINAN - Notifiable Diseases Information System.

Graph 2 shows that, in the period evaluated, Fortaleza was responsible for, on average, 50.75% of the incidence of the disease among the macro-regions evaluated, while the average of Ceará in general was 37.6%[6].

Graph 2 - Tuberculosis incidence rate by macro-region, according to year of diagnosis. Ceará, 2013 to 2023



Source: Prepared by the authors, 2024. DATASUS/SINAN - Notifiable Diseases Information System

Table 2 presents the confirmed cases of tuberculosis in Ceará, classified by race/color and year of diagnosis, between 2013 and 2023. The brown population represents the majority of cases, with 76.8% of the total of 46,895 records, followed by the white population, which makes up 11.8% of the cases. The highest number of cases occurred in 2022, with 4,786 records[6].

Table 2 - Number of confirmed cases of tuberculosis according to race/color and year of diagnosis. Ceará, 2013 to 2023.

Race/Color	2013		2014		2015		2016		2017		2018	
	n°	%	n°	%	n°	%	n°	%	n°	%	n°	%
White	632	15.6	530	13.7	528	13.2	473	11.7	496	11.6	553	12.1
Black	300	7.4	253	6.5	273	6.8	293	7.2	278	6.5	309	6.8
Yellow	38	0.9	22	0.6	24	0.6	12	0.3	24	0.6	26	0.6
Brown	2.928	72.2	2.909	75.0	3.036	75.7	3.139	77.6	3.293	76.7	3.500	76.6
Indigenous	12	0.3	22	0.6	29	0.7	17	0.4	16	0.4	22	0.5

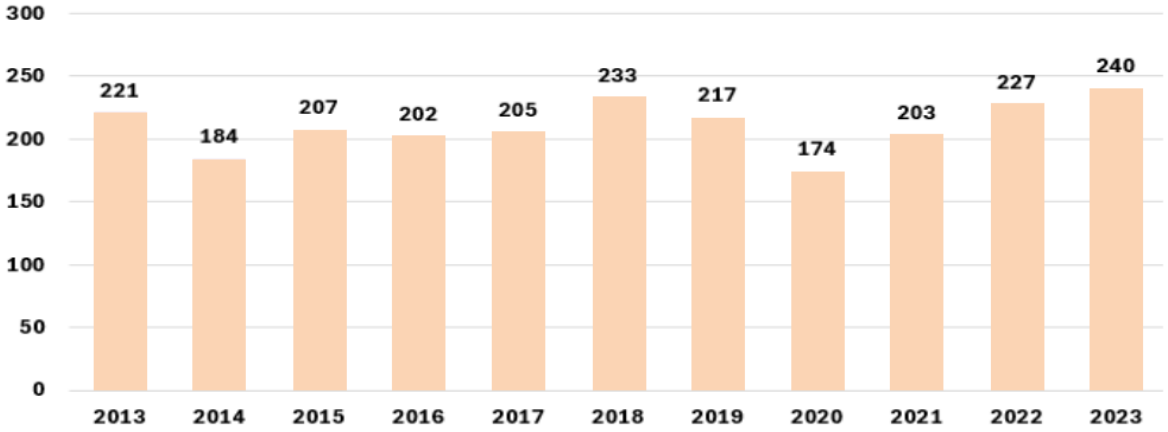
Ign/White	145	3.6	141	3.6	122	3.0	110	2.7	187	4.4	159	3.5
Ceará	4.055	-	3,877	-	4.012	-	4.044	-	4.294	-	4.569	-

Race/Color	2019		2020		2021		2022		2023		Total	
	n°	%	n°	%	n°	%	n°	%	n°	%	n°	%
White	524	11.5	426	11,1	387	9.4	485	10.1	491	10.4	5,525	11.8
Black	281	6.2	239	6.2	249	6.0	305	6.4	324	6.8	3.104	6.6
Yellow	21	0.5	25	0.7	29	0.7	15	0.3	23	0.5	259	0.6
Brown	3,532	77.7	2.995	77.9	3,278	79.3	3,756	78.5	3,652	77.2	36.018	76.8
Indigenous	20	0.4	13	0.3	18	0.4	18	0.4	26	0.5	213	0.5
Ign/White	170	3.7	146	3.8	172	4.2	207	4.3	217	4,6	1,776	3.8
Ceará	4,548	-	3,844	-	4.133	-	4,786	-	4.733	-	46,895	-

Source: Prepared by the authors, 2024. DATASUS/SINAN - Notifiable Diseases Information System

Graph 3 shows the progression of deaths from tuberculosis between 2013 and 2023 in the state of Ceará. In 2013, 221 deaths were recorded, while in 2023 the number rose to 240, reaching the highest number in the period[6].

Graph 3 - Total number of deaths from tuberculosis in the State of Ceará from 2013 to 2023.



Source: Prepared by the authors, 2024. DATASUS/SINAN - Notifiable Diseases Information System

DISCUSSION

At the national level, the National Plan to End Tuberculosis as a Public Health Problem, in partnership with other government institutions, aims to achieve the goals to eliminate tuberculosis as a public health problem by 2030[7].

In this sense, it can be seen that, despite the formulation of plans to reduce the number of tuberculosis cases throughout Brazil, some states, such as Ceará, face multiple challenges in showing data that correspond to the goals put into practice[5], such as early diagnosis, recurrence, and treatment abandonment[8]. This is because it is a social disease, which involves medical panoramas and social factors, which highlights the relevance of also discussing the social determinants of health, such as nutrition, access to health and housing, which, just as proper diagnosis and treatment are essential pillars, social aspects are also part of the process of combating diseases[9].

In the state of Ceará, in the 10-year period, between 2013 and 2023, the annual average was significant, with 3046 new cases registered. In Graph 1, in 2020, a reduction in the number of new cases can be observed. This may be reflected in factors such as underreporting, interruption of care programs, and overload of health services during the Covid-19 pandemic[10].

Table 1 shows the notoriety of the city of Fortaleza with the highest number of cases, related to the theory of Harling and Castro (2014), which states that, commonly, the population of large urban centers, with a high population density, is more affected by tuberculosis due to the most prevalent social impasses, such as social inequality and interruption of treatment[11]. Although the numbers decreased in 2020 and 2021, the following years showed a resumption in the large numbers of occurrences, suggesting a temporary impact of the pandemic, which compromised the diagnosis of new cases, given that health services redirected their priorities to confront the coronavirus, returning to previous levels soon after[12].

After Fortaleza, Sobral is the second city with the highest number of tuberculosis infections in the State of Ceará in the years analyzed. In this same logic, it is verified that sociodemographic factors, such as population density, socioeconomic conditions and social exclusion are important guidelines in the epidemiological analysis[12].

According to the Epidemiological Bulletin released in 2024 by the Ceará Health Department (Sesa), about 11% of the population diagnosed with tuberculosis in the state cannot complete treatment. This is because many people, when their health improves, do not complete the six months of treatment. As a result, as reported by the executive secretary of Health Care and Regional Development of Sesa and infectious disease physician, Lauro Perdigão, this cooperates with the high incidence rates (Graph 2), because, without adequate attention, the disease can be transmitted again[13].

With regard to black and brown people in Ceará and in much of Brazil, it is noted that they have historically faced fewer educational opportunities, lower incomes, and more limited access to health services[14]. In this bias, in view of the data presented in Table 2, it is known that socioeconomic aspects, such as unemployment, income and housing, represent a risk for tuberculosis, given that, for example, groups with socioeconomic disadvantages tend to adopt less healthy behaviors, such as sedentary lifestyle and inadequate diet[15]. In view of this, adherence to effective and coordinated public policies to reduce poverty and strengthen social harmony, with the disintegration of racist behaviors, is extremely necessary to mitigate the incidence of this infection in the social sphere of all races[16].

Tuberculosis has a high rate of co-infection, so it is closely associated with HIV. This fact poses challenges for a considerable decrease in its recurrence because TB is one of the opportunistic diseases to which HIV carriers are victims. In addition, TB affects about 85,000 individuals per year, which shows the importance of its monitoring, with the aim of promoting public policies related to its prevention and treatment[17].

In 2023, the number of deaths reached the highest rate recorded in the 10-year period (Graph 3), due to multiple factors, such as socioeconomic aspects, failures in public health policies, and treatment abandonment rate[18]. This highlights the need to reformulate diagnostic and treatment measures in the state and in the country, in order to follow the goal of the National Plan for the End of Tuberculosis as a Public Health problem, which aims to reduce the incidence coefficient to less than 10 cases per 100 thousand inhabitants and restrict the number of deaths to less than 230 per year[5].

FINAL CONSIDERATIONS

It was found that the number of new cases of tuberculosis remained above average between 2013 and 2023 in the State of Ceará, which contributed to a higher incidence in some cities, especially Fortaleza, which involves several factors, including limited knowledge about the disease, social inequality, and the interruption of treatment. At this juncture, it is essential that some guidelines are reformulated so that the population is better served. Therefore, the need to monitor tuberculosis, the main objective of this bulletin, which presents relevant data for the adoption of effective measures to combat this disease, despite the absence of some more individual informational data on the causes of incidence in some regions of the state of Ceará.

It is important to emphasize that tuberculosis is a disease that encompasses social determinants. This is a limiting factor in its reduction, which delays the goal set by the National Plan to End Tuberculosis as a Public Health problem. While this program also has significant potential to improve the fight against tuberculosis, when combined with some pillars, such as patient-centered care, investment in research, based on more planned public policies. In this sense, there is also a potential in tuberculosis monitoring, with the SUS as a tool for health promotion, based on equity, equality and comprehensiveness, an advantage in comparison with other countries, which do not have a public health system[19].

In this way, tuberculosis can be controlled. However, this objective can only be achieved through collective effort and the use of tools already present in Brazil, which are important advantages over other countries.

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