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Original Article

Characterization of the epidemiological profile of Hansen's disease in the municipality of Araçuaí, Minas Gerais, 2010-2022

Caracterização do perfil epidemiológico da hanseníase no município de Araçuaí, Minas Gerais, 2010-2022

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ABSTRACT

Leprosy, or Hansen's Disease, caused by the bacterium *Mycobacterium leprae,* is an infectious disease that affects the peripheral nerves and can lead to chronic disabilities. Recognized as one of the oldest diseases known to mankind, leprosy still represents a serious public health problem that requires continuous and effective interventions. The objective of this study is to describe the incidence and epidemiological profile of leprosy cases in the city of Araçuaí, Minas Gerais. This is a descriptive longitudinal study with information obtained from the secondary database of the Notifiable Diseases Information System of Araçuaí, from 2010 to 2022. The results demonstrate a downward trend in the incidence of the disease from 2010 to 2022 in the municipality evaluated, with a greater incidence of males in this population. Despite advances in reducing leprosy in the municipality, it is necessary to continue and expand public health actions to ensure a reduction in cases.

KEYWORDS (ou PALABRAS CLAVE): Leprosy. Incidence. Epidemiology. Public health.

RESUMO

A Hanseníase causada pela bactéria *Mycobacterium leprae* é uma doença infectocontagiosa que afeta os nervos periféricos e pode levar a incapacidades crônicas. Reconhecida como uma das doenças mais antigas da humanidade, a hanseníase ainda representa um grave problema de saúde pública, exigindo intervenções contínuas e eficazes. O objetivo deste estudo é descrever a incidência e perfil epidemiológico dos casos de hanseníase no município de Araçuaí, Minas Gerais. Estudo descritivo, longitudinal com informações obtidas a partir da base de dados secundários do Sistema de Informação de Agravos de Notificação, município de Araçuaí, no período de 2010 a 2022. Os resultados demonstram uma tendência de queda na incidência da doença no período de 2010 a 2022 no município avaliado, mantendo-se ainda um maior acometimento de pessoas do sexo masculino nesta população. Apesar dos avanços na redução da hanseníase no município é necessário continuidade e ampliação das ações de saúde pública para garantir a redução dos casos.

PALAVRAS-CHAVE: Hanseníase. Incidência. Epidemiologia. Saúde Pública.

INTRODUCTION

Leprosy, or Hansen’s disease, is an infectious-contagious disease caused by the bacterium *Mycobacterium leprae*, popularly known as Hansen's bacillus. It affects the peripheral nerves and can lead to a concerning disabling condition in its chronic phase.

Originating from ancient times with traceable evidence throughout different periods, leprosy is recognized as one of the oldest diseases in human history. It has been the subject of numerous studies that track its trajectory and impact over the centuries. Some studies suggest that it was introduced to Europe by ancient Israelites after the diaspora, contributing to its spread in different regions of the world.

The *Mycobacterium leprae* bacillus grows best in temperatures below the central body temperature. It therefore usually infects the more distal areas of the body such as feet, hands, ears, and nose. The affected cells in which it reproduces are those of the immune system, such as macrophages and Schwann cells. After evading the immune system, the bacteria remain inside these cells, as lytic enzymes are unable to degrade their thick cell wall. In addition, infection of Schwann cells causes demyelination of the peripheral nerves.

Leprosy transmission occurs through close and prolonged contact between a susceptible individual and a bacilliferous patient via the inhalation of bacilli. It is a highly contagious disease with low pathogenicity, and the best way to stop transmission is through early diagnosis and treatment.

The incubation period ranges from 2 to 20 years or more, indicating a slow proliferation of the bacteria. About 90% of the population has a genetic adaptation known as the natural factor (Factor N), which provides a certain level of protection against Hansen’s disease, but the other 10%, lacking this adaptation, require early diagnosis for successful treatment.

Concerns about Hansen’s disease are not just based on skin damage, but primarily on the damage caused to peripheral nerves (free nerve endings and nerve trunks). Damage here can result in sensory loss, atrophy, paresis, and muscle paralysis, which, if not properly diagnosed and treated, can lead to permanent physical disabilities.

Symptoms vary and include the appearance of brownish or white patches on the skin. These lesions always present altered sensation, such as the loss of thermal, pain, or tactile sensitivity. Other symptoms include tingling, decreased muscle strength, nerve involvement with neural thickening, and areas with reduced hair and sweat.

Diagnosis is made via clinical examination (including anamnesis, dermatological and neurological evaluation) and laboratory tests (using bacilloscopy, where *Mycobacterium leprae* is directly observed in intradermal scrapings from leprosy lesions or other areas such as earlobes and/or elbows).

Multidrug therapy is the main treatment option for Hansen's disease and lasts 6 to 12 months. This therapeutic regimen combines three antimicrobials (rifampicin, dapsone, and clofazimine) and achieves a high cure rate. After completing the standard treatment, the patient is considered cured, even without negative bacilloscopy. Recurrences are infrequent, usually occurring after a five-year period.

A lack of knowledge among students and health professionals results in late diagnoses, physical disabilities, stigma, prejudice, and an increased number of infected individuals. It is crucial for all healthcare professionals to know how to identify signs and symptoms in order to guide and reassure patients.

Hansen's disease remains a serious public health problem in Brazil. In addition to the complications inherent in any disease related to socio-economic vulnerabilities, the psychological repercussions caused by the physical sequelae of the disease are notable, and contribute to decreased self-esteem and self-segregation of the patient.

In 2004, Hansen's disease was predominantly concentrated in India and Brazil, accounting for 79% of annual recorded cases. The planned global strategies have not yet been fully implemented in Brazil. In 2015, actions focusing on the elimination of the disease as a public health problem were implemented in various countries, although the reduction in the number of new cases was modest. The strategy for 2016-2020 shifted the focus to early diagnosis and transmission reduction, overcoming the limitations of previous strategies that relied solely on detection and treatment. Following the plan "Towards zero leprosy: zero infection and disease, zero disability, zero stigma and discrimination," the WHO launched the new Global Leprosy Strategy in 2021, aiming to eliminate the disease by 2030. The 2021-2030 Strategy introduced significant changes by focusing efforts on "interrupting transmission and achieving zero indigenous cases."

In the city of Araçuaí, Minas Gerais (MG), Hansen's disease still represents a serious public health problem because it exceeds the incidence rates set as the goal of the WHO 2021-2030 Global Leprosy Strategy, defined as less than one case under treatment per 10,000 inhabitants. The new strategy focuses on interrupting transmission and achieving zero indigenous cases.

From this perspective, Hansen's disease represents a public health scourge and has great epidemiological relevance, especially in the municipality of Araçuaí. Therefore, it is necessary to study the incidence of the disease in the municipality. This study aims to describe the incidence and epidemiological profile of leprosy cases in Araçuaí.

The preparation of this report sought to generate information that can contribute, even if only partially, to Brazil's goal of becoming a leprosy-free country in the future.

METHODOLOGY

This is a descriptive, analytical, and retrospective longitudinal study that adopts a time-series format to examine confirmed cases of Hansen's disease. The information was obtained from the secondary database of the Notifiable Diseases Information System (SINAN), covering the municipality of Araçuaí, from 2010 to 2022. The target population of the study included all confirmed cases of Hansen's disease reported among residents of Araçuaí, Minas Gerais. Secondary data collection was conducted through the Minas Gerais Health Surveillance Portal.

To outline the epidemiological profile of Hansen's disease in the municipality, indicators such as the year of diagnosis, age group of the cases, race/color, and sex were analyzed, as well as the incidence rates of the disease.

The total incidence rate was calculated by considering the number of new resident cases in a given location diagnosed in the evaluation year, divided by the total resident population in the same location and evaluation year, multiplied by 10,000. The incidence by sex was calculated by considering the number of new resident cases, by sex, in a given location diagnosed in the evaluation year divided by the resident population, by sex, in the same location and evaluation year, multiplied by 10,000.

Age stratification was done according to the data available in the Minas Gerais Health Surveillance Portal – SINAN.

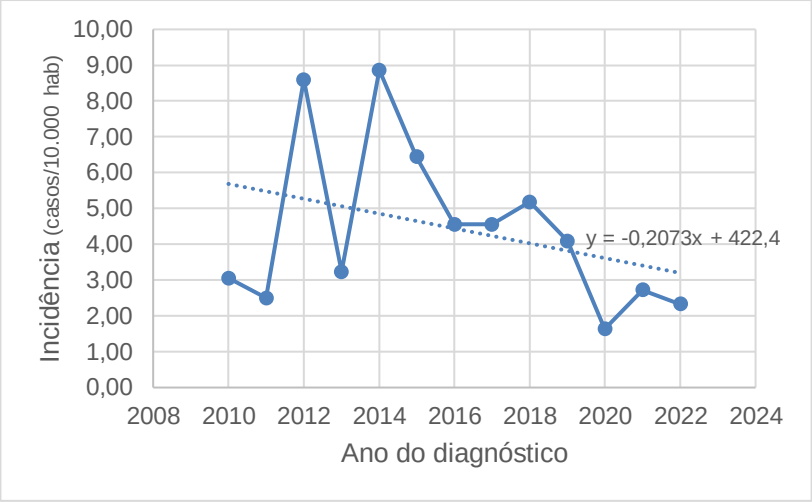
From an ethical standpoint, this study uses secondary data that are publicly available and do not include participant identification, being based on aggregated municipal data. Therefore, according to Resolution No. 510 of April 7, 2016, of the National Health Council, submission, review and approval by a Research Ethics Committee are waived.

RESULTS AND DISCUSSION

In Araçuaí, MG, Hansen's disease still represents a serious public health problem, as it exceeds the incidence rates set as the goal of the WHO 2021-2030 Global Leprosy Strategy, defined as less than one case under treatment per 10,000 inhabitants. The new strategy focuses on interrupting transmission and achieving zero indigenous cases.

Seeking to understand the scenario in Araçuaí, MG, incidence of Hansen's disease in the municipality was analyzed for the period from 2010 to 2022, with the values expressed in new cases per 10,000 inhabitants (Figure 1).

Figure 1 – Incidence of leprosy, by year of diagnosis, in Araçuaí, MG, 2010 to 2022



Source: SINAN, 2024

It may be seen that the incidence of Hansen's disease varied considerably over the years evaluated, with significant peaks in certain ones, such as 2012 and 2014, when the incidence exceeded eight cases per 10,000 inhabitants (Figure 1). The trend line (represented by the dotted line) indicates a general decrease in incidence over the evaluated period. It is important to note that between 2019-2020, there was a sharp decline in the incidence of Hansen's disease in Araçuaí, with an average of 2.2 cases per 10,000 inhabitants in the subsequent period (2020 to 2022). This decline may be related to the implementation of public health interventions in the municipality; improvements in disease prevention and early detection; or even the fact that, during the pandemic, many health services directed their resources to combating COVID-19, which led to the interruption or reduction of diagnoses and treatment activities for other diseases, including Hansen's disease, which could indicate possible underreporting.

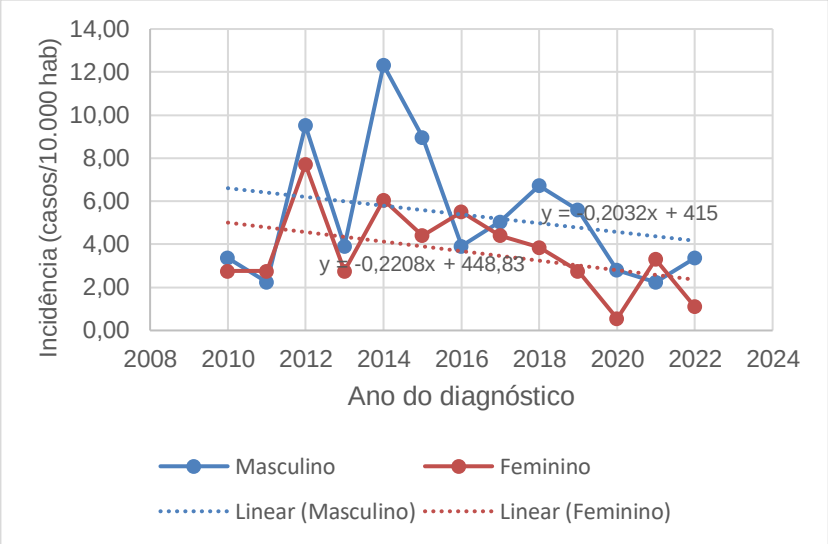
In Brazil, the geographical distribution of Hansen's disease is unequal. The states in the South region, which are more socioeconomically developed, have achieved the goal of eliminating Hansen's disease as a public health problem, with a prevalence of less than one case per 10,000 inhabitants. However, the North, Center-West, and Northeast regions still persist as areas with high disease incidence, the latter being the zones of highest transmission of Hansen's disease in the country. An ecological study conducted in the Brazilian state of Ceará, in the Northeast, revealed that Hansen's disease is correlated with higher rates of low income and unplanned urban growth.

Hansen's disease is a disease that is closely associated with poverty and with poor sanitation and housing conditions. The clustering of people plays a crucial role in spreading the bacillus through respiratory pathways. Additionally, in general terms, it is a disease that reflects a lack of access to health systems, as its diagnosis is primarily clinical and treatment does not require high costs or high-complexity technologies.

It is crucial to point out that the decrease in new cases of Hansen's disease in Araçuaí, MG, over the analyzed period, represents a positive factor of public health actions, such as the implementation of multidrug therapy, research, and outreach about the disease. However, incidence is still higher than the desired goal of less than one case per 10,000 inhabitants in order to eliminate Hansen's disease as a public health problem.

Next, the incidence of Hansen's disease in Araçuaí, MG, was analyzed and stratified by biological sex (Figure 2).

Figure 2 – Incidence of Hansen's disease by diagnosis year and biological sex in Araçuaí, Minas Gerais, from 2010 to 2022



Source: SINAN, 2024

Figure 2 shows a trend of a reduction in new Hansen's disease cases in both sexes in Araçuaí, MG, during the evaluated period. It can also be noted that males were more affected by Hansen's disease than females in the analyzed municipality, with an incidence exceeding 12 cases per 10,000 male inhabitants in 2014, a very high number (in the same year, the number of cases among women was six per 10,000 inhabitants). For women, the incidence peak occurred in 2012, reaching 7.71 cases per 10,000 inhabitants (in the same year, the incidence among men was 9.52 cases per 10,000 inhabitants).

It is observed that the overall incidence rate described in Figure 1 is not equal to the sum of the incidence by sex. This is related to the calculation method described in the methodology, which considers the overall incidence rate based on the total number of cases in the total population, while specific rates by sex can be calculated based on the number of cases within each group (male or female). Thus, the overall incidence rate is not the simple sum of the incidences by sex.

The gender disparities presented may be related to factors such as illiteracy, low social status, and cultural aspects. These factors are pointed out as influencing underreporting of

leprosy cases among women. In contrast, the higher number of cases among men can be attributed to greater interpersonal contact in workplaces and less concern with body and health. Additionally, neglect of one's own health is ingrained in male identity, where admitting vulnerability is considered to be at odds with masculinity. This can lead men not to seek medical care even when they notice symptoms, delaying the start of treatment and increasing disease transmission. Studies conducted in the states of Maranhão and Rondônia revealed behavior similar to that identified in this study, corroborating our results. However, other studies conducted in Paraíba and Santa Catarina found different results, indicating a higher occurrence among females in these locations.

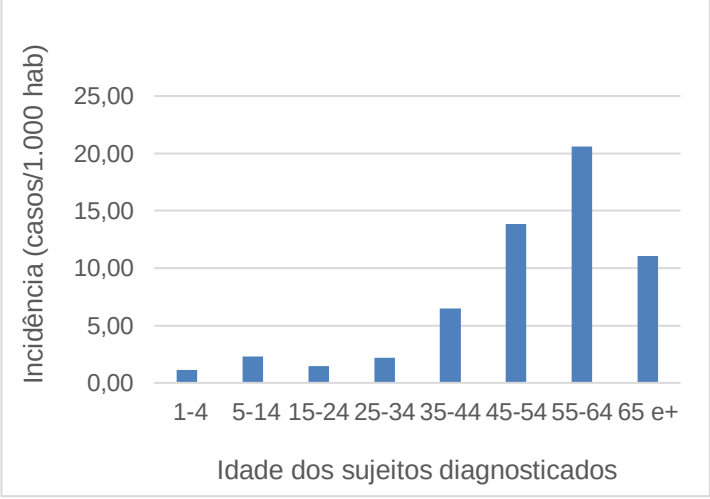
Although the impact of actions against this endemic disease is not immediately felt, Brazil currently enjoys highly favorable conditions for eliminating the disease as a public health problem. This commitment, assumed by the country in 1991 and with a goal to be achieved by 2005, aims to reach a prevalence coefficient of less than one case per 10,000 inhabitants.

The results presented in this work (Figure 2) are in line with the literature, which reports that Hansen's disease predominantly manifests in the male population. It is worth noting, however, that there is no predisposition of the disease by sex.

In this context, the WHO highlights the importance of conducting studies to better understand disease incidence rates by sex to clarify the magnitude and nature of possible disparities. Additionally, it seeks to sensitize health professionals about the need to incorporate gender equality into health programs in order to provide equity in access to services and minimize these differences.

Figure 3 presents the results regarding the incidence of Hansen's disease in Araçuaí, MG, stratified by the age of the person at diagnosis. The results are presented in the number of cases per 1,000 inhabitants of each age group, as made available in SINAN.

Figure 3 – Incidence of Hansen's disease by age in Araçuaí, MG, from 2010 to 2022



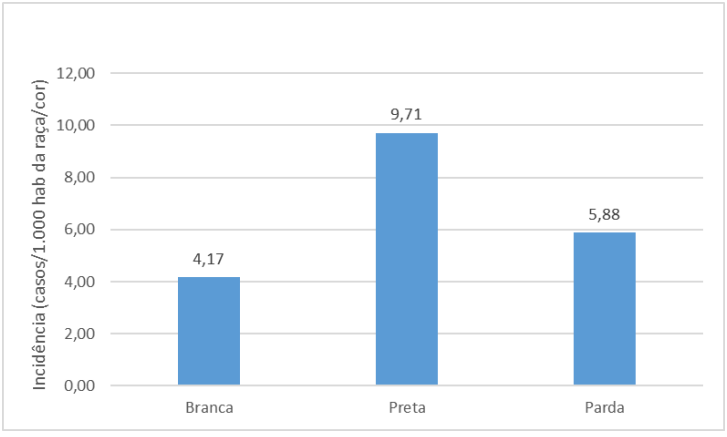
Source: SINAN, 2024

It can be observed in Figure 3 that the incidence of Hansen's disease in Araçuaí, MG, increases significantly with age until reaching its peak in the age group between 55 and 64 years. Hansen's disease can affect people of all ages; however, it is observed in Figure 3 that the disease is more prevalent in people over 35. This fact may be related to this being an economically active population, constituting the majority of the working class. This means more time dedicated to routine activities, which can result in less seeking of health care. A lack of education on the subject can also explain the higher number of cases in specific groups. In addition, in the elderly phase of life (+60), people often face various health problems, which can obscure the disease and make early diagnosis difficult.

As occurs with all diseases with long incubation periods, there is an increase in cases with advancing age. It is important to highlight that factors such as immunosenescence may be relevant to explaining the incidence in certain groups. From the age of 60 onward, the immune system no longer has the same efficiency and protection as in younger people, which may contribute to increased vulnerability to diseases such as Hansen's disease. Various mechanisms can explain this greater vulnerability to Hansen's disease in the elderly. One is the decrease in the production of T cells, especially Th1 cells, which are essential for controlling Hansen's disease infection. Furthermore, the detection rate in children under 15 is one of the most frequently used indicators to evaluate disease control. Therefore, diagnosis in the pediatric age group indicates early exposure to *Mycobacterium leprae* and an alarming endemicity. This happens in small proportions in the study above. Additionally, the Health Department clarifies that Hansen's disease affects people of all ages and genders, being rare in children, which reinforces the relevance of this study.

Finally, Figure 4 presents the results obtained from the analysis of the incidence of Hansen's disease in different racial groups in Araçuaí, MG, from 2010 to 2022 (results expressed in the number of cases per 1,000 inhabitants of each racial group).

Figure 4 – Incidence of Hansen's disease by race/color in Araçuaí, Minas Gerais, from 2010 to 2022



Source: SINAN, 2024

Figure 4 shows that Black individuals were the most affected by the disease, followed by Brown (mixed race people). This result may reflect differences in access to health services, socioeconomic conditions, educational level, and other social determinants of health. Regarding race or skin color, there is no direct relationship to justify the observed pattern. In Brazil, there is a higher proportion of cases among Brown individuals. In the Southeast region, this profile changes to a predominance of diagnoses among White individuals. Minas Gerais, in turn, according to data from the State Health Department of Minas Gerais, follows the national pattern, with most diagnoses occurring in the mixed-race population.

In contrast, this study points to Black as the skin color with the highest incidence of Hansen's disease in Araçuaí, MG during the evaluated period. This can be explained by the number of Black people present in the population or by how individuals self-identify. Although the absolute frequency was higher in Brown individuals, the normalization of data in relation to the total number of people self-declared as White, Brown, or Black resulted in a higher incidence among Black people in the municipality and evaluated periods (figure 4).

Moreover, socioeconomic and cultural factors can influence racial self-identification as well as access to health services, impacting incidence and prevalence statistics. According to the Brazilian Institute of Geography and Statistics (IBGE), the population of Araçuaí, MG, is distributed by color/race as follows: Yellow: 0.42%; Indigenous: 0.41%; Black: 7.72%; White: 21.98%; and Brown: 69.47% of the municipality's total population. These data help contextualize differences in the incidence of Hansen's disease among different ethnicities and highlight the importance of considering demographic and social factors in epidemiological analyses.

CONCLUSION

This study reveals a concerning persistence of Hansen's disease as a public health problem in Araçuaí, MG during the analyzed period. Despite improvements observed in some years, the incidence of Hansen's disease remains high, especially in certain groups (men, Black people, age group above 35 years), highlighting the need for more effective and continuous intervention strategies. This study reinforces the importance of effective epidemiological surveillance, including the collection and timely analysis of detailed data to direct leprosy control actions. It is essential that health programs incorporate gender equity and address socioeconomic and racial disparities in order to ensure equal access to health services and minimize differences in disease incidence. Training professionals capable of dealing with Hansen's disease, from assisting in early diagnosis to treatment, is equally crucial.

Finally, despite advances in reducing Hansen's disease in Araçuaí, MG, the persistence of the disease and its associated inequalities highlight the need for an integrated and sustained

approach to disease control. The continuity and expansion of public health actions are essential to achieve the goal of eliminating Hansen's disease as a public health problem in Brazil in line with the objectives of the WHO Global Leprosy Strategy.

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