EPIDEMIOLOGICAL PROFILE OF DENGUE IN NORTHEASTERN BRAZIL FROM 2014 TO 2024

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ABSTRACT

Dengue, transmitted by the Aedes aegypti mosquito, is a serious public health challenge, especially in the Northeast of Brazil, due to social vulnerability and climatic conditions favorable to the proliferation of the mosquito. Between 2014 and 2024, more than 10 million cases were recorded. This is a retrospective study with an epidemiological aspect that aimed to describe the epidemiological profile of dengue in the Brazilian Northeast from 2014 to 2024. Methodology: The selected variables were obtained through the Notifiable Diseases Information System (SINAN). A comparison was made between the years and the descriptive analysis of the data. Results: Thus, it is observed that SINAN data indicate that the states of the Northeast have a significant contribution to the persistence of the epidemic, with Bahia registering the highest number of cases in four consecutive years. Most infections occurred in people with incomplete elementary school and in the age group of 15 to 39 years. The brown race was the most affected and the female sex had the highest number of notifications. Conclusion: Dengue remains a serious public health problem in Brazil, especially in the Northeast, due to disorderly urbanization, hot climate, and unsanitary conditions. It is crucial to strengthen public policies to improve sanitation, awareness, diagnosis, treatment and vaccination.

Keywords: Dengue. Northeast. Vaccine.

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INTRODUCTION

Dengue is an arbovirus transmitted by the bite of the female Aedes aegypti mosquito, belonging to the Flaviviridae virus family and the Flavivirus genus. According to the World Health Organization (WHO), there are four serotypes of the dengue virus: DENV-1, DENV-2, DENV-3 and DENV-4, each with different genotypes and lineages. This arbovirus is considered one of the most serious public health problems, especially in the Northeast Region of Brazil, due to its high social vulnerability (CAVALCANTE *et al*., 2018). The hot and humid climate of the region is conducive to the proliferation of the mosquito, in addition, the lack of access to adequate health services aggravates this situation, keeping this scenario increasingly alarming (BRITO et al., 2022).

In Brazil, suspected and confirmed cases of Dengue are mandatory to be notified and are registered in the Diseases and Notification Information System (SINAN), in the database of the Department of Informatics of the Unified Health System (DATASUS) of the Ministry of Health. The diagnosis is made based on the patient's clinical condition and laboratory techniques, which identify the virus (up to the fifth day of the disease) and search for antibodies from the sixth day, according to the WHO. Dengue is characterized as an acute febrile infectious disease, which can vary from mild to severe, depending on its manifestation and are classified as: classic dengue; dengue with complications; dengue hemorrhagic fever; dengue shock syndrome; dengue fever; dengue with alarm signs and severe dengue, all of which can lead to death if not treated properly (WANG *et al.,* 2020).

Dengue has more than 10 million cases reported in the period from 2014 to 2024 in Brazil, according to DATASUS. Originally considered a predominant disease in tropical and subtropical areas, dengue has expanded significantly to medium and large urban regions in recent years, as the mosquito is able to reproduce in small accumulations of water, such as tires, potted plants and bottles, since in many cities there are deficiencies in basic sanitation (LYRA; ARAÚJO JÚNIOR, 2014). As part of the group of neglected tropical diseases, dengue represents a serious public health problem, so it is necessary to understand and discuss the data that were made available in SINAN, which can help in the planning of prevention policies and specific care for the vulnerable population, such as guidance and vaccination.

Vaccinations began in the public network in February 2024, becoming part of the National Immunization Program (PNI) of the Unified Health System (SUS) after approval by the National Health Surveillance Agency (Anvisa). Its composition is through live attenuated "weakened" viruses, which guarantees an efficient and lasting immune response. As well

as, it requires the immunized person to have a low number of doses or the indispensability of boosters over time (PEREIRA *et al.,* 2024).

Thus, the objective of the present study is to conduct an analysis of the main epidemiological characteristics and sociodemographic data related to dengue in the Northeast region of Brazil between the years 2014 and 2024.

METHODOLOGY

This is a descriptive epidemiological study, based on data collected by the Notifiable Diseases Information System (SINAN) from 2014 to 2024. The objective of the study was to analyze the distribution and evolution of dengue cases in the four most affected states in the Northeast region of Brazil.

All sociodemographic and epidemiological data available in SINAN were collected, including: schooling; age group; race; sex; confirmation criteria; evolution of cases; final classification of dengue; By initial notification and after analysis of the results, the four most affected states in the Northeast region of Brazil were chosen.

The collected data and graphs were organized in an Excel spreadsheet according to the year of notification. The privacy and anonymity of individuals were guaranteed, as the records in the system are only available in absolute numbers, without personal identification. Therefore, no individual has been or will be identified throughout this study, ensuring confidentiality of the information.

RESULTS AND DISCUSSIONS

Regarding the SINAN data, it is observed that the states of the Northeast are major contributors to the persistence of the dengue epidemic. In 2014, the state of Ceará had the highest number of dengue cases. However, in 2015 Pernambuco led among the four most affected states, surpassing Ceará, Bahia and Rio Grande do Norte. In subsequent years, the scenario underwent significant changes, with Bahia emerging as the state with the highest number of cases in the years 2019, 2020, 2023 and 2024.

Specifically, between the months since 2024, Bahia has already registered more than 90 thousand cases of dengue, consolidating its position at the top of the ranking of states most affected by the disease in the Northeast.

As shown in graph 1, the states of Ceará, Rio Grande do Norte and Pernambuco, despite being part of the same region, had the highest rates of dengue cases in the period studied. In 2015, Pernambuco recorded the highest number of cases, reaching the range of 111,368 (43.93%) occurrences, while the State of Rio Grande do Norte, in that year had the

lowest number, reaching the level of 22,945 (9%) cases. In this area, it should be noted that urbanization factors, socioeconomic conditions, and environmental sanitation contribute to an increase in the detection coefficient of this or other arboviruses in states with greater endemic diseases (PEREIRA, 2023).

Graph 1: Cases of dengue notification in the 4 most affected states in the Northeast region of Brazil.
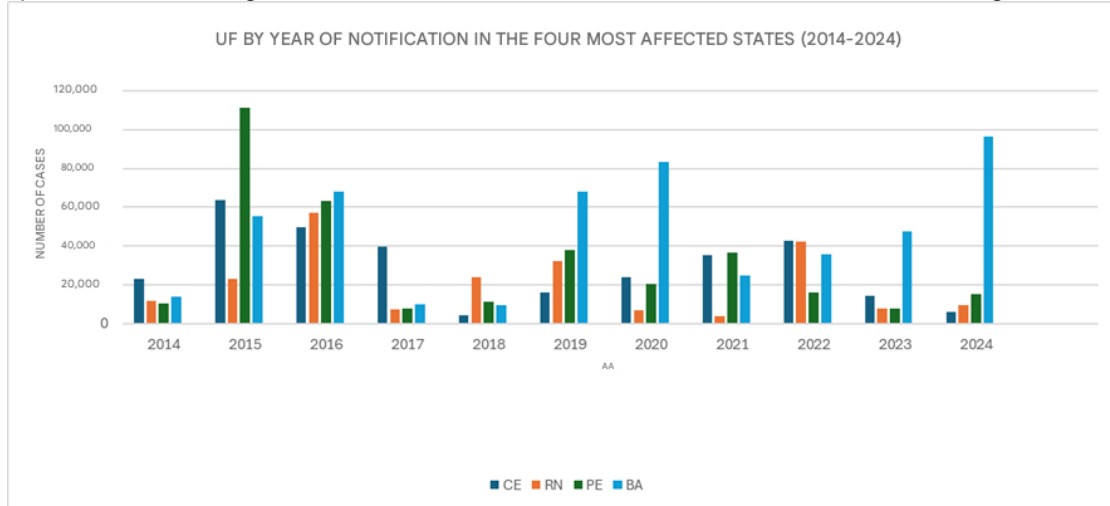
Source: Cases reported in SINAN 2014 – 2024.

Regarding gender, it was evident that, in the period analyzed, the number of females was higher, with a total of 1,069,047 cases (56.58%), when compared to males, which resulted in 817,485 cases (43.27%) (Graph 2)

Graph 2: Dengue notification cases in the Brazilian Northeast by sex
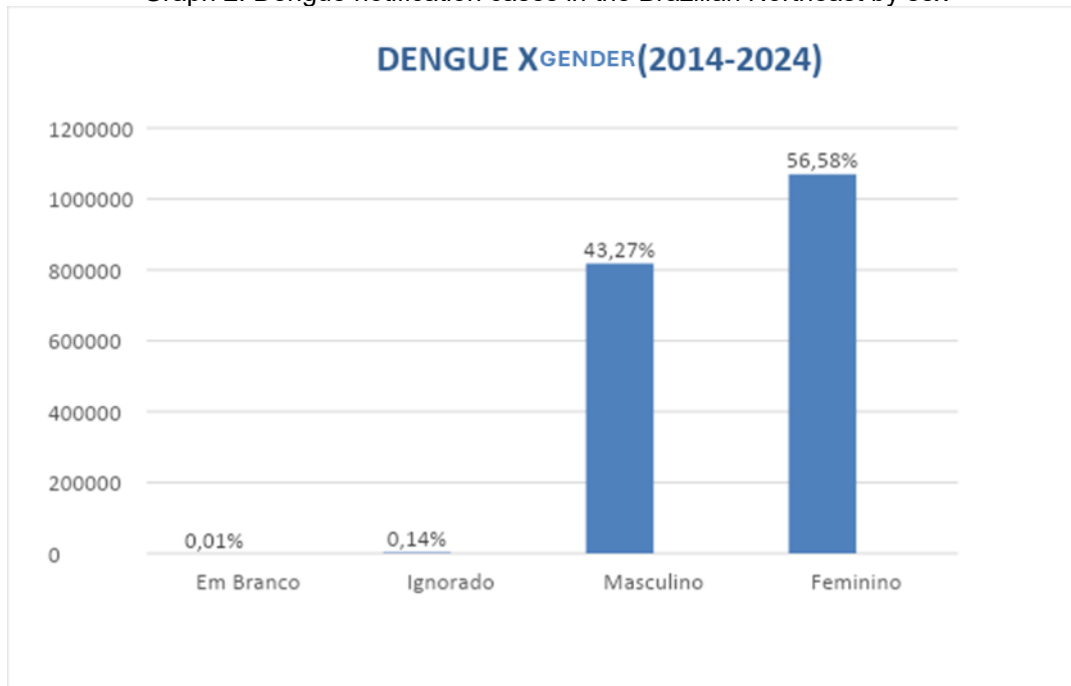
Source: Cases notified in SINAN 2014 - 2024.

Analyzing the education data in graph 3, individuals with incomplete primary education were the most affected by dengue, totaling 188,220 cases (35.81%), followed by complete high school (32.65%), incomplete high school (22.10%) and complete higher education (6.47%).

Graph 3: Distribution of education level of dengue patients in the Northeast region of Brazil.
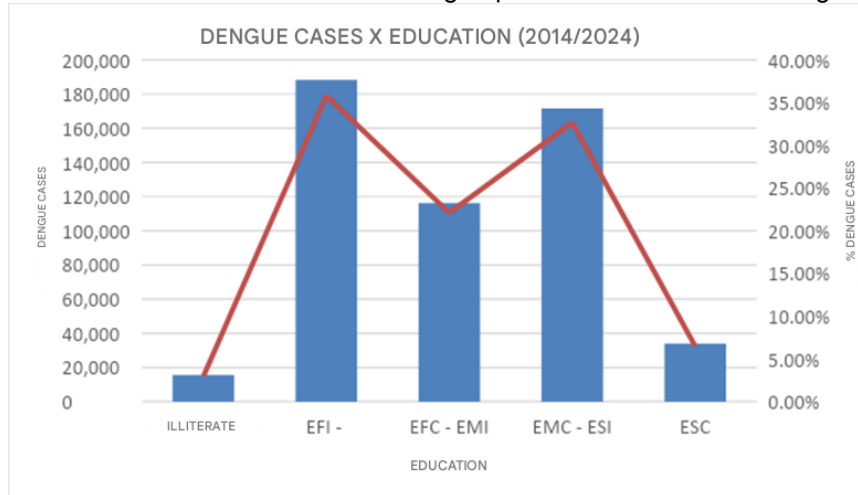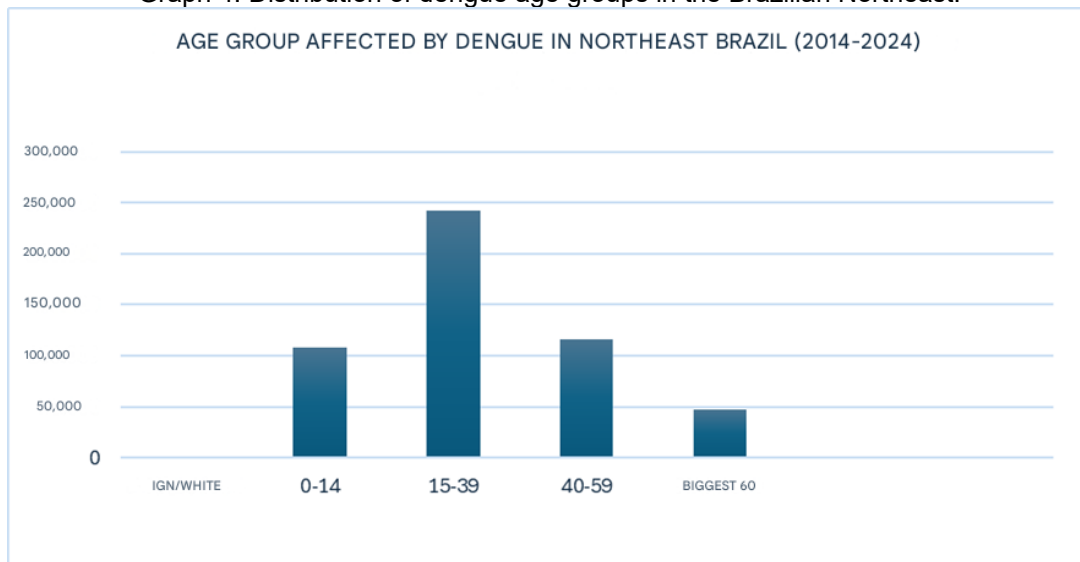

Source: Cases reported in SINAN 2014-2024
Caption:
EFI: incomplete elementary education
EFC: complete elementary school
EMI: incomplete high school
EMC: complete high school
ESI: incomplete superior unit
ESC: complete higher education

Analyzing the age group variable, as shown in graph 4, the study identified that dengue cases are more concentrated between the ages of 15 and 39 years, with 241.978 thousand cases (47.16%). Next, the age group from 40 to 59 years old presents 115,700 cases (22.55%). Soon after, children and adolescents aged 0 to 14 years and finally those over 60 years old register the lowest number of cases 47,564 (9.27%). The literature states that dengue transmissibility is high in urban agglomerations, which explains the higher concentration of cases among individuals aged 15 to 39 years, corroborating Martins *et al.,* (2015). Thus, it is noticed that this age group tends to spend more time in public environments and workplaces, increasing exposure to the Aedes aegypti mosquito. In addition, this population is more socially and economically active, which enhances contact with endemic areas and, consequently, the risk of infection, corroborating Lima (2024).
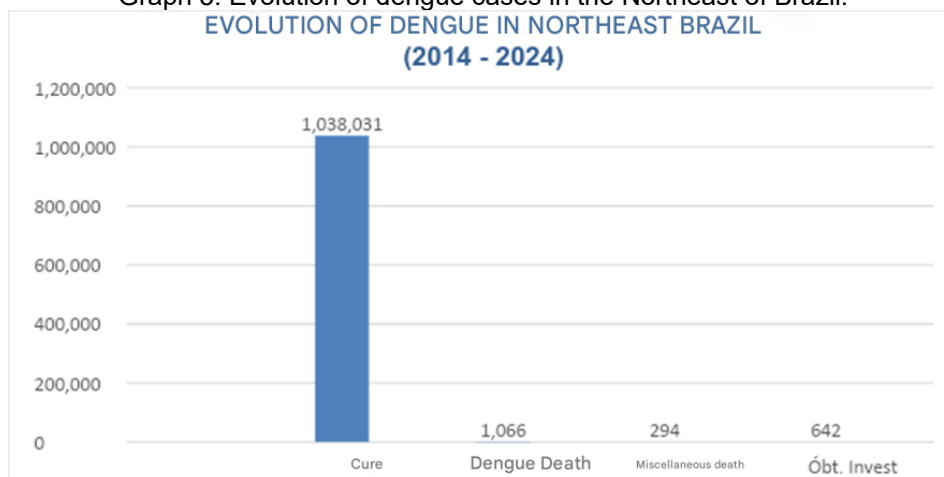
Graph 4: Distribution of dengue age groups in the Brazilian Northeast.

AGE GROUP AFFECTED BY DENGUE IN NORTHEAST BRAZIL (2014-2024)

	IGN/WHITE	0-14	15-39	40-59	BIGGEST 60

Source: Cases notified in SINAN 2014 - 2024.

With regard to the evolution of dengue, there was a greater number of cure cases, totaling more than 1 million, while the cases of death were around 1 thousand deaths due to the disease. These data reinforce the need to continue the control and treatment of the disease to further reduce the mortality associated with dengue, agreeing with Souza (2021). (Graph 5).

Graph 5: Evolution of dengue cases in the Northeast of Brazil.

EVOLUTION OF DENGUE IN NORTHEAST BRAZIL (2014 - 2024)

| Cure	Dengue Death	Miscellaneous death	Óbt. Invest
1,038,031	1,066	294	642

Source: Cases reported in SINAN 2014 - 2024

In the ethnicity/race graph, the brown race had the highest number of cases of the disease, in a total of more than 1 million cases, surpassing the white, black, yellow and indigenous races.

Therefore, it is worth mentioning, as shown in graph 6, the existence of 1,022,048 (54.10%) cases in individuals who self-declared themselves brown in the Northeastern population, and it should be clarified that this race has a predominance in the population
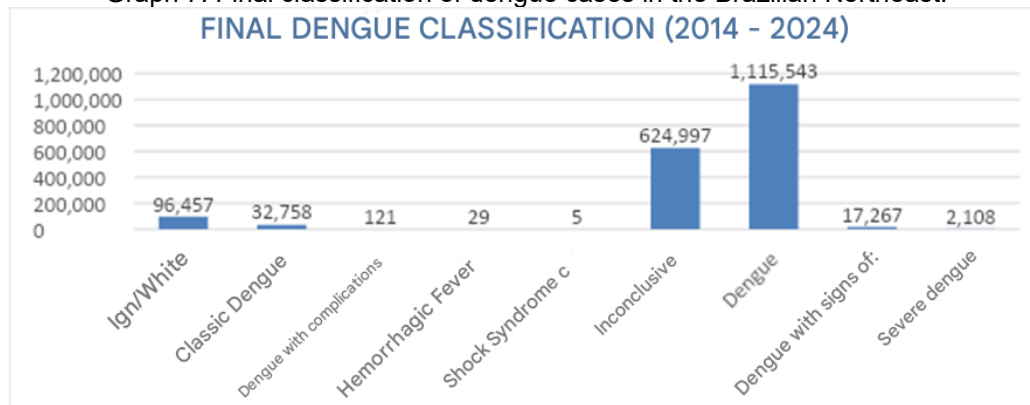
studied, as well as in the Brazilian population. Thus, justifying a higher percentage of dengue cases in this race. Subsequently, the white race appears on a smaller scale with 185,409 (9.81%) cases of dengue, which is also the second largest at the population level in the country. This is followed by the black race/ethnicity 62,166 (3.29%) and in last place are the indigenous people 5,290 (0.28%) with low rates of dengue, which corresponds to the lowest number of people in this Brazilian population group. Thus, it is noted that no specific comparison can be made between the number of dengue cases and the affected race, serving only to title the epidemiological classification of the affected races in this population (IBGE, 2017)

Graph 6: Distribution of race/ethnicity of dengue cases in the Brazilian Northeast.
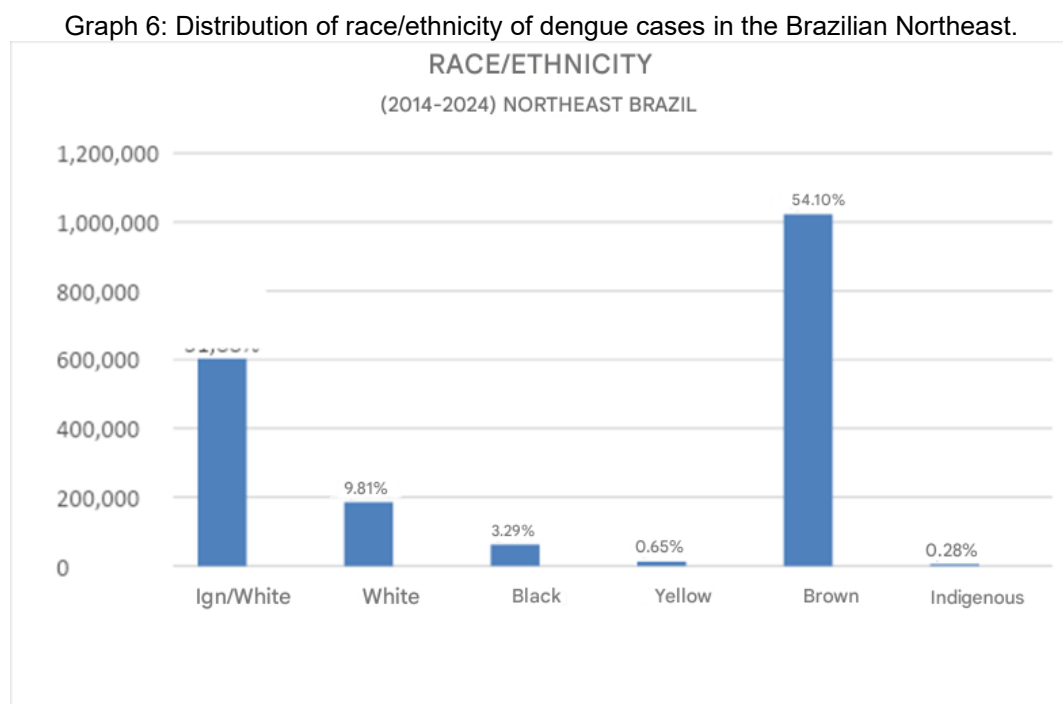
Source: Cases reported in SINAN 2014 - 2024

For a better understanding of the virulence profile of dengue, it is necessary to focus on a more in-depth analysis of the Final Classification of the pathology, which were subdivided into: Dengue, in a generic way, with 1,115,543 (59%) cases. Inconclusive cases point to an expressive number of 624,997 (33.08%) cases. Followed by Classic Dengue 32,758 (17.33%) cases. Soon after, cases of Dengue with alarm signs with 17,267 (0.9%). It is followed by Severe Dengue with 2,108 (0.1%) cases. With 121 (0.006%) cases classified as Dengue with complications and 29 (0.0015%) cases with Hemorrhagic Fever. And finally, there is the Dengue Shock Syndrome with 5 cases (0.00023%) (graph 7).

Graph 7: Final classification of dengue cases in the Brazilian Northeast.

FINAL DENGUE CLASSIFICATION (2014 – 2024)

Category	Value
Ign/White	96,457
Classic Dengue	32,758
Dengue with complications	121
Hemorrhagic Fever	29
Shock Syndrome c	5
Inconclusive	624,997
Dengue	1,115,543
Dengue with signs of:	17,267
Severe dengue	2,108

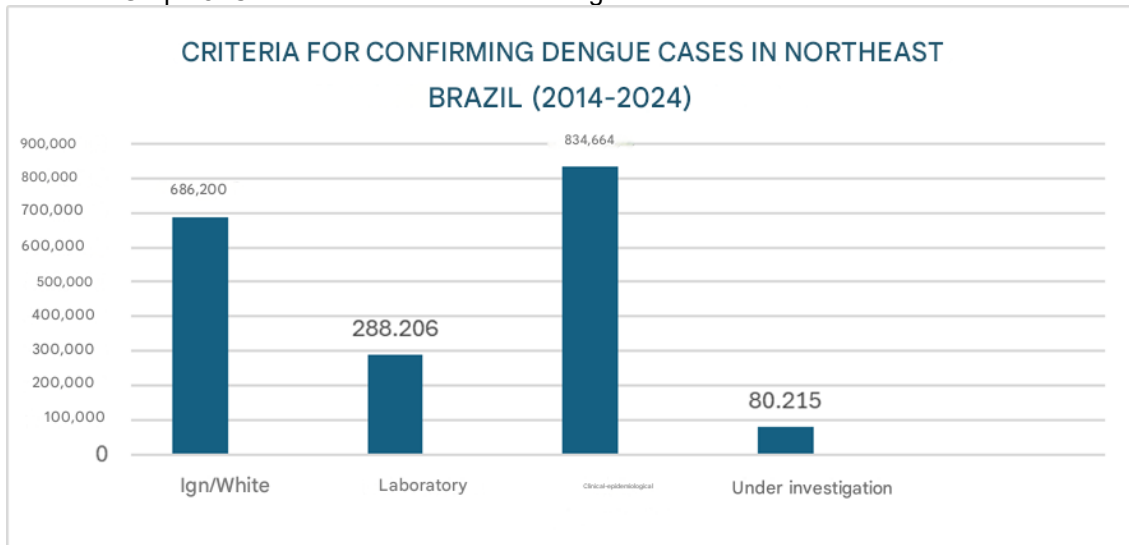Source: Cases notified in SINAN 2014 - 2024.

As indicated in the data presented below, a significant proportion of dengue cases, totaling 834,664 (44.17%), are confirmed based on clinical manifestations, without the need for specific tests. This procedure is in line with the guidelines of the Ministry of Health (2024), which allows the clinical diagnosis of Dengue in endemic areas, based on characteristic symptoms such as high fever, retroorbital pain, myalgia, arthralgia, and skin rashes. Studies corroborate this practice, highlighting that, in areas with a high prevalence of Dengue, clinical diagnosis is highly reliable. (DAHER; ALCÂNTARA, 2024).

The diagnosis most found in the research was the clinical-epidemiological form, which is an initial diagnosis of the disease, taking into account the clinical history and the patient's condition at the time of the physical examination, which computed the number of 834,664 (44.17%) of the cases, followed by the laboratory form 288,206 (15.25%) and, finally, by the form under investigation 80,215 (4.25%) of the cases. The diagnosis of the disease requires clinical and laboratory tests, with investigation of the epidemiological situation in the region or city from which the patients with suspected dengue originated (XAVIER *et al*., 2014).

Among the available laboratory methods, the detection of viral RNA by RT-PCR is recommended up to the 5th day after the onset of symptoms, which allows direct identification of the virus and its virulence. On the other hand, the search for IgM and IgG antibodies, carried out from the 6th day onwards, is essential to confirm recent and past infections, respectively (MINISTRY OF HEALTH, 2024). Thus, it is observed that in the period from 2014 to 2024, these laboratory methods were responsible for confirming 288,206 (15.25%) cases of dengue, according to SINAN records, remaining in the second diagnostic position. In first place in the ranking was the clinical form that allows a rapid adoption of measures for the management of the disease, in view of its high lethality potential.

Graph 8: Criteria for confirmation of dengue cases in the Brazilian Northeast.

Source: Cases notified in SINAN 2014 - 2024.

CONCLUSION

In view of the results found, it is concluded that dengue and its high infection rate remain a serious public health problem in Brazil, especially in the Northeast region. The persistent infection rate may be related to disorderly urbanization, hot and humid climate, and unsanitary environmental conditions. In addition, the epidemiology of dengue demonstrates that there is no clear prevalence among races/ethnicities, but there is a significant relationship with age and unfavorable socioeconomic conditions.

The disease continues to generate high morbidity and mortality and significant costs for the Brazilian economy. In this sense, it is important that public policies are reinforced to improve basic sanitation, promote awareness campaigns, ensure quick and effective access to diagnosis and treatment, and implement vaccination strategies, such as the introduction of the vaccine in the National Immunization Program (PNI) of the SUS.

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