Original article

Characterization of dengue cases in a town in the Southwest of Paraná

Caracterização de casos de dengue em um município do Sudoeste do Paraná

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ABSTRACT | OBJECTIVE: To characterize dengue cases in a town of Paraná. **METHODS:** Cross-sectional, descriptive, exploratory and retrospective study. The data were found from the SINAN dengue notification form, using descriptive statistics for analysis. **RESULTS:** 20,945 dengue case notifications were confirmed. The majority of cases were in adults (60.6%), women (53.2%), white (66%) and with no education (83.5%). There was an incidence of cases in the urban area (88.9%), with emphasis on the Padre Ulrico neighborhood (10.1%). The most frequent symptoms were: fever (73.1%), myalgia (73.1%) and headache (72%), in hypertensive (6.8%) and diabetic (2.5%) patients. Serology was not performed for 85.3% of patients, while the rapid test was positive for (39.6%). It was found that (44.3%) of the cases were autochthonous and of these, (45.1%) were positive for dengue, distributed between classic dengue (9,440 cases), dengue with warning signs (3 cases) and hemorrhagic dengue (2 cases). Most laboratory diagnostic classifications were identified (90.7%) of the sample and did not require hospitalization (95.5%). **CONCLUSION:** The epidemiological profile of dengue cases suggests the need to implement public policies, better sanitation conditions and new studies that address this topic.

KEYWORDS: Dengue. Epidemiology. Public Health. Nursing.

RESUMO | OBJETIVO: Caracterizar os casos de dengue em um município do Paraná. **MÉTODOS:** Estudo transversal, descritivo, exploratório e retrospectivo. Os dados foram coletados a apartir da ficha de notificação de dengue do SINAN, empregando para a análise a estatística descritiva. **RESULTADOS:** Foram analisadas 20.945 notificações de casos de dengue. A maioria dos casos foi em adultos (60,6%), mulheres (53,2%), raça/cor branca (66%) e com escolaridade ignorada (83,5%). Verificou-se maior incidência de casos na zona urbana (88,9%), com destaque para o bairro Padre Ulrico (10,1%). Os sintomas mais frequentes foram: febre (73,1%) mialgia (73,1%) e cefaleia (72%), pacientes hipertensos (6,8%) e diabéticos (2,5%). A sorologia não fora realizada para 85,3% dos pacientes, já o teste rápido, foi positivo para (39,6%). Verificou-se que 44,3% dos casos foram autóctones e destes, 45,1% positivos para dengue, distribuídos entre dengue clássica (9.440 casos), dengue com sinais de alarme (3 casos) e dengue hemorrágica (2 casos). Identificou-se critério de diagnóstico majoritariamente laboratorial (90,7%) da amostra e não necessitou de internamento (95,5%). **CONCLUSÃO:** O perfil epidemiológico dos casos de dengue sugere a necessidade de implementação de políticas públicas, melhores condições de saneamento básico e novos estudos que abordem esta temática.

PALAVRAS-CHAVE: Dengue. Epidemiologia. Saúde Coletiva. Enfermagem.

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1. Introduction

Dengue is considered a severe global public health problem, difficult to control, with extensive impacts in urban environments, as socio-environmental conditions such as high rainfall and elevated temperatures favor the proliferation of the vector. It is also characterized as an acute febrile infectious disease of viral origin, generally benign but potentially severe, as hemorrhagic cases can be fatal. Transmission occurs through the Aedes aegypti mosquito, which can also transmit Chikungunya and Zika. It is most common in tropical and subtropical countries, where environmental conditions favor the vector's proliferation.[1]

In Brazil, a significant increase in dengue cases has been recorded, with growing incidence and increasingly devastating impacts on the population, especially in 2019 and 2020. Due to its seasonal pattern, the number of cases rises considerably from January to May, as the climate favors mosquito larva reproduction.[2]

According to the Arboviral Dengue Epidemiological Bulletin from the State of Paraná, the 2021/2022 epidemiological period reported 257,842 notifications, with 132,328 confirmed cases and 88 deaths. Among the states in Southern Brazil, Paraná has recorded high rates of probable case incidence, accumulating 1,262 cases per 100,000 inhabitants by epidemiological week 24 (2021/2022).[3]

In the Southwest region of Paraná, a single study in 2012 registered endemic dengue data in Francisco Beltrão, with an 8.7% increase in cases above the average, resulting in 1,144 suspected cases notified by May of that year, of which 505 were confirmed.[4]

Given this context, and considering the lack of records on the epidemiological scenario of dengue cases in the Southwest region of Paraná over the past 10 years, the need for detailed data to inform public health policies, improve prevention and control strategies, and better understand associated risk factors, the objective of this study is to characterize dengue cases in the municipality of Francisco Beltrão, located in the Southwest of Paraná, during the year 2022.

2. Materials and methods

This is a descriptive, exploratory, cross-sectional, and retrospective study with a quantitative approach. The target population comprised all dengue notification records available in the National System of Notifiable Diseases (SINAN), within the scope of the Municipal Health Department. All dengue notification forms filled out in health institutions managed by the Unified Health System (SUS), from January to December 2022, were included in the study, totaling 20,945 notifications. Forms prior to this period and those from 2023 onwards were excluded.

Data collection was carried out using a structured form with closed questions based on the SINAN dengue notification form. The following sociodemographic variables were analyzed: age, sex, education, race, marital status, occupation, pregnancy status, gestation trimester, and date of first symptoms. Clinical data included pre-existing diseases, probable place of infection, clinical signs, and hospitalization status. Laboratory data covered serology, clinical presentation, diagnostic criteria, serotype classification, and case evolution.

After data collection, they were organized in Excel spreadsheets and subsequently analyzed using the Statistical Package for the Social Science (SPSS), version 25.0, applying descriptive statistics to characterize the sample and distribute the frequency of the different variables analyzed. All data were presented in table format.

This study was submitted to the Human Research Ethics Committee (CEPEH) for analysis, according to opinion 3.363.857 and the Certificate of Ethical Appreciation Presentation (CAAE) 70500823.3.0000.0109. Ethical principles involving human subjects were adopted in accordance with Resolution 466/12 of the National Health Council (CNS).

3. Results

Among the 20,945 dengue case notifications evaluated, most were adults (60.6%) and females (53.2%). The predominant racial group was white (66%), while the highest percentage in terms of education was "unknown" (83.5%), followed by "not applicable" (9.9%). In terms of residence, most cases occurred in urban areas (88.9%), with a notable concentration in the Padre Ulrico neighborhood (10.1%)

Table 1. Sociodemographic profile of dengue cases in a municipality in Southwest Paraná, 2022

Variable	N	%
Age Group		
Child (<12)	3,420	16.2%
Adolescent (12-18)	2,100	10.2%
Adult (18-60)	12,674	60.6%
Elderly (>60)	2,751	14.0%
Sex		
Male	9,801	46.8%
Female	11,144	53.2%
Race/Color		
White	13,842	66.0%
Mixed	1,253	6.0%
Black	62	0.3%
Asian	53	0.3%
Indigenous	18	0.1%
Ignored	5,717	27.3%
Education		
Illiterate	33	0.2%
1st to 4th grade incomplete	106	0.5%
4th grade complete	75	0.4%
5th to 8th grade incomplete	159	0.7%
Fundamental Education complete	158	0.7%
High School incomplete	199	1.0%
High School complete	348	1.7%
Incomplete Higher Education	88	0.4%
Higher Education complete	202	1.0%
Ignored	19,577	93.4%
Neighborhood		
Padre Ulrico	2,110	10.1%
Rural Area	2,100	10.0%
Alvorada	1,471	7.0%
Ignored	1,240	6.0%
Downtown	1,102	5.4%
São Miguel	1,071	5.1%
Cristo Rei	1,020	4.9%
Pinheirinho	941	4.5%
Vila Nova	836	4.0%
Sadia	770	3.7%
Luther King	733	3.5%
Jardim Floresta	703	3.4%
Other (19 neighborhoods)	6,848	32.4%
Residence Zone		
Urban	18,621	88.9%
Rural	1,065	5.1%
Ignored	1,259	6.0%

Source: National System of Notifiable Diseases (SINAN) (2022).

In Table 2, representing the symptomatology of the cases, the most frequently observed symptoms were: fever (73.1%), myalgia (73.1%), and headache (72%). Regarding past medical history, the most recorded conditions were systemic arterial hypertension (6.8%) and diabetes mellitus (2.5%).

Table 2. Symptomatology and medical history of dengue cases in a municipality in Southwest Paraná, 2022

Variables	N	%
Symptoms		
Fever	15,301	73.1%
Myalgia	15,313	73.1%
Headache	15,084	72.0%
Nausea	8,549	40.8%
Back Pain	7,072	33.8%
Arthralgia	4,677	22.3%
Vomiting	4,565	21.8%
Retro-orbital Pain	5,872	28.0%
Medical History		
Hypertension	1,426	6.8%
Diabetes	521	2.5%
Liver Disease	112	0.5%
Kidney Disease	112	0.5%
Hematologic Disease	108	0.5%

Source: National System of Notifiable Diseases (SINAN) (2022).

Table 3 covers the diagnostic data, classification, and clinical outcomes. Regarding the rapid test, it was negative for 45.8% of cases, while 39.6% tested positive. As for the origin of cases, 44.3% were autochthonous, with 45.1% of these testing positive for dengue, distributed among classic dengue, dengue with warning signs, and hemorrhagic dengue. The main diagnostic criterion was laboratory testing (90.7%). Hospitalization was not required for 95.5% of the sample, and in terms of case outcomes, 20,934 (99.9%) patients recovered, while 6 died due to dengue.

Table 3. Diagnosis, classification, and outcomes of dengue cases in a municipality in Southwest Paraná, 2022

Variable	N	%
Rapid Test		
Positive	8,284	39.6%
Negative	9,602	45.8%
Not performed	2,436	11.6%
Ignored	623	3.0%
Hospitalization		
Yes	84	0.4%
No	20,010	95.5%
Ignored	851	4.1%
Autochthonous Cases		
Yes	9,288	44.3%
No	73	0.3%
Ignored	11,584	55.4%
Classification		
Classic Dengue	9,440	45.1%
Dengue with Warning Signs	3	0.0%
Hemorrhagic Dengue	2	0.0%
Discarded	11,500	54.9%
Criterion		
Laboratory	18,987	90.7%
Clinical	1,958	9.3%
Outcome		
Recovery	20,934	99.9%
Death due to dengue	6	0.1%
Death from other causes	5	0.1%

Source: National System of Notifiable Diseases (SINAN) (2022).

4. Discussion

When analyzing the dengue notification profile in a municipality of Paraná, this study identified a higher percentage of cases among adult women, consistent with a state-level study conducted in the Northeast, which also demonstrated a higher incidence among females. This can be explained by the fact that this group tends to seek healthcare services more often and generally spends more time at home, where infection frequently occurs.[5]

Regarding race/color, this study found that 66% of the sample consisted of white individuals, differing from a study conducted in the state of Pernambuco, where 54.7% of participants were mixed-race. This difference can be attributed to racial mixing in Pernambuco[6], whereas European immigrants predominate in the southern states.

Regarding education level, most cases were classified as "unknown," similar to findings in other studies[7] where a large proportion of dengue cases also had incomplete education data. The quality of education data in both studies suggests that incomplete information hinders a comprehensive evaluation of the problem, negatively impacting studies that aim to analyze the epidemiological scenario of dengue.

It is important to highlight that education level acts as a facilitator in the health-disease process by enabling better access to information. However, community awareness generally depends on adopting behavioral changes influenced by social, economic, political, and environmental conditions, which shape human interactions with the environment and contribute to disease prevention or development.[8]

As for the locations with the highest number of notifications, urban areas predominated, consistent with another study that found 91.4% of dengue cases[7] occurring in Brazilian cities. Regarding neighborhoods, this study found that most cases were recorded in the Padre Ulrico neighborhood (10.1%). A study[9] conducted in Itajaí, Santa Catarina, demonstrated that conditions common in peripheral neighborhoods, such as higher water accumulation, vacant lots, and improper waste disposal, are associated with increased vector development.

In terms of symptomatology, this study found that the most common symptoms were myalgia, fever, and headache. These findings are consistent with a 2019 study[10] conducted in Cascavel, Paraná, where 93.1% of dengue patients reported hyperthermia, myalgia, and headache as the main symptoms. Similar results were found in a study[6] conducted in Recife, Northeast Brazil, where fever was the most frequent symptom, followed by myalgia and headache.

Similarly, a study conducted in Três Lagoas, Mato Grosso do Sul, found that myalgia was the most prevalent symptom among positive dengue cases, followed by fever.[11] It is noteworthy that body temperature regulation depends on the balance between heat production and loss through exchanges with the environment, which is influenced by peripheral thermoreceptors and neurons, coordinated by the hypothalamus.

Hemorrhagic fever, a severe condition associated with dengue, was found to be the leading cause of death for 615 individuals in Brazil between 2018 and 2023, with the highest incidence identified in 2022, accounting for 165 deaths according to the Mortality Information System.[12]

Regarding past medical history, this study found that a small percentage of patients had a history of hematologic disease, similar to findings from a study[10] also conducted in Paraná, where 0.47% of notified cases had a similar history. This suggests that patients at higher risk for viral infections may have a close relationship with hematologic disorders.

In addition, 2.5% of the notified patients in this study were diagnosed with diabetes, similar to findings in Cascavel[10], Paraná, where 4.7% of dengue patients were identified as having diabetes mellitus. Characterized as a chronic metabolic disease due to elevated blood glucose levels, diabetes causes severe damage to cardiovascular, nervous, and renal systems over time. It affects over 422 million people worldwide and accounts for 1.5 million deaths annually. There is also a higher incidence of diabetes among individuals in underdeveloped countries and in low- and middle-income populations.[13]

Regarding liver and kidney diseases, this study found that 0.5% of notifications were associated with these conditions, a lower percentage than a study evaluating emerging arboviruses in João Pessoa, which found 9.1% of notifications related to acute liver disease.[14] A study conducted in Londrina suggested that 6.7% of dengue patients develop acute renal failure.[15]

When it comes to hypertension, this study found that 6.8% of the sample had arterial hypertension, differing from a study in Paraíba that found 69.7% of cases with hypertension. This difference can be attributed to the sample being composed of hospitalized elderly patients, as age is a risk factor for the disease.[16] Arterial hypertension is characterized by consistently high blood pressure levels, correctly measured at least twice in different instances without the use of antihypertensive medication. It is a multifactorial condition influenced by genetic, environmental, and social factors.[17]

Recent studies in tropical countries have indicated a significant connection between hypertension, diabetes mellitus (DM), and the severity of dengue. Elevated blood pressure levels may contribute to renal overload, while diabetes inhibits immune mechanisms like chemotaxis, leukocyte adhesion, and phagocytosis, making patients more susceptible to infection.[18] Thrombocytopenia, which plays an important role in dengue's pathophysiology, is also more pronounced in individuals with diabetes. Given the prevalence of hypertension, diabetes mellitus, and significant dengue endemicity in Brazil, it is crucial to recognize the impact of these conditions on the clinical course of dengue.[18]

Regarding dengue diagnostics in this study, rapid testing was most frequently used (39.6%), followed by serology (2.1%) and PCR (0.2%). In contrast, a study[19] conducted in Rio Grande do Norte found that few samples tested positive for different tests (NS1, IgM, and RT-PCR), and most cases were not tested.

Serological analyses are often based on detecting antibodies produced by the immune system in response to dengue virus infection. Antibodies (IgM and IgG) can be found in the bloodstream a few days after symptom onset, making them useful for determining whether a patient has had prior contact with the virus. RT-PCR (Real-Time Polymerase Chain Reaction) is an extremely precise and specific molecular technique essential for identifying the four types of dengue virus.[20]

Rapid tests are accessible for analysis outside the testing environment, but they are subjective and do not identify the specific virus type, which is relevant for broad monitoring. Genomic analysis also enables research into how the virus spreads and clinical characteristics arising from infection by different virus types.[21]

Of the total cases in this study, 45.1% tested positive for dengue, totaling 9,445 notifications distributed among classic dengue (9,440 cases), dengue with warning signs (3 cases), and hemorrhagic dengue (2 cases). Regarding hospitalizations, 95.5% of the sample did not require admission, with 20,934 cases resulting in recovery, 5 deaths due to dengue, and 6 deaths from other causes. Similar results were observed by researchers in Araçatuba, São Paulo, where 98.7% of patients recovered, with only three deaths reported due to dengue.[6]

Examining hospitalizations and the profile of dengue patients, a study conducted in Minas Gerais found that lethality rates were higher in smaller municipalities, despite lower incidences. Major cities like Belo Horizonte, Juiz de Fora, and Contagem recorded the highest number of deaths.[22]

Regarding hospital costs, Minas Gerais reported approximately 20 million Brazilian Reais spent on dengue-related hospitalizations between 2010 and 2019.[22] While most costs were associated with classic dengue, hemorrhagic dengue showed a longer average length of stay and a tenfold higher mortality rate. In addition, the most frequent patients were men, elderly individuals, mixed-race individuals, and those with pre-existing health conditions like arterial hypertension and diabetes mellitus, suggesting that socioeconomic, cultural, and environmental factors influence disease development and recovery.[22]

The main limitations of this study relate to selection biases and the quality of collected data, given that data was obtained from secondary sources, leading to inconsistencies in some information, such as education level. It is possible that education positively influences health outcomes like dengue, suggesting better health conditions and improved understanding of the disease's characteristics.

5. Conclusion

This study found that most dengue cases affected adult, white women with unknown educational levels. There was a higher incidence in urban areas, with the Padre Ulrico neighborhood standing out. The most frequently identified symptoms among patients were fever, myalgia, and headache, primarily among those with hypertension and diabetes. Serology was not performed for most patients, while rapid testing yielded positive results for a portion of the sample. The majority of cases were autochthonous, with nearly half testing positive for classic dengue, diagnosed through laboratory criteria and not requiring hospitalization.

The relationship between Aedes aegypti and the urban population's quality of life is closely linked to urban planning, basic sanitation, efficient waste collection, and hygiene conditions. Socioeconomic conditions influence the spread of dengue, contributing to social vulnerability and increased case numbers. Despite ongoing efforts such as prevention campaigns and public health interventions, dengue remains a persistent problem, presenting significant management and control challenges.

To address dengue more effectively, it is crucial to identify high-risk areas through epidemiological profile studies like this one, which provide essential data for guiding interventions. It is recommended that these findings be integrated into public health strategies that consider local specificities, promoting a more effective and sustainable approach to dengue prevention and control. Future studies should explore the gaps identified in this research and expand the findings to other regions or populations.

Authors' contributions

The authors declared that they made substantial contributions to the work in terms of research conception or design; data acquisition, analysis, or interpretation; and drafting or critically revising the content for intellectual relevance. All authors approved the final version to be published and agreed to take public responsibility for all aspects of the study.

Conflicts of interest

No financial, legal, or political conflicts involving third parties (government, private companies, or foundations, etc.) were declared for any aspect of the submitted work (including, but not limited to, grants and funding, advisory board participation, study design, manuscript preparation, statistical analysis, etc.).

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