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Original article

# Clinical and epidemiological profile of dengue fever in municipalities in southern Brazil

Perfil clínico-epidemiológico da dengue em municípios do Sul do Brasil

*Perfil clínico y epidemiológico del dengue en municipios del sur de Brasil*

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## Abstract

**Objective:** to describe the clinical and epidemiological profile of dengue cases in two municipalities in the Paranhana Valley, Rio Grande do Sul, Brazil. **Method:** observational, cross-sectional, retrospective, census sampling study. Data was obtained from the Notifiable Diseases Information System between January and June 2024 and analyzed using descriptive statistics. **Results:** 1,321 cases were recorded, 52.1% of which were female, 34.8% between 19 and 39 years old, and 95.4% white. The urban area accounted for 96.1% of cases, with 66.5% being autochthonous. Most were not hospitalized (95.5%), presented dengue without warning signs (98.2%), and progressed to cure (99.8%). The most frequent symptoms were fever (90.2%), myalgia (82.1%), and headache (80.1%). **Conclusion:** Dengue is prevalent in the Paranhana Valley, requiring strategies for prevention, identification, diagnosis, and treatment.
**Descriptors:** Dengue; Aedes; Arboviruses; Epidemiology; Public Health Surveillance

## Resumo

**Objetivo:** descrever o perfil clínico-epidemiológico dos casos de dengue, em dois municípios do Vale do Paranhana, Rio Grande do Sul, Brasil. **Método:** estudo observacional, transversal, retrospectivo, de amostragem censitária. Os dados foram obtidos do Sistema de Informação de Agravos de Notificação, entre janeiro e junho de 2024, e analisados por estatística descritiva. **Resultados:** registraram-se 1.321 casos, sendo 52,1% do sexo feminino, 34,8% entre 19 e 39 anos e 95,4% de raça branca. A zona urbana concentrou 96,1% dos casos, com 66,5% autóctones. A maioria não foi hospitalizada (95,5%), apresentou dengue sem sinais de alarme (98,2%) e evoluiu para cura (99,8%). Os sintomas mais frequentes foram febre (90,2%), mialgia (82,1%) e cefaleia (80,1%). **Conclusão:** a dengue é prevalente no Vale do Paranhana, sendo necessárias estratégias de prevenção, identificação, diagnóstico e tratamento.
**Descritores:** Dengue; Aedes; Arbovírus; Epidemiologia; Vigilância em Saúde Pública

## Resumen

**Objetivo**: describir el perfil clínico y epidemiológico de los casos de dengue en dos municipios del valle del Paranhana, en el estado de Rio Grande do Sul (Brasil). **Método:** estudio observacional, transversal, retrospectivo, con muestreo censal. Los datos se obtuvieron del Sistema de Información de Enfermedades Notificables entre enero y junio de 2024 y se analizaron mediante estadísticas descriptivas. **Resultados**: se registraron 1321 casos, de los cuales el 52,1% eran mujeres, el 34,8% tenían entre 19 y 39 años y el 95,4% eran de raza blanca. El 96.1% de los casos se registraron en zonas urbanas, y el 66.5% fueron autóctonos. La mayoría no requirió hospitalización (95.5%), presentó dengue sin signos de alerta (98.2%) y se recuperó (99.8%). Los síntomas más frecuentes fueron fiebre (90.2%), mialgia (82.1%) y dolor de cabeza (80.1%). Conclusión: El dengue es prevalente en el valle del Paranhana, lo que requiere estrategias de prevención, identificación, diagnóstico y tratamiento.
**Descriptores:** Dengue; Aedes; Arbovirus; Epidemiología; Vigilancia en Salud Pública

## Introduction

Dengue is an arbovirus disease transmitted by arthropod vectors. In Brazil, the species most associated with its transmission is the female *Aedes aegypti* mosquito.[1] The disease can be defined as a zoonosis that affects humans and is maintained in nature in vertebrate hosts.[2] The dengue virus (DENV) has four serotypes (DENV-1, DENV-2, DENV-3, and DENV-4) and belongs to the *Flaviviridae* family of the *Flavivirus* genus, which also includes other viruses of public health importance, such as yellow fever, Zika, Japanese encephalitis, and West Nile fever.[3]

In 2014, Brazil adopted the case classification used by the World Health Organization (WHO) to improve care for patients with dengue. Thus, dengue can develop in asymptomatic or symptomatic forms and in three clinical phases, also having three classifications. The febrile stage is characterized by high fever (39°C to 40°C), with abrupt onset and lasting two to seven days, associated with arthralgia, myalgia, retro-orbital pain, headache, and adynamia. Cases that present classic signs and symptoms and do not progress to warning signs or worsening are classified as "dengue without warning signs." The critical phase, which begins with a decline in fever between the third and seventh day after the onset of symptoms, may present warning signs such as severe and continuous abdominal pain, persistent vomiting, postural hypotension or lipothymia, hepatomegaly, lethargy and/or irritability, mucosal bleeding, and fluid accumulation, characterizing "Dengue with warning signs"; such symptoms are caused by increased vascular permeability, with the potential to progress to severe shock and death,

determining cases of "Severe Dengue." Finally, the recovery phase occurs with the reabsorption of extravasated fluid, leading to improvement in the clinical picture.[1]

The diagnosis is clinical and laboratory-based, using reverse transcription polymerase chain reaction (RT-PCR) tests, NS1 protein detection, viral isolation, and IgG and IgM antibody detection.[1] Definition by clinical-epidemiological criteria is also possible when laboratory tests are not available or cannot be performed, provided there is an epidemiological link with other laboratory-confirmed cases in the patient's territory of origin.[2] Treatment consists of adequate volume replacement, which may be oral and/or intravenous, depending on the stage of the disease, in addition to symptomatic treatment with analgesics.[1]

In addition, staging and defining the complexity of the disease is essential for clinical decision-making, treatment, and hospitalization. Thus, cases can be classified into four groups, from A to D, with group A being the least severe and group D being the most severe, requiring frequent reassessments given the dynamic nature of clinical evolution.[1]

In 2023, the WHO documented that the incidence of dengue has increased sharply in recent years around the world, representing a public health problem. Dengue has been reported in more than 80 countries, causing five million cases and five thousand deaths, with 80% of these cases, or 4.1 million, reported in the Americas, a cumulative incidence of 419 cases per 100,000 inhabitants.[4] In this region, the disease occurs throughout the year, with seasonal patterns during periods of heat and rain.[1]

According to DataSUS records, Brazil recorded a total of 1,508,653 confirmed cases of dengue and 1,096 deaths in 2023. In 2024, from Epidemiological Week (EW) 1 to EW 26, 6,171,083 confirmed cases of dengue and 5,148 deaths from dengue were reported.[5] In Rio Grande do Sul (RS), there has been a significant increase in the number of cases over the years: in 2020, there were 4,006 cases and 6 deaths; in 2021, 10,877 cases and 11 deaths; in 2022, 67,292 cases and 66 deaths; and in 2023,38,791 cases and 54 deaths.[6]

Climatic factors such as rising temperatures, increased rainfall, and the *El Niño* phenomenon contribute to the spread and development of epidemics.[1] The literature indicates that extreme increases in humidity levels increase the risk of

dengue within three months, while extreme droughts contribute to an increased risk three to five months after the event.[7]

When evaluating data from 2024, up to SE 26, it was found that 94.6% of municipalities in the state of RS were infested with *Aedes aegypti*, with confirmed cases of dengue fever in all Regional Health Coordinating Offices (CRS), with 267 deaths recorded, 60% of which occurred between the 1st and 14th CRS.[8] Despite the wide dissemination of data on incidence, there is a scarcity of studies characterizing the epidemiological profile of dengue in RS, especially in the Paranhana Valley region, which belongs to the 1st CRS and was classified as at risk for dengue epidemics, according to risk communication no. 08/2024.[9] In this context, this research seeks to contribute to filling gaps in the literature and local context by describing the regional particularities of the disease, such as demographic characteristics, spatial distribution, and predominant clinical manifestations. Such information can support surveillance actions and prevention strategies targeted at the regional context. Given this, the objective of this study was to describe the clinical-epidemiological profile of dengue cases in two municipalities in the Paranhana Valley, RS, Brazil.

## Method

This is an observational, cross-sectional, retrospective, census-type study on the clinical-epidemiological profile of dengue cases reported in the Notifiable Diseases Information System (SINAN) in the first half of 2024, conducted in two municipalities in the Paranhana Valley/RS. The research report was prepared according to the *Strengthening the Reporting of Observational Studies in Epidemiology* (STROBE) criteria.

The Paranhana Valley is in the Metropolitan Region of Porto Alegre, in RS, Brazil, and consists of the municipalities of Três Coroas, Igrejinha, Parobé, Taquara, Rolante, and Riozinho. Its economy is based on the footwear industry, commerce, and agriculture.[10] The cities included in the study were chosen for convenience, namely Parobé, with an estimated population of 52,058 inhabitants in 2022, a per capita Gross Domestic Product (GDP) (2021) of R$23,398.44, and a Municipal Human Development Index (MHDI) of 0.704 (2010). The second was Igrejinha, which has an estimated population of 32,808 inhabitants in 2022, a GDP per capita of R$50,031.27 (2021), and an MHDI of 0.721 (2010).[11]

To develop the research, the project was first presented to the respective Municipal Health Secretariats to ensure that the proposal was reviewed and to formalize the invitation to participate. After the letters of consent were accepted and signed, visits were made to the Epidemiological Surveillance sectors in both municipalities, followed by data collection from the SINAN databases.

During the collection stage, data was consulted and extracted from the records of notifications made between January and June 2024. Cases from this period were included in the analysis. In the initial extraction, 2,354 reported cases were identified. Of these, 1,033 cases were excluded because they did not provide information about the participants' outcome, resulting in a sample of 1,321 cases with positive results for dengue.

The information was extracted directly from SINAN and organized into spreadsheets, which constituted the research database. The set of information was submitted to descriptive statistical analysis using *Microsoft Excel*®. For the presentation of the results, the findings were arranged in tables and graphs, with quantitative variables described by mean and standard deviation (SD) and categorical variables expressed in absolute and relative frequencies.

This research was conducted in accordance with ethical principles involving Human subjects, in compliance with Resolution No. 510/2016 of the National Health Council.[12] The project was approved by the Research Ethics Committee of the Faculdades Integradas de Taquara, with no consent required, according to CAAE 80788224.5.0000.8135 and opinion No. 6,914,016.

## Results

In the first half of 2024, 1,321 cases of dengue fever were confirmed in the two municipalities. When analyzing the sociodemographic variables, it is noteworthy that females predominated, with 52.1% of cases; the most affected age group was composed of individuals aged 19 to 39 years (34.8%), with a mean age of 39.21±19.87 years, and 95.4% of the records indicated white individuals. Regarding education, there was a high proportion of records classified as "unknown" (65.9%). Regarding the domicile variable, the urban area accounted for 96.1% of events, and autochthonous cases in the municipalities themselves accounted for 66.5% (Table 1).

**Table 1 –** Sociodemographic profile of participants, Vale do Paranhana, Rio Grande do Sul, Brazil, 2024 (n=1321)

| Sociodemographic profile | n | % |
|---|---|---|
| **Gender** | | |
| Female | 688 | 52.1 |
| Male | 633 | 47.9 |
| **Age** | | |
| Child (up to 11 years old) | 112 | 8.5 |
| Teenager (12-18 years old) | 97 | 7.3 |
| Young adult (19-39 years old) | 460 | 34.8 |
| Adults (40-59 years old) | 435 | 32.9 |
| Elderly (60 years and older) | 217 | 16.4 |
| **Pregnant women** | | |
| Yes | 10 | 0.8 |
| No | 1304 | 98.7 |
| Ignored | 7 | 0.5 |
| **Ethnicity** | | |
| White | 1260 | 95.4 |
| Black | 13 | 1.0 |
| Brown | 21 | 1.6 |
| Indigenous | 2 | 0.1 |
| Ignored | 25 | 1.9 |
| **Education** | | |
| Illiterate | 6 | 0.4 |
| Up to 12 years of schooling | 186 | 14.1 |
| More than 12 years of schooling | 9 | 0.7 |
| Ignored | 871 | 65.9 |
| Not filled | 193 | 14.6 |
| Not applicable | 56 | 4.2 |
| **Area of residence** | | |
| Urban | 1269 | 96.1 |
| Rural | 6 | 0.4 |
| Ignored | 1 | 0.1 |
| Not filled | 45 | 3.4 |
| **Endemic case in the municipality** | | |
| Yes | 879 | 66.5 |
| No | 358 | 27.1 |
| Undetermined | 84 | 6.4 |

Regarding the evolution of the disease, it was observed that in 95.5% of cases, there was no need for hospitalization, and in 99.8% of them, there was progression to

cure. Regarding classification, dengue without warning signs predominated (98.2%), followed by dengue with warning signs (1.7%). Regarding the confirmation criterion, laboratory tests were used in 93.6% of cases, with the NS1 test being the most performed, at 92.2% (Table 2).

**Table 2 –** Clinical epidemiological profile of participants, Vale do Paranhana, Rio Grande do Sul, Brazil, 2024 (n=1321)

| Clinical epidemiological profile | n | % |
|---|---|---|
| **Hospitalization** | | |
| No | 1262 | 95.5 |
| Yes | 42 | 3.2 |
| Ignored | 1 | 0.1 |
| Not filled | 16 | 1.2 |
| **Classification** | | |
| Dengue without warning signs | 1298 | 98.2 |
| Dengue with warning signs | 22 | 1.7 |
| Severe dengue | 1 | 0.1 |
| **Case progression** | | |
| Recovery | 1318 | 99.8 |
| Death due to the disease | 2 | 0.1 |
| Death from other causes | 1 | 0.1 |
| **Confirmation criteria** | | |
| Laboratory | 1236 | 93.6 |
| Clinical epidemiological | 85 | 6.4 |
| **Laboratory Tests** | | |
| Serology (IgM) | 79 | 6.0 |
| NS1 Test | 1218 | 92.2 |

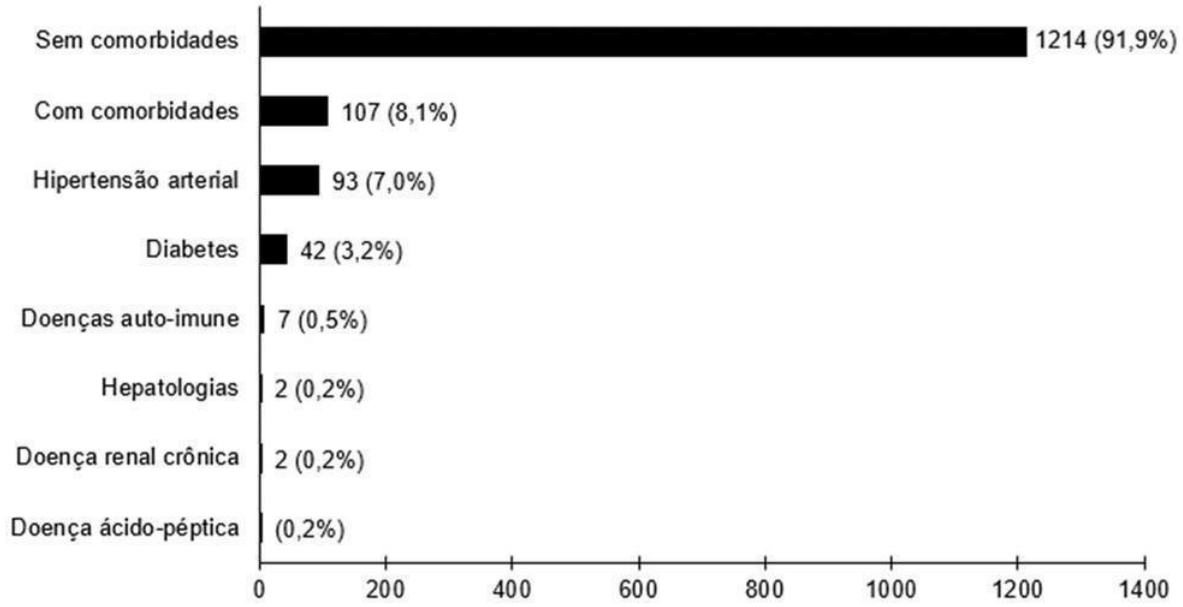
The predominant clinical signs and symptoms were fever, recorded in 90.2% of cases, followed by myalgia (82.1%) and headache (80.1%) (Table 3).

**Table 3 –** Clinical signs and symptoms of participants, Vale do Paranhana, Rio Grande do Sul, Brazil, 2024 (n=1321)

| Signs and symptoms | n | % |
|---|---|---|
| Fever | 1192 | 90.2 |
| Myalgia | 1084 | 82.1 |
| Headache | 1058 | 80.1 |
| Rash | 123 | 9.3 |
| Vomiting | 304 | 23.0 |
| Nausea | 558 | 42.2 |
| Back pain | 324 | 24.5 |
| Conjunctivitis | 20 | 1.5 |
| Arthritis | 97 | 7.3 |
| Severe arthralgia | 102 | 7.7 |
| Petechiae | 51 | 3.9 |
| Leukopenia | 17 | 1.3 |
| Positive snare test | 8 | 0.6 |
| Retroorbital pain | 147 | 11.1 |

Regarding preexisting conditions, 107 people had some type of comorbidity, with 93 individuals having hypertension and 42 having diabetes (Chart 1).

**Chart 1 –** Pre-existing conditions of participants, Vale do Paranhana, Rio Grande do Sul, Brazil, 2024 (n=1321)



About dengue with warning signs, 22 people presented this condition, with intense and continuous abdominal pain being the most common symptom, appearing in 20 participants (1.5%). Other changes appeared in the rest, such as postural hypotension and/or lipothymia (0.1%) and thrombocytopenia, persistent vomiting, hemorrhages, and fluid accumulation in 0.1%.

## Discussion

In the sociodemographic characterization of the population diagnosed with dengue, the predominance of females stands out, representing 52.1% of confirmed cases. A similar result was observed in Anápolis, Goiás, between 2016 and 2020, when 54.2% of the disease records occurred among women.[13] In Brazil, between 2014 and 2019, females also prevailed, accounting for 55.6% of those affected, even though a wide variety of factors may be involved in determining this.[14] In line with this finding, studies addressing the epidemiological profile of the disease in the country point to women as the most affected group, suggesting that this situation may be determined by the predominantly female demand for health services, resulting in greater representation among those diagnosed with the disease.[14-15]

Cultural and social factors may influence the gender pattern, since women tend to seek medical care more frequently and at an earlier stage, resulting in a higher number of registered diagnoses. It is also possible that, in family contexts, they assume the role of caregivers, increasing their exposure to domestic and peridomestic environments, where there is a higher concentration of vector breeding sites.

The 19-39 age group was the most affected, which corroborates other Brazilian data showing similar results, indicating 38.3% of cases in the same age group.[14] Considering only the years 2023 and 2024, individuals between 20 and 29 years of age were the most affected, followed by those between 30 and 39 and those between 40 and 49.[16] This result may be related to the intense mobility of this age group, which comprises the economically active population, favoring exposure to the vector in different environments (residential, work, and

community). The high incidence among young adults has repercussions on the economically active portion of the population, as there is a loss of workdays, causing an economic burden during epidemic periods.[17]

It was observed that the white race stood out in 95.4% of cases. The study identified a change in the epidemiological profile in Brazil, with the white race being prevalent in 2023 and mixed-race individuals in 2024.[16] According to data from the Brazilian Institute of Geography and Statistics (IBGE), the southern region has the highest percentage of white population in the country, reaching 72.6%,[18] which may explain the findings in the study.

The education variable was ignored in 65.9% of cases, reflecting similar results to those found at the national level between 2010 and 2019, when 57.3% of reported cases had this criterion ignored.[19] Limitations in the collection and recording of education in dengue notification forms in SINAN have been studied previously, demonstrating a relationship between worsening record quality and the advancing age of the reported population, especially among women.[20]

Although the data analyzed do not allow us to accurately infer the educational levels of the population diagnosed with dengue in the region, nor to establish relationships with the other variables analyzed, the scientific literature points to an association between increased rates of arboviruses and low levels of education.[21] In a study that analyzed the relationship between educational attainment and mortality rates in Brazil, it was observed that people with less education had a higher number of deaths from the disease. Among the factors that contributed to this result, we highlight the fact that these people lived in areas with greater proliferation of the mosquito transmitting and the presence of comorbidities, such as diabetes and hypertension, which increased the lethality of the disease. [22]

About the area of residence, 96.1% of confirmed cases were concentrated in urban areas. The data reinforces the findings of a study that identified that 86.2% of confirmed cases corresponded to urban areas.[19] This finding may reflect not only the concentration of the urban population, but also the greater diagnostic coverage and epidemiological surveillance in these territories. In contrast, rural

areas may be underreported due to reduced access to health services and laboratory testing.

Uncontrolled urbanization, waste accumulation, and poor sanitation create conditions favorable to vector proliferation. According to a systematic review that evaluated associations between land use change and coverage factors and dengue incidence, 28 studies published between 1978 and 2017 observed that urbanization was associated with the spread of dengue.[23] Furthermore, in a systematic review that evaluated 29 studies between 2000 and 2019, it was observed that human population density of more than 1,000 inhabitants per square kilometer was associated with increased levels of arbovirus cases.[24]

Regarding climate, a study that investigated climate change and its influence on the risk of mosquito-borne diseases found that *Aedes* species will spread to different regions of the planet because of ongoing climate change and estimated that more than 4.7 billion people will be at risk of dengue virus infection by 2070.[25]

Regarding the hospitalization variable, most of the population did not require hospitalization, which can be attributed to the high number of cases that evolved with clinical signals of dengue without warning signs (98.2%), while only 1.7% presented warning signs. These findings are consistent with a similar study, which found that 5.7% of cases required hospitalization, with the form without warning signs being the most prevalent, representing 95.2% of the total.[14] Another cohort study, conducted in Araraquara, southeastern Brazil, evaluated the incidence of dengue among children and adolescents aged 2 to 16 years, from 2014 to 2018, and found that most infections were mild, with few individuals presenting warning signs, no severe cases, and only two hospitalizations.[26]

Regarding the progression of the disease, it was observed that most of the affected individuals recovered, which corroborates a previously mentioned study that pointed to a low mortality rate from dengue.[13] In a study that evaluated the epidemiological profile of hospitalizations for dengue in the state of Minas Gerais between 2010 and 2019, it was observed that the average mortality rate was 0.84%,[27] a finding that is also consistent with the findings of this study.

When analyzing the variable referring to the confirmation criterion, it was observed that laboratory tests were used in 93.6% of notifications, while the clinical-epidemiological criterion corresponded to 6.4%. This high proportion of laboratory diagnoses may be associated with the intensification of surveillance actions and the expansion of rapid testing in municipalities, especially during outbreaks, contributing to rapid recognition and early notification of the disease. This scenario contrasts with that found in a similar study conducted in Brazil, in which clinical-epidemiological criteria predominated, accounting for 62.8% of confirmations, suggesting that the availability and access to laboratory tests in the country are not homogeneous.[14]

With regard to clinical signs and symptoms, fever was the most prevalent variable (90.2%), followed by myalgia (82.1%) and headache (80.1%). In a previously cited cohort study, the most frequently reported symptoms were fever (100%), headache (84.4%), and myalgia (59.7%).[26]

Regarding preexisting conditions, 107 people had some type of comorbidity, with hypertension and diabetes being the most prevalent. According to a meta-analysis, diabetes and hypertension were found to be related to the risk of progression to severe disease.[28] In addition, patients with diabetes who have inadequate glycemic control are at greater risk of developing shock syndrome compared to patients with adequate glycemic control and no other comorbidities.[29]

Regarding dengue with warning signs, the symptom of severe and continuous abdominal pain prevailed. According to a meta-analysis that identified risk predictors for the progression of severe disease during the febrile phase of dengue, the associated symptoms were vomiting, abdominal pain and tenderness, bleeding, fluid accumulation, and low platelet count.[28]

The incompleteness of the data in the mandatory notification forms was one of the limitations of this study, which was expected given the retrospective design of the investigation. However, the SINAN databases are considered reliable, trustworthy, and relevant to the results. Although a census-type study was conducted, the ability to generalize the data is limited, as it deals with realities and contexts of a specific region.

Among the scientific contributions of this research, we highlight the collaboration for the foundation and development of strategic management practices in the prevention, tracking, diagnosis, and treatment of dengue, as well as for the direction of mobilization and popular education activities in health, with a view to controlling the disease. The findings also reinforce the importance of understanding the local determinants of dengue, allowing public policies to be guided by regional evidence. In addition, the results presented provide support for the planning and implementation of continuing educational activities for local health teams, in preparation for the response to dengue and possible epidemics — especially for nursing teams, who are on the front lines in caring for individuals affected by this arbovirus.

## Conclusion

The highest incidence of dengue was among the female, white population aged between 19 and 39 years, residing in the urban area of Vale do Paranhana, RS. Regarding the evolution of the disease, most patients were classified as having dengue without presenting any warning signs, and they achieved a cure without the need for hospitalisation. The analysis of the clinical-epidemiological profile of dengue cases conducted in this study enabled us to understand the disease's behaviour in this region, providing support for targeted interventions, particularly in clinical care.

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