

Prevalence and factors associated with severe dengue cases in Maranhão

Prevalência e fatores associados à ocorrência de casos de dengue grave no Maranhão

Prevalencia y factores asociados a la aparición de casos de dengue grave en Maranhão

Ana Beatriz Gonçalves de Oliveira¹ , Kezia Cristina Batista dos Santos¹ 

Corresponding author:

Ana Beatriz Gonçalves de Oliveira

E-mail:

biagoncalvespho@gmail.com

¹Universidade Federal do Maranhão. Pinheiro, Maranhão, Brasil.



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Abstract

Objective: To examine the prevalence and factors related to the occurrence of severe dengue cases in Maranhão. **Methods:** Cross-sectional and analytical study using secondary data from confirmed dengue cases reported in the Information System for Notifiable Diseases (SINAN) between 2019 and 2023. Dengue classification followed the Ministry of Health criteria: dengue without warning signs, dengue with warning signs, and severe dengue. Logistic regression analysis was performed to estimate odds ratios (ORs), considering a 5% significance level ($p < 0.05$). **Results:** A total of 17,324 dengue cases were reported, including 100 (0.58%) severe dengue cases, with higher prevalence among individuals aged < 10 years (35.0%), male gender (53.5%), mixed race (81.0%), and 0–8 years of schooling (72.2%). The most frequent clinical manifestations were cold extremities (30.0%), tachycardia and hematemeses (23.0%), and altered consciousness (19.0%). There was a significant association between hospitalization (OR=28.71; 95%CI 10.26–80.55; $p < 0.001$) and death (OR=92.75; 95%CI 44.36–193.95; $p < 0.001$) with severe dengue cases. High fatality rates were observed throughout the historical series, except in 2021. **Conclusion:** Sociodemographic and clinical factors influence dengue severity in Maranhão, demanding integrated prevention and early management strategies to reduce prevalence and fatality. **Descriptors:** Dengue. Risk Factors. Public Health. Epidemiology. Health Surveillance.

Whats is already known on this?

Previous literature shows that severe dengue is associated with factors such as age, comorbidities, and socioeconomic conditions, along with persistent challenges in vector control and surveillance.

What this study adds?

This study revealed higher odds of severe dengue among socially vulnerable individuals, along with high fatality rates due to the disease, which reinforces the need for targeted local interventions.

Resumo

Objetivo: Analisar a prevalência e os fatores associados à ocorrência de casos de dengue grave no Maranhão. **Métodos:** Estudo transversal e analítico com dados secundários de casos confirmados de dengue notificados no Sistema de Informação de Agravos de Notificação (SINAN), no período de 2019 a 2023. A classificação da dengue foi baseada nos critérios do Ministério da Saúde: dengue sem sinais de alarme, dengue com sinais de alarme e dengue grave. Realizou-se

análise de regressão logística para estimação do *odds ratio* (OR), considerando nível de significância de 5% ($p < 0,05$). **Resultados:** Notificaram-se 17.324 casos de dengue, sendo 100 (0,58%) casos de dengue grave, com maior prevalência em indivíduos com idade <10 anos (35,0%), sexo masculino (53,5%), pardos (81,0%), com 0-8 anos de estudo (72,2%). As manifestações clínicas mais frequentes foram extremidades frias (30,0%), taquicardia e hematêmese (23,0%) e alteração da consciência (19,0%). Houve associação significativa entre hospitalização (OR=28,71; IC95% 10,26–80,55; $p < 0,001$) e óbito (OR=92,75; IC95% 44,36–193,95; $p < 0,001$) com os casos de dengue grave. Observou-se altas taxas de letalidade em toda série histórica, exceto em 2021. **Conclusão:** Fatores sociodemográficos e clínicos influenciam a gravidade da dengue no Maranhão, exigindo estratégias integradas de prevenção e manejo precoce para redução da prevalência e letalidade. **Descritores:** Dengue. Fatores de Risco. Saúde Pública. Epidemiologia. Vigilância em Saúde.

Resumen

Objetivo: Analizar la prevalencia y los factores asociados a la aparición de casos de dengue grave en Maranhão. **Métodos:** Estudio transversal y analítico con datos secundarios de casos confirmados de dengue notificados al Sistema de Información de Enfermedades de Notificación Obligatoria (SINAN) entre 2019 y 2023. La clasificación del dengue se basó en los criterios del Ministerio de Salud: dengue sin signos de alarma, dengue con signos de alarma y dengue grave. Se realizó un análisis de regresión logística para estimar la *odds ratio* (OR), considerando un nivel de significación del 5 % ($p < 0,05$). **Resultados:** Se notificaron 17. 324 casos de dengue, de los cuales 100 (0,58%) fueron casos graves, con mayor prevalencia en individuos menores de 10 años (35,0%), de sexo masculino (53,5%), de raza mestiza (81,0%) y con 0-8 años de estudio (72,2%). Las manifestaciones clínicas más frecuentes fueron extremidades frías (30,0%), taquicardia y hematemeses (23,0%) y alteración de la conciencia (19,0%). Hubo una asociación significativa entre hospitalización (OR = 28,71; IC del 95 %: 10,26-80,55; $p < 0,001$) y muerte (OR = 92,75; IC del 95 %: 44,36-193,95; $p < 0,001$) con los casos de dengue grave. Se observaron altas tasas de letalidad en toda la serie histórica, excepto en 2021. **Conclusión:** Los factores sociodemográficos y clínicos influyen en la gravedad del dengue en Maranhão, lo que exige estrategias integradas de prevención y manejo precoz para reducir la prevalencia y la letalidad

Descriptores: Dengue. Factores de Riesgo. Salud Pública. Epidemiología. Vigilancia en Salud.

INTRODUCTION

Dengue is an arboviral infection with major relevance for global public health, especially in tropical and subtropical regions where environmental conditions favor proliferation of the *Aedes aegypti* vector. It is a febrile viral disease caused by dengue virus (DENV), a Flavivirus genus member with four distinct serotypes: DENV-1, DENV-2, DENV-3, and DENV-4.⁽¹⁾

It is estimated that, worldwide, nearly 80 million people are infected annually, with approximately 550 thousand requiring hospitalization and 20 thousand progressing to death.⁽²⁾ In the first three months of 2024, Brazil recorded more than 2.5 million cases, reaching a historical record for the period, with more than 1,000 deaths.⁽³⁾

The Health and Environmental Surveillance Secretariat (*Secretaria de Vigilância em Saúde e Ambiente*, SVSA) recorded 5,443 dengue-positive samples in the Northeast region from the 1st to the 26th

epidemiological week, with DENV-2 accounting for most cases, with 3,070 confirmed infections.⁽¹⁾ In Maranhão, according to the epidemiological alert from the State Health Secretariat no. 05, published in March 2024, 1,898 cases were reported, including 1,416 probable and 482 confirmed cases.⁽⁴⁾

Infection by any DENV serotype can result in clinical manifestations that range from mild self-limited forms to severe conditions characterized by hemorrhage, hypovolemic shock, and multiple organ failure, which pose a significant threat to life.⁽⁵⁾ In Brazil, dengue has historically represented an epidemiological and sanitary challenge, with cyclical outbreaks and a marked increase in hospitalizations and deaths in recent years.⁽⁶⁾

In the state of Maranhão, dengue is a recurrent public health problem driven by climatic, socioeconomic, and structural factors that favor vector spread and hinder disease control.⁽⁷⁾ Unplanned urbanization, inadequate sanitation, high population density, and limited coverage of preventive measures are determining factors for the high incidence of dengue in the region.⁽¹⁾

Understanding the factors that determine disease severity is essential for designing more effective strategies for prevention, diagnosis, and clinical management.⁽⁸⁾ In 2014, with the aim of improving care for patients with dengue, the Ministry of Health adopted the currently used case classification, revised by the World Health Organization (WHO), which groups dengue into three main categories: dengue without warning signs, dengue with warning signs, and severe dengue.⁽²⁾

The main risk factors associated with progression to severe forms include advanced age, presence of comorbidities, coinfection with other pathogens, the involved viral serotype, and individual immunological characteristics.⁽⁹⁾ In Maranhão, high social vulnerability and weaknesses in the healthcare network also contribute to worsening of the situation.⁽¹⁰⁾

To control dengue, the National Dengue Control Program (*Programa Nacional de Controle da Dengue*, PNCD) was launched in 2002 as a governmental strategy to reduce the number of cases and mitigate its impact on the population. More recently, vaccination has been incorporated as an additional tool in dengue control. In February 2024, dengue vaccine was added to the National Immunization Calendar, initially covering 521 municipalities across 37 health regions in the country.⁽¹¹⁾

However, despite advances in disease control, the effectiveness of preventive measures is undermined by operational challenges, such as population resistance to preventive practices and the difficulty in sustaining long-term vector control programs. In Maranhão, PNCD implementation faces additional obstacles due to the state environmental and socioeconomic characteristics, which demand ongoing adaptation and improvement to ensure an adequate response to the epidemic.⁽¹²⁾

Given this scenario, it is essential to investigate factors associated with the occurrence of severe dengue cases in Maranhão, considering regional particularities that affect both transmission dynamics and clinical evolution of the disease. This study seeks to understand the elements that contribute to dengue severity in the state and therefore aims to answer the following research question: what is the prevalence and which factors are associated with severe dengue infection reported in Maranhão? Thus, the objective was to examine the prevalence and factors related to the occurrence of severe dengue cases notified in Maranhão.

METHODS

This was an observational, analytical, cross-sectional, quantitative, retrospective study that examined all dengue cases reported in the Notifiable Diseases Information System (*Sistema de Informação de Agravos de Notificação*, SINAN) in Maranhão between 2019 and 2023, made available by the Informatics Department of the Unified Health System (DATASUS) through the TabNet application, accessible at <http://www.datasus.gov.br>. The study followed the recommendations of the STROBE checklist for observational studies in epidemiology.⁽¹³⁾

Data from Maranhão, which comprises 217 municipalities, were used. Maranhão covers approximately 329,651.495 km², with the following geographical boundaries: southwest and south bordering Tocantins, west bordering Pará, and east bordering Piauí. It has a population of approximately 7,010,960 inhabitants, predominantly urban. Regarding socioeconomic indicators, Maranhão has an HDI of 0.676, an average monthly per capita household income of approximately R\$ 1,077, and an educational system with nearly 1,045,700 enrollments per year in primary education.⁽¹⁴⁾

Dengue diagnosis and classification were based on the current criteria issued by the Ministry of Health (*Ministério da Saúde*, MS)⁽⁵⁾, which define:

1. Dengue without warning signs: confirmed case by laboratory criteria or clinical-epidemiological linkage, without warning signs;
2. Dengue with warning signs: dengue case that, during the defervescence period, presents one or more warning signs - severe abdominal pain (reported or on palpation) and continuous; persistent vomiting; fluid accumulation (ascites, pleural effusion, pericardial effusion); postural hypotension and/or presyncope; hepatomegaly >2 cm below the costal margin; mucosal bleeding; lethargy and/or irritability; progressive increase in hematocrit;
3. Severe dengue: dengue case that presents one or more of the following conditions: severe plasma leakage leading to shock, evidenced by tachycardia; cold distal extremities; weak, thready pulse; slow capillary refill (>2 seconds); narrow pulse pressure (<20 mmHg); tachypnea; oliguria (<1.5 mL/kg/h); arterial hypotension (late phase of shock); cyanosis (late phase of shock); fluid accumulation with respiratory failure; severe bleeding, such as hematemesis, melena, heavy metrorrhagia, and bleeding in the central nervous system (CNS); severe organ impairment, such as marked hepatic injury (AST/ALT >1,000), central nervous system involvement (altered consciousness), myocardial involvement (myocarditis), and impairment of other organs.⁽⁵⁾

The studied variables were obtained from the SINAN dengue investigation form - Dengue and Chikungunya Fever Investigation Form, namely: 1) Demographic and socioeconomic variables - age, race, gender, and schooling; 2) Temporal variables - year of occurrence; 3) Clinical and laboratory variables - clinical signs, pre-existing diseases, final dengue classification (dengue without warning signs, dengue with warning signs, severe dengue), confirmation criterion, clinical presentation, severe dengue type (yes, no), clinical data on severe dengue (weak or undetectable pulse, fluid accumulation with respiratory failure, tachycardia, cold extremities, arterial hypotension in late phase, hematemesis, organ impairment, and altered consciousness); and case outcome.

Data collection took place in June 2025. Inclusion criteria were all dengue cases confirmed in SINAN between 2019 and 2023 whose place of residence was Maranhão. The dataset for analysis was selected and obtained by downloading and preprocessing DATASUS microdata using the "Microdatasus" package in R® statistical software version 4.5.1.

Two categories were created from the final case classification in the SINAN form: severe dengue and non-severe dengue. The severe dengue category comprised all severe dengue cases. Non-severe dengue included cases of dengue without warning signs and dengue with warning signs. The case fatality rate was calculated by dividing the number of deaths in each year by the number of severe cases in that year and expressed as a percentage. Temporal distribution of case fatality was presented in a bar chart with an overlaid line connecting annual values as a descriptive resource.

Statistical analysis was performed using R software (version 4.5.1) ® in the R Studio environment. Absolute and relative frequencies of the variables of interest were calculated. Pearson chi-square test and Fisher exact test were used to assess associations between variables. Additionally, Cramer V coefficient (V) was used to measure the magnitude of association between variables and the outcome, with Cohen cutoffs for effect interpretation: $V < 0.10$: negligible effect; $0.10 \leq V < 0.30$: small effect; $0.30 \leq V < 0.50$: moderate effect; and $V \geq 0.50$: large effect.⁽¹⁵⁾ For analysis of associated factors, logistic regression modeling was applied to estimate Odds Ratios (OR) with respective confidence intervals, having severe dengue as the outcome and adopting a 5% significance level ($p < 0.05$).

Ethical and legal aspects of the research were fully respected, in accordance with Law no. 14.874/2024 and Decree no. 12.651/2025, which regulate research involving human beings in Brazil. As this was a study based on anonymized, publicly available secondary data, submission to a Research Ethics Committee (REC) was waived, according to complementary regulations established in Resolutions no. 510/2016 and no. 466/2012 of the National Health Council.

RESULTS

A total of 17,324 dengue cases reported in Maranhão between 2019 and 2023 were analyzed, including 100 (0.5%) severe dengue cases. The year with the highest number of reported dengue cases was 2022, with 5,640 (32.6%) notifications, whereas 2021 had the lowest number, with 1,142 (6.8%) records. Regarding severe dengue, 2019 stood out with the highest number, with 36 (0.2%) reported cases, while 2021 had the lowest number, with 4 (0.02%) notifications. As for dengue-related deaths, 43 (0.2%) cases were identified during the period, with 2022 recording the highest number, 17 (0.09%) reported deaths, 9 (0.05%) of which were due to severe dengue.

Table 1 presents sociodemographic, clinical, and laboratory data for dengue cases according to severity in Maranhão. Most severe dengue cases occurred among male individuals (53.5%), mixed-race individuals (81.0%), individuals aged <10 years (35.0%), and those with 0–8 years of schooling (72.2%). Among clinical variables, 56 cases were laboratory-confirmed (64.4%), 93 patients were hospitalized (93.0%), and 51 progressed to cure (51.8%). Age group, schooling, confirmation criterion, tourniquet test, hypertension, diabetes, renal disease, hospitalization, and outcome showed statistically significant association with severe dengue ($p < 0.05$).

Table 1. Univariate and bivariate analysis of sociodemographic, clinical, and laboratory characteristics of dengue cases according to clinical severity in Maranhão, 2019 to 2023. Pinheiro, MA, Brazil, 2025. (N=17.324)

Variables	Severe Dengue n = 100		Non-severe Dengue n = 17224		p-value
	n	%	n	%	
Gender	99	99.0	17212	99.9	0.256*
Male	53	53.5	8231	47.8	
Female	46	46.5	8981	52.2	
Race	100	100.0	16684	96.7	0.645**
White	15	15.0	1960	11.7	
Black	4	4.0	824	5.0	
Brown	81	81.0	13664	81.9	
Asian	00	0.0	175	1.0	
Indigenous	00	0.0	61	0.4	
Age group	100	100	17218	99.9	< 0.001*
< 10 years old	35	35.0	3586	20.8	
10-19 years old	24	24.0	3866	22.5	
20-59 years old	29	29.0	8570	49.8	
≥60 years old	12	12.0	1196	6.9	
Schooling	90	90.0	13814	80.2	0.004*
0-8 years	65	72.2	7663	55.5	
9-12 years	23	25.6	5068	36.7	
≥ 12 years	02	2.2	1083	7.8	
Classification	100	100	17224	100.0	< 0.001**
Dengue without warning signs	00	00	16581	96.3	
Dengue with warning signs	00	00	643	3.7	
Severe dengue	100	100	00	00	
Confirmation criterion	87	87.0	16618	96.5	< 0.001*
Laboratory	56	64.4	6420	38.6	
Clinical-epidemiological	31	35.6	10198	61.4	
Tourniquet test positive	100	100.0	17224	100.0	0.001**
Yes	09	9.0	564	3.3	
No	91	91.0	16660	96.7	
Hypertension	100	100.0	17224	100.0	0.048*
Yes	10	10.0	944	5.5	
No	90	90.0	16280	94.5	
Diabetes	100	100.0	17224	100.0	< 0.001**
Yes	11	11.0	460	2.7	
No	89	89.0	16764	97.3	
Renal disease	100	100.0	17224	100.0	< 0.001**
Yes	05	5.0	82	0.5	
No	95	95.0	17142	99.5	
Hospitalization	100	100.0	16021	93.1	< 0.001*
Yes	93	93.0	4120	25.7	
No	07	7.0	11901	74.3	
Evolution	71	91.0	15749		< 0.001**
Cure	51	71.8	15726	99.9	
Death	20	28.2	23	0.1	

Key: Analysis considered only valid information. Variables with missing data may not sum to 100%. *Pearson chi-square test; **Fisher exact test

Source: SINAN, 2025.

A statistically significant association was observed between hospitalization and occurrence of severe dengue ($\chi^2 = 233.06$; $p < 0.001$), with a small effect size ($V = 0.12$). The outcome variable showed a significant association with moderate effect ($V = 0.36$), with higher odds of severe dengue among individuals with unfavorable outcome ($OR = 265.5$; 95%CI: 129.8–549.0). The remaining variables that showed statistically significant association with the outcome had negligible effect sizes ($V < 0.10$) (Table 2).

Table 2. Analysis of the effect of association between sociodemographic, clinical, and laboratory variables of dengue cases according to clinical severity, 2019 to 2023. Pinheiro, MA, Brazil, 2025. (N= 17.324)

Variable	Test	χ^2 / Fisher	g1:	p-value	Cramer V	Effect interpretation	OR (95% CI)
Age group	χ^2	21.94	3	<0.001	0.033	Negligible	-
Schooling	χ^2	11.15	2	<0.001	0.025	Negligible	-
Confirmation criterion	χ^2	24.14	1	<0.001	0.037	Negligible	-
Hospitalization	χ^2	233.06	1	<0.001	0.119	Small	-
Hypertension	χ^2	3.90	1	<0.001	0.012	Negligible	-
Diabetes	Fisher	-	-	<0.001	0.038	Negligible	4.50(2.15-8.52)
Renal disease	Fisher	-	-	<0.001	0.047	Negligible	10.99(3.40-27.61)
Tourniquet test positive	Fisher	-	-	0.001	0.023	Negligible	2.92(1.28-5.83)
Evolution	Fisher	-	-	<0.001	0.359	Moderate	265,53(129.79- 548.97)

The most frequent clinical manifestations of severe dengue were cold extremities (30.0%), tachycardia (23.0%), gastrointestinal bleeding in the form of hematemesis (23.0%), and altered consciousness (19.0%), signs typical of shock (Table 3).

Table 3. Clinical manifestations of severe dengue in Maranhão, 2019 to 2023. Pinheiro, MA, Brazil, 2025. (n=100)

Clinical manifestations	n	%
Altered consciousness		
Yes	19	19.0
No	79	79.0
Unknown	02	2.0
Weak or undetectable pulse		
Yes	13	13.0
No	85	85.0
Unknown	02	2.0
Tachycardia		
Yes	23	23.0
No	75	75.0
Unknown	02	2.0
Cold extremities		
Yes	30	30.0
No	68	68.0
Unknown	02	2.0
Arterial hypotension (late phase of shock)		
Yes	14	14.0
No	84	84.0
Unknown	02	2.0
Fluid accumulation with respiratory failure		
Yes	17	17.0
No	80	80.0
Unknown	03	3.0
Hematemesis		
Yes	23	23.0
No	75	75.0
Unknown	02	2.0
Severe organ impairment		

Yes	09	9.0
No	89	89.0
Unknown	02	2.0
Total*	100	100

Key: *Analysis considered only information referring to severe dengue cases.

Source: SINAN, 2025.

In multivariate analysis, hospitalization and death were identified as factors associated with occurrence of severe dengue. Individuals with severe dengue had 28.71 times higher odds of hospitalization compared with those without severe dengue (OR=28.71; 95%CI: 10.26–80.55; $p<0.001$). Likewise, individuals with severe dengue had higher odds of death, estimated at 92.75 times higher than non-severe cases (OR=92.75; 95%CI: 44.36–193.95; $p<0.001$). A positive tourniquet test was more frequent among severe cases (9.7%) than among non-severe cases (3.2%) ($p=0.050$) (Table 4).

Table 4. Factors associated with occurrence of severe dengue cases in Maranhão, 2019 to 2023 (n=12,033*). Pinheiro, MA, Brazil, 2025.

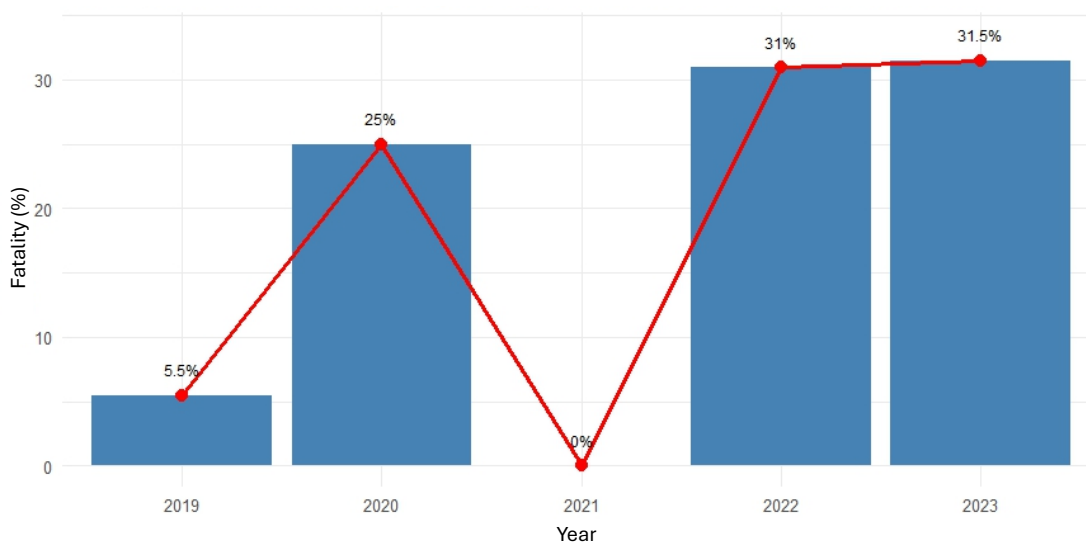
Variable	Severe dengue		Non-severe dengue		OR(95% CI)	p-value
	n	%	n	%		
Hospitalization						<0.001
No	4	6.5	8936	74.6	Ref.	
Yes	58	93.5	3035	25.4	28.71(10.26-80.55)	
Evolution						<0.001
Cure	43	69.4	11953	99.8	Ref.	
Death	19	30.6	18	0.2	92.75 (44.36-193.95)	
Tourniquet test						0.050
Negative	56	90.3	11584	96.8	Ref.	
Positive	6	9.7	56	3.2	2.57 (0.99-6.61)	

Key: *Analysis considered only valid values. Missing and blank records were excluded.

Source: SINAN, 2025.

Case fatality due to severe dengue in Maranhão showed important variations between 2019 and 2023, as indicated by the red line representing temporal trend in fatality due to severe dengue, highlighting fluctuations over the study period. In 2019, 2 deaths occurred among 36 severe cases (5.5%), whereas in 2020 fatality rose to 25.0% (3/12). In 2021, no deaths occurred; in contrast, 2022 and 2023 recorded the highest rates in the series, with 31.0% (9/29) and 31.5% (6/19), respectively, as shown in Figure 1.

Figure 1. Distribution of severe dengue cases according to fatality in Maranhão, 2019 to 2023. Pinheiro, MA, Brazil, 2025.



Source: SINAN, 2025.

DISCUSSION

The analysis of prevalence and distribution of dengue cases according to their sociodemographic, clinical, and laboratory characteristics in the state of Maranhão allowed identification of variables associated with greater disease severity, as well as the patterns of hospitalization, case outcomes, and fatality across the study period. The results obtained in this study reinforce the multifactorial complexity underlying dengue dynamics in Brazil, particularly when considering the spatiotemporal distribution of the disease, social inequalities, and the role of health services in addressing the problem.^(11, 13)

It was observed that prevalence and fatality due to severe dengue varied over the years and may have been influenced by multiple contextual factors. In this sense, the impact of the Covid-19 pandemic must be taken into account when interpreting the results. During 2020 and 2021, the overload of health services, prioritization of care for patients with Covid-19, and partial interruption of vector control activities contributed to the reduction in recording of dengue cases and, at the same time, to the worsening of clinical outcomes. In the subsequent years, with the gradual resumption of surveillance and notification, there was a marked increase in cases and deaths, reflecting both the resumption of notifications and possible complications resulting from discontinuation of preventive actions.⁽³⁾ This scenario highlights the need for health system resilience in the face of simultaneous emergencies, so that management of one epidemic does not compromise the control of another.

In relation to sociodemographic variables, the association between age and schooling reflects the predominantly pediatric profile seen in severe cases, since children, by definition, have lower schooling because they are at an initial stage of formation. Indeed, age extremes deserve greater attention, as, like older adults, children are more immunologically susceptible to infections and face a higher risk of unfavorable evolution.^(14,16) Studies have shown that, in endemic regions, children are disproportionately affected compared with adults, with a relatively higher incidence of dengue hemorrhagic fever (DHF) and severe dengue observed among them.^(14,17)

The absence of primary immunoprophylaxis for this age group further increases susceptibility; individuals who are not vaccinated become even more susceptible to the disease. Currently, the dengue vaccine is available in the Unified Health System (*Sistema Único de Saúde*, SUS) for children and adolescents aged 10 to 14 years.⁽¹⁴⁾ Added to this, social vulnerability, expressed by the predominance of male gender, mixed race, low socioeconomic conditions, and reduced schooling, reinforces inequalities already pointed out in other national and international studies.^(6,7,9,16,18) In this sense, the association between age, schooling, race, and higher dengue mortality rates indicates that social determinants of health play an important role in disease severity and death by dengue.

From a clinical perspective, the most frequent signs in severe cases were cold extremities, tachycardia, hematemesis, and altered consciousness, complications associated with plasma leakage, severe bleeding, and organ impairment, manifestations typical of shock. These results converge with the literature that describes such signs as classic markers of severe dengue, frequently associated with unfavorable outcomes.^(5,7)

In addition, the presence of comorbidities such as hypertension, diabetes, and renal disease was significantly associated with severity, confirming the relevance of these conditions as factors that worsen the clinical course of the disease. The predominance of laboratory confirmation among severe dengue cases indicates greater diagnostic rigor in the face of more complex cases, since the need for confirmation of the disease by laboratory tests is greater than in cases with warning signs, where clinical diagnosis may be faster. This reinforces the importance of clinical protocols that include dynamic monitoring of warning signs, which allows timely management and reduction of mortality due to severe dengue.⁽⁵⁾

Among the associated factors, hospitalization showed a strong association with the occurrence of severe dengue in Maranhão. Patients admitted to hospital had 28.7 times higher odds of having severe dengue compared with those not hospitalized, evidencing that hospitalization is directly associated with clinical severity of the cases. However, this result reflects clinical management and cannot be interpreted as a causal factor for its occurrence, since hospitalization is indicated for the more severe cases or those at risk of complication, although it also reveals overload of hospital services in periods of higher incidence of the disease.⁽¹⁸⁻²⁰⁾

The findings demonstrated that clinical severity of dengue in Maranhão was associated with unfavorable outcome, with a substantially higher risk of death among severe cases. Patients with severe dengue had 92.7 times higher odds of evolving to death compared with non-severe forms of the disease.

This result is consistent with studies that relate severe dengue to higher fatality rates, resulting from shock, hemorrhage, and multiple organ failure.⁽⁹⁾

The analysis of the association between the tourniquet test and occurrence of severe dengue cases in Maranhão revealed that positivity for the test was present in 9.7% of severe cases, compared with only 3.2% of non-severe cases. Nevertheless, despite this variable being included in the final model, it showed a borderline association from a statistical standpoint ($p=0.050$). The Ministry of Health recommends, as part of the national dengue clinical management protocol, performing the tourniquet test, which is an important clinical examination to assess capillary fragility in patients suspected of dengue.⁽⁵⁾ Despite being a useful tool for identifying patients at higher risk of progression to severe forms of the disease, the tourniquet test should not be used in isolation to confirm diagnosis.⁽²¹⁾

These findings reinforce the relevance of clinical protocols with dynamic staging (groups A-D), early identification of warning signs and high-risk patients, systematic reevaluation, as well as rapid and effective triage by experienced professionals in Primary Health Care (PHC) and urgent and emergency services – central elements for adequate management and prevention of worsening and deaths due to dengue.⁽⁵⁾ In addition, timely attention in health services is important, considering that reduction of mortality due to dengue is one of the main indicators of effectiveness of surveillance and care actions.⁽¹⁾

In relation to fatality rates for severe dengue, it was observed that throughout the entire historical series analyzed fatality remained high, with the exception of 2021, when no deaths were recorded. In the years 2022 and 2023, fatality exceeded 30%, a value far above the target established by the WHO, which recommends indices below 1%.⁽⁵⁾ This situation may be related to failures in early detection of severe cases, difficulties in access to timely care, and structural limitations of health services, especially in more vulnerable regions.^(14,16) The persistence of high fatality rates indicates a need to strengthen epidemiological surveillance, expand access to early diagnosis, and invest in the training of multidisciplinary teams for clinical management of the disease.

The results demonstrated that clinical severity of dengue in Maranhão was associated with unfavorable outcome, with a substantially higher risk of death among severe cases. This finding converges with results from national and international studies, which indicate higher fatality in severe dengue due to complications resulting from shock, bleeding, and multiple organ failure.^(11,14,16,22) From a public health perspective, these findings reinforce the need to strengthen epidemiological surveillance, continuous training of multidisciplinary teams, and expansion of access to timely care, especially in regions with greater social and sanitary vulnerability. In this way, the management of severe dengue demands an integrated approach between prevention, rapid diagnosis, and qualified clinical management to reduce disease-related fatality.⁽²³⁾

In this context, the role of nursing stands out as a fundamental link between the health system and the population. In PHC and emergency services, the nurse acts directly in reception, risk classification, care, notification, and follow-up of compulsory-notification conditions, including dengue.⁽²⁴⁾ The application of the Nursing Process (NP), particularly in clinical management of cases and in active surveillance, has been pointed out as an efficient strategy to reduce severity of episodes and avoid deaths, because it favors objectivity of clinical data, supports decision-making, and accelerates development of professional documentation, generating indicators and facilitating the execution and precision of an evidence-based NP.^(8,10,25)

As study limitations, the use of secondary data does not allow the researcher to control possible under-reporting, omissions, or incomplete records, evidenced by the presence of blank fields and/or entries marked as “ignored” in some variables analyzed. However, because these are official data from the Ministry of Health, compulsory notification throughout the national territory, it is considered that the proposed objective could be achieved in a consistent manner. It is highlighted, however, that continuous training, improvement of professionals responsible for the correct completion of notification forms, integration between information systems, and availability of updated data constitute essential strategies to support more effective public policies and to foster high-quality scientific production.

CONCLUSION

The study showed that occurrence of severe dengue in Maranhão in the period 2019 to 2023 was associated with sociodemographic and clinical factors, with higher prevalence in individuals aged <10 years, male gender, mixed race, with 0–8 years of schooling. There was a significant association between hospitalization and death and severe dengue cases. High fatality rates were observed in the entire historical

series, with the exception of 2021. The findings reinforce the need for integrated strategies that involve strengthened epidemiological surveillance, early diagnosis, and qualified clinical management, with emphasis on the role of nursing. These measures are essential to reduce case severity and fatality due to dengue in the state, especially in more vulnerable populations.

CONTRIBUTIONS

Contributed to the conception or design of the study/research: Santos KCB. Contributed to data collection: Oliveira ABG, Santos KCB. Contributed to the analysis and/or interpretation of data: Oliveira ABG, Santos KCB. Contributed to article writing or critical review: Oliveira ABG, Santos KCB. Final approval of the version to be published: Oliveira ABG, Santos KCB.

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