Descriptive and Analytical Analysis of Dengue Reported Cases in a Medium-Sized Municipality of the State of Pernambuco, 2015

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Abstract: Dengue is a serious public health problem, described as acute febrile illness, having a benign or severe course, depending on its presentation. The study aimed to present an analytical descriptive analysis of reported dengue cases in the municipality of Vitória de Santo Antão - PE. A bank was built in the Microsoft Excel spreadsheet, exported to the SPSS program, version 21, and analyzed. To evaluate the distribution of the personal and clinical profile of the patients, the percentage frequencies were calculated and the frequency distributions were constructed. The prevalence of symptoms presented by the patients was calculated and which factors were associated with the diagnosis of dengue, constructing contingency tables and applying the Chi-square test for independence. Gross Odds Ration and confidence intervals were obtained. The factors that presented significance in the bivariate analysis were included in the multivariate analysis. For the permanence of the factors in the model, the significance level of 5% was considered. The results were significant in relation to the characterization of the factors of the personal profile of the patients, indicating a higher prevalence of the disease in men (50.1%), aged 20 to 30 years (15.9%) and brown/black color/race (85.6%). The majority were not hospitalized (89.5%), being confirmed/discarded by epidemiological clinical criterion (92.2%), had cure of the disease (99. 8%), had dengue (61.0%) and three symptoms (35.9%).

It is important that health professionals correctly fill out compulsory notification forms and that epidemiological weeks are properly fed with valuable information so that actions can be implemented.

1. Introduction

Among the reemerging diseases, according to the World HealthOrganization 1,dengue is a serious public health problem. Described as acute febrile disease pathology, having a benign or severe course, depending on the form presented: dengue without alarm signs, dengue with alarm signs and severe dengue. The year 2015 was considered the most epidemic regarding dengue disease in Brazil, surpassing the epidemiological records consolidated in previous years, 2010 and 2013, which was the period in which notifications presented a categorization pattern.

In reference to the study by Araújo *et al.* 2   There was a significant increase in dengue virus infection in Brazil during the period from 2000 to 2015, highlighting incidence and mortality rates. This growth totaled 232.7% in the case index and 639.0% in the rate of deaths.

According to data from the epidemiological bulletins of the Ministry of Health, in the last three years, 2014, 2015 and 2016 the four different serotypes continued circulating throughout the country and infecting populations3.

Despite increasing efforts and encouragement of practices that can contribute to the eradication of the mosquito, it is noted that its proliferation has still been exponential, demonstrating the need for change in strategies to combatit 1.

Inreference, the calculations on dengue do not reveal the real situation of the occurrence of the disease due to the underreporting of cases. Symptomatic cases of dengue present a wide change in the spectrum of the disease and several patients do not seek treatment4.

Therefore, considering the various studies that demonstrate and affirm the relationship of environmental determinants and climatic factors under the dynamics of endemic smaemias, and knowing the relevance and magnitude of dengue in Brazil and worldwide, it is relevant to develop a study that presents a descriptive and analytical analysis of reported dengue cases in the municipality of Vitória de Santo Antão,   PE, 2015.

The present study aims to present an analytical descriptive analysis of about the reported cases of dengue in the municipality of Vitória de Santo Antão, PE, 2015.

2. Methodology

Type of study

A descriptive, epidemiological study of the population-based spatial type (case-control) of the spatial distribution of dengue cases occurred in the municipality of Vitória de Santo Antão in 2015 was carried out.

Study population

The study population consisted of the reported cases of dengue in 2015, in the municipality of Vitoria de Santo Antão and consolidated in the Notifiable Diseases Information System - SINAN.

Inclusion and exclusion criteria

The description of the control case respected the categorization offered by the Health Surveillance Guide published in 2014 effective until the beginning of 2016 and SINAN's online dictionary.

Inclusion criteria – The inclusion criteria of the research were defined by all reported cases of dengue in 2015, in the municipality of Vitória de Santo Antão and consolidated in the Notifiable Diseases Information System - SINAN. Being named as: Confirmed cases of dengue by epidemiological clinical investigation or confirmed cases of dengue by laboratory investigation.

Exclusion criteria – The exclusion criteria of the research were defined by all reported cases of dengue in 2015, in the municipality of Vitória de Santo Antão and consolidated in the Notifiable Diseases Information System - SINAN. Being named as: Discarded cases of dengue and inconclusive cases.

The area of study

The municipality of Vitória de Santo Antão has a territorial area of approximately 335,942 km², with 5.717 km² in urban perimeter, with an estimated population of 136,706 inhabitants and a population density of 348.80 inhabitants/km², according to the population census of 2010 (IBGE, 2010).

Statistical plan
Database construction

For data analysis, a database was built in the Microsoft Excel spreadsheet, which was exported to the SPSS program, version 21, where the analysis was performed. To evaluate the distribution of the personal and clinical profile of the patients, the percentage frequencies were calculated and the respective frequency distributions were constructed. Furthermore, the prevalence of symptoms presented by the patients in the study was calculated. To determine which factors are associated with the diagnosis of dengue, contingency tables were constructed and the Chi-square test for independence was applied. Crude Odds Ration and their respective confidence intervals were obtained. The factors that presented significance in the bivariate analysis were included in the Multivariate analysis. All conclusions were drawn considering the significance level of 5%.

The variables that presented statistical significance up to 20% in the bivariate analysis were included in the adjustment of the multivariate logistic model for the diagnosis of dengue. For the permanence of the factors in the model, the significance level of 5% was considered. Furthermore, the confidence intervals for the prevalence ratio and the Wald test

were calculated in the comparison of risks between the levels of the factors evaluated.

3. Results and Discussion

Table 1 shows the characterization of the factors of the personal profile of the patients evaluated. It was verified that the majority are male (50.1%), are aged 20 to 30 years (15.9%), are not pregnant (97.9%) and are brown/black (85.6%). It is observed that the proportion comparison test was significant in all factors evaluated, except for gender (p-value = 0.922), indicating that the number of male patients is similar to the number of female patients. Furthermore, the confidence intervals were calculated for the estimated prevalence.

Table 2 shows the distribution of the clinical situation of the patients evaluated. It was verified that the majority did not go through hospitalization (89.5%), was confirmed/discarded by the epidemiological clinical criterion (92.2%), had cure of the disease (99.8%), had dengue (61.0%) and 3 symptoms (35.9%). The distribution comparison test was significant in all factors evaluated. Indicating that the profile described is relevantly the most frequent in the group of patients evaluated.

Table 3 shows the distribution of the comorbidities evaluated. The most prevalent symptoms were: Fever (84.0%), Exanthema (55.5%) and Myalgia (53.5%). The distribution comparison test was significant in all symptoms evaluated (p-value < 0.05), except for headache (p-value = 0.588) indicating that the prevalence of patients who presented this symptom is similar to those who did not.

Bivariate Analysis

Table 4 shows the distribution of dengue diagnosis according to the personal characteristics of patients. There is a higher prevalence of dengue in female patients (63.5%), aged between 40 and less than 50 years (72.5%), who are women of childbearing age, but have no child (68.5%) and white/yellow/indigenous (72.3%). Furthermore, we have the analysis of the crude Odds Ratio for each category of variables comparing with the reference category (lower prevalence of dengue positivity).

Table 5 shows the distribution of dengue diagnosis according to the clinical situation of patients. There was a higher prevalence of dengue in hospitalized patients (82.1%), clinically evaluated (61.6%), who obtained cure (61.1%) and who had 6 or more symptoms (80.7%). Inda,we have the analysis of the odds ration (odds ratio) gross for each category of variables comparing with the reference category (lower prevalence of dengue positivity).

Multivariate Analysis

Table 6 shows the adjustment of the Logistic model for the diagnosis of dengue. It was verified that the variables evaluated in the study were those that remained jointly significant for the diagnosis of Dengue were: Gender, age group, race, occurrence of hospitalization,

confirmation/disposal criteria and number of symptoms There was a significant increase in the chance of positive diagnosis of dengue when the patient is female (OR = 1.241), aged 40 to 50 years (OR = 1.917), is white/yellow/indigenous (OR = 1.771), is hospitalized (OR = 2.327), receives epidemiological clinical evaluation (OR = 1.869) and presents a higher number of symptoms (OR directly proportional to the number of symptoms being OR = 3.823 to the group with 6 or more symptoms).

The ROC curve graph shows an area of 0.663 for the model suggested in Table 6, indicating a significant discriminatory power.

Discussion

The findings of the present study demonstrated significant results in relation to the characterization of the factors of the personal profile of the patients evaluated in the municipality of Vitória de Santo Antão. Indicating that the prevalence of the disease occurs in greater quantity, respectively: in males (50.1%), aged 20 to 30 years (15.9%), is not pregnant (97.9%) and is brown/black (85.6%). However, a study by Oliveira et al. 5 identifies a greater involvement in females and in the age group between 15 and 19 years, followed by 20 and 34 years. This same study found the prevalence of dengue notifications, approximately 55.91% of cases, in females (n=2,036).

Flauzino et al. 6 state that the female sex is more affected by the disease, due to the prevalence of women in the home environment, and because they are the ones who most seek the health service, which was also observed in the study. A higher prevalence was obtained in the age group of 20 to 30 years of individuals reported with dengue, which corroborates with other studies, according to which the most affected individuals belong to the working class.

The confirmed cases of dengue, according to gender, presented the following results: in all years there was a predominance of dengue cases in females; in 2008, 63.93%; 2009, 70,27%; 2010, 66,67%; 2011, 60% and 2012, 70.69%. The most affected age group was 35 to 49 years in 2008; 20 to 34 years in 2009 and 2010; 1 to 4 years in 2011 and 15 to 19 years in 20127. In general, the age group with the highest number of notifications is between 20 and 59 years8.
Severe cases and deaths in particular were not investigated, but the age group most affected by dengue in the period was between 20 and 59 years, which corresponds to the economically active population, who work or study during the day. Women had a small difference in the distribution of cases and were more affected than men8.

Regarding the distribution of the clinical situation of the patients evaluated, it was found that most individuals did not go through hospitalization (89.5%), being confirmed/discarded by epidemiological clinical criterion (92.2%), had cure of the disease (99.8%), had dengue (61.0%) and 3 symptoms (35.9%). In the study conducted by Carvalho, Magalhães and Medronho10, the results found suggest that barriers to access to health services interfere in the early diagnosis of dengue, leading to the greater possible

cases of severe dengue, since the late diagnosis of the disease may imply the non-identification of the alarm signs of the disease. It is noteworthy that the improvement of access to health services is related to the principle of universality provided for in the Unified Health System.

The spread and flow of the various serotypes of dengue virus over the years also has a significant influence on epidemics, as well as the increase in cases diagnosed by the most severe form of the disease. These factors demonstrate the importance of introducing preventive measures in order to reduce dengue rates2.

The study shows that higher numbers of cases are confirmed in individuals from the urban area of the municipality of Vitória de Santo Antão.

It is verified in relation to the distribution of the diagnosis of dengue according to the personal characteristics of patients that the highest prevalence of dengue is found in female patients (63.5%), aged between 40 and less than 50 years (72.5%), who are women of childbearing age, but have no child (68.5%) and white/yellow/indigenous (72.3%). The female gender is more affected by the disease, due to the prevalence of women in the home environment, and because they are the ones who most seek the health service, which was also observed in the study. A higher prevalence was obtained in the age group of 20 to 30 years of individuals reported with dengue, which corroborates with other studies, according to which the most affected individuals belong to the working class6.

It is observed that, in 2015, there was an increase in the number of dengue cases, characterizing an epidemic transmission in the municipality. According to Vasconcelos11, although year after year there has been an increase in the number of dengue cases reported, during the occurrence of epidemics it is well known that the number of reported cases does not represent the total number of cases that occurred, indicate that only between 5% and 10% of the infections that occurred are reported.

5. Conclusion

It is noteworthy the difficulty in finding statistical information of dengue cases in a centralized and standardized way, which facilitated data studies and would enable the proposal of new visions of analysis.

Therefore, it is necessary to emphasize the importance of correct filling out compulsory notification forms by health professionals, avoiding that epidemiological weeks are not properly fed with valuable information so that actions can be implemented and that seasonality is an important reference in the preparation of strategies to combat the vector and organize the care network in order to better lead health problems.

6. Ethical Aspects

This research was approved by the Research Ethics Committee involving human beings of the Center for Health Sciences of UFPE.

Data were collected after approval of this body. The technique applied in this research was to search for secondary data in SINAN.

The research sought to meet the recommendations of Resolution No. 466/12 of the National Health Council/Ministry of Health - CNS/MS, which provides for the standards applicable to research in Human and Social Sciences whose methodological procedures involve the use of data directly obtained from participants or identifiable information or that may entail greater risks than those existing in everyday life, in the defined form found in the above-mentioned Resolution.

7. Acknowledgments

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Table 1. Characterization of the patients evaluated.

Factor evaluated	N	%	CI (95%)	p-value[1]
Sex				
Male	826	50,1	47,7 - 52,5	0,922
Female	822	49,9	47,5 - 52,3	
Age				
Less than 1 year	97	5,9	4,8 - 7,1	
1 to less than 5 years	213	12,9	11,4 - 14,6	
5 to less than 10 years	216	13,1	11,6 - 14,8	
10 to less than 20 years	229	13,9	12,3 - 15,6	
20 to under 30 years	262	15,9	14,2 - 17,7	<0,001
30 to less than 40 years	191	11,6	10,1 - 13,2	
40 to less than 50 years	171	10,4	8,9 - 11,9	
50 to under 60 years	114	6,9	5,8 - 8,2	
60 years or more	155	9,4	8,1 - 10,9	
CS_gestante				
Pregnant	35	2,1	1,5 - 2,9	
You don't have a child	356	21,6	19,7 - 23,6	
Non-fertile	431	26,2	24,1 - 28,3	<0,001
Does not apply	826	50,1	47,7 - 52,5	
Race				
White/yellow/indigenous	238	14,4	12,8 - 16,2	<0,001
Brown/black (exposed)	1410	85,6	83,8 - 87,2	

[1]p-value of the Chi-square test for proportion comparison. IC = confidence interval.
Source: Prepared by the author.

Table 2. Distribution of the clinical situation of the patients evaluated.

Factor evaluated	N	%	CI (95%)	p-value[1]
Hospitalization occurred				
Yes	173	10,5	9,1 - 12,1	<0,001
No	1475	89,5	87,9 - 90,9	
Confirmation Criterion/ Disposal				
Laboratory	128	7,8	6,6 - 9,2	<0,001
Epidemiological Clinical	1520	92,2	7,0 - 10,1	
Evolution of the Case				
Healing	1645	99,8	99,5 - 99,9	<0,001
Death Dpelo injury	3	0,2	0,1 - 0,5	
Dengue fever				
Yes	1005	61,0	58,6 - 63,3	<0,001

	N	%	CI	
No	643	39,0	36,7 - 41,4	
Number of symptoms				
Up to 1 symptom	85	5,2	4,2 - 6,3	
2 symptoms	316	19,2	17,4 - 21,1	
3 symptoms	591	35,9	33,6 - 38,2	<0,001
4 symptoms	400	24,3	22,3 - 26,4	
5 symptoms	173	10,5	9,1 - 12,1	
6 or more symptoms	83	4,9	4,1 - 6,2	

[1]p-value of the Chi-square test for proportion comparison. IC = confidence interval.
Source: Prepared by the author.

Table 3. Distribution of comorbidities evaluated.

Factor evaluated	It has comorbidity		CI for occurrence of the event (95%)	p-value[1]
	Yes	No		
Fever	1385(84,0%)	263(16,0%)	82,2 - 85,7	<0,001
Rash	914(55,5%)	734(44,5%)	53,0 - 57,8	<0,001
Myalgia	882(53,5%)	766(46,5%)	51,1 - 55,9	0,004
Headache	835(50,7%)	813(49,3%)	48,2 - 53,1	0,588
Arthralgia	693(42,1%)	955(57,9%)	39,7 - 44,4	<0,001
Dor_retroorbital	288(17,5%)	1360(82,5%)	15,7 - 19,4	<0,001
Vomit	214(13,0%)	1434(87,0%)	11,4 - 14,7	<0,001
Petequia_n	106(6,4%)	1542(93,6%)	5,4 - 7,7	<0,001
Nausea	90(5,5%)	1558(94,5%)	4,4 - 6,7	<0,001
Leukopenia	44(2,7%)	1604(97,3%)	2,0 - 3,6	<0,001
Dor_costas	9(0,5%)	1639(99,5%)	0,3 - 1,0	<0,001
Conjuntvit	8(0,5%)	1640(99,5%)	0,2 - 1,0	<0,001
Arthritis	1(0,1%)	1647(99,9%)	0,0 - 0,3	<0,001
Sin_gravid	0(0,0%)	1648(100,0%)	0,0 - 0,2	<0,001

Table 4. Distribution of dengue diagnosis according to the personal characteristics of the patients evaluated

Factor evaluated	Dengue fever		OR	IC95% (OR)	p-value[1]
	Yes	No			
Sex					
Male	483(58,5%)	343(41,5%)	1,00	-	
Female	522(63,5%)	300(36,5%)	1,24	1,01 - 1,51	0,036
Age					
Less than 1 year	48(49,5%)	49(50,5%)	1,14	0,68 - 1,89	0,601
1 to less than 5 years	122(57,3%)	91(42,7%)	1,56	1,04 - 2,32	0,023
5 to less than 10 years	100(46,3%)	116(53,7%)	1,00	-	-
10 to less than 20 years	123(53,7%)	106(46,3%)	1,35	0,91 - 1,99	0,118
20 to under 30 years	172(65,6%)	90(34,4%)	2,22	1,51 - 3,26	<0,001
30 to less than 40 years	129(67,5%)	62(32,5%)	2,41	1,58 - 3,69	<0,001
40 to less than 50 years	124(72,5%)	47(27,5%)	3,0	1,95 -	<0,001

Factor	Yes	No	OR	IC95%	p-value
)		6		4,81	1
50 to under 60 years	76(66,7%)	38(33,3%)	2,32	1,41 - 3,83	<0,001
60 years or more	111(71,6%)	44(28,4%)	2,93	1,84 - 4,66	<0,001
CS_gestante					
Pregnant	17(48,6%)	18(51,4%)	1,00	-	-
You don't have a child	244(68,5%)	112(31,5%)	2,31	1,09 - 4,90	0,017
Non-fertile	261(60,6%)	170(39,4%)	1,63	0,77 - 3,42	0,165
Does not apply	483(58,5%)	343(41,5%)	1,49	0,72 - 3,08	0,245
Race					
White/yellow/indigenous	172(72,3%)	66(27,7%)	1,81	1,32 - 2,47	<0,001
Brown/black (exposed)	833(59,1%)	577(40,9%)	1,00	-	-

Qui-square test [1]p-value for independence. Source: Prepared by the author.

Table 5. Distribution of dengue diagnosis according to the clinical situation of patients.

Factor evaluated	Dengue fever		OR	IC95% (OR)	p-value
	Yes	No			
Hospitalization occurred					
No	863(58,5%)	612(41,5%)	1,00	-	-
Yes	142(82,1%)	31(17,9%)	3,25	2,14 - 4,96	<0,001
Confirmation Criterion/ Disposal					
Laboratory	68(53,1%)	60(46,9%)	1,00	-	-
Epidemiological Clinical	937(61,6%)	583(38,4%)	1,42	0,97 - 2,07	0,058
Evolution of the Case					
Healing	1005(61,1%)	640(38,9%)			
Death from the disease	0(0,0%)	3(100,0%)	-	-	-
Number of symptoms					
Up to 1 symptom	35(41,2%)	50(58,8%)	1,00	-	-
2 symptoms	155(49,1%)	161(50,9%)	1,38	0,82 - 2,30	0,197
3 symptoms	359(60,7%)	232(39,3%)	2,21	1,36 - 3,60	<0,001
4 symptoms	260(65,0%)	140(35,0%)	2,65	1,60 - 4,40	<0,001
5 symptoms	129(74,6%)	44(25,4%)	4,19	2,33 - 7,56	<0,001
6 or more symptoms	67(80,7%)	16(19,3%)	5,98	2,83 - 12,78	<0,001

Qui-square test [1]p-value for independence. Source: Prepared by the author.

Table 6. Adjustment of the logistic model for dengue diagnosis

Factor evaluated	OR	IC95% (OR)	p-value[1]
Sex			
Male	1,000	-	-
Female	1,241	1,004 - 1,535	0,046
Age			
Less than 1 year	1,000	-	-
1 to less than 5 years	1,319	0,807 - 2,158	0,270
5 to less than 10 years	0,767	0,468 - 1,257	0,293
10 to less than 20 years	0,914	0,555 - 1,505	0,724
20 to under 30 years	1,459	0,887 - 2,399	0,137
30 to less than 40 years	1,484	0,872 - 2,524	0,146
40 to less than 50 years	1,917	1,111 - 3,309	0,019
50 to under 60 years	1,278	0,705 - 2,318	0,420
60 years or more	1,391	0,793 - 2,440	0,249
Race			
White/yellow/indigenous	1,771	1,276 - 2,457	0,001
Brown/black (exposed)	1,000	-	-
Hospitalization occurred			
No	1,000	-	-
Yes	2,327	1,492 - 3,631	<0,001
Confirmation Criterion/ Disposal			
Laboratory	1,000	-	-
Epidemiological Clinical	1,869	1,255 - 2,782	0,002
Number of symptoms			
Up to 1 symptom	1,00	-	-
2 symptoms	1,411	0,860 - 2,315	0,173
3 symptoms	2,233	1,377 - 3,622	0,001
4 symptoms	2,374	1,431 - 3,938	0,001
5 symptoms	3,184	1,773 - 5,718	<0,001
6 or more symptoms	3,823	1,807 - 8,087	<0,001

Wald statistic [1]p-value. Source: Prepared by the author.