

## Controlling the Vector *Aedes Aegypti* and Handling Dengue Fever Bearing Patients

Controle do Vetor *Aedes Aegypti* e Manejo dos Pacientes com Dengue

Control del Vector *Aedes Aegypti* y Manejo de los Pacientes con Dengue

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### ABSTRACT

**Objective:** The study's purpose has been to identify the actions to fight the dengue fever vector, and also the way that patients bearing the symptoms have being handled. **Methods:** This research describes the semiological and pathophysiological aspects of dengue fever through the perception of health professionals, who assisted the patients bearing the symptoms of this disease. Furthermore, this study addresses the perception of endemic diseases combat agents and community health agents regarding the efficiency of vector control measures. **Results:** The health professionals are working according to the World Health Organization recommendations. The majority of the population contributes to the mosquito breeding sites elimination. The elevated number of closed properties and houses with difficult access has been the greatest obstacle to control the vector. **Conclusion:** These services need to be aware of the disease trends in order to quickly detect changes in its profile and guide control actions.

**Descriptors:** Health Professionals, Endemic Diseases Combat Agents, Endemic Diseases, Epidemiological Surveillance, Environmental Surveillance.

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## RESUMO

**Objetivo:** Identificar as ações adotadas de combate ao vetor e as formas de manejo dos pacientes com sinais e sintomas de alarme para dengue grave. **Métodos:** Estudo que descreve, na percepção dos profissionais de saúde que atenderam pacientes com suspeita de dengue, os aspectos semiológicos e fisiopatológicos da doença. Apresenta a percepção dos Agentes de Combate a Endemias e Agentes Comunitários de Saúde sobre a eficiência das medidas de controle do vetor. **Resultados:** Os profissionais de saúde procedem o cuidado conforme orientações da Organização Mundial da Saúde. A maior parte da população contribui com a eliminação dos criadouros do mosquito. Imóveis fechados e o difícil acesso têm sido os principais desafios para o controle do vetor. **Conclusão:** Esses serviços precisam estar atentos às tendências dessa doença para rapidamente conseguir detectar mudanças em seu perfil e orientar ações de controle.

**Descritores:** Profissionais de saúde, Agentes de combate às endemias, Endemias, Vigilância Epidemiológica.

## RESUMEN

**Objetivo:** Identificar la satisfacción de los pacientes seguidos en un ambulatorio de Educación para la Salud y evaluar el efecto de las variables antecedentes sobre el nivel de satisfacción de los pacientes. **Método:** Se trata de un estudio transversal realizado en un ambulatorio la Educación para la Salud. La muestra estuvo constituida por todos los pacientes cardíacos en el ambulatorio (17 pacientes). La satisfacción del paciente se evaluó a través del Instrumento de Satisfacción del Paciente (ISP). **Resultados:** Todos los pacientes informaron un alto nivel de satisfacción. Los dominios con los puntajes más altos y más bajos fueron el profesional y el educacional, respectivamente. No hubo correlación significativa entre los niveles de satisfacción con cualquiera de las variables antecedentes. **Conclusión:** Pacientes informaron un alto nivel de satisfacción y no hubo correlación significativa entre variables y los niveles de satisfacción.

**Descriptorios:** Satisfacción del paciente, Servicio ambulatorio en hospital, Enfermería.

## INTRODUCTION

Dengue fever is caused by an RNA virus, arbovirus of the genus *Flavivirus*, belonging to the *Flaviviridae* family, which are known as four serotypes according to the Ministry of Health: DENV 1, DENV 2, DENV 3 and DENV 4.<sup>1</sup>

The mosquito *Aedes aegypti* (Linnaeus, 1762) (Diptera: Culicidae) is a synanthropic and anthropophilic species, preferentially and easily proliferate in densely populated urban areas.<sup>2,3</sup> Infestation by *A. aegypti* and consequently the transmission of Dengue, has been a public health problem since the beginning of the 20<sup>th</sup> century, worsening from 2014 by the introduction of the Zika Virus and the Chikungunya Fever in Brazil, and recently with the re-urbanization of the Yellow Fever in 2016 and 2017. Considered by World Health Organization (WHO) as a neglected disease, Dengue gained the status of a promoter and perpetrator of poverty in the mid-2000s, due to the association of its epidemics with the precariousness of basic sanitation, common in areas of poverty.<sup>4</sup>

Several factors have been described as responsible for the recurrence of this endemic: ineffective control

and prevention programs; inefficient surveillance; lack of resources for public health research; urbanization and transportation of products; climate, demographic and social changes, and; inappropriateness to vectors and infectious diseases.<sup>5</sup> In regions still free of viral circulation, the alert of health authorities is growing, especially with the international traffic of people and goods that have been described as a factor that acts positively for the dispersion of the virus and for the increase of cases.<sup>6</sup>

After the recurrence of the dengue virus in Brazil, the disease became endemic and epidemic, spreading in all Brazilian states. Its rapid spread was responsible for the high number of cases, with over one million patients being notified, and because of its large lethality, with around four to five percent of the cases being severe, thus characterizing itself as one of the main problems of public health in Brazil.<sup>7</sup>

Dengue is highlighted by social impact, requires a great demand for clinical and hospital care, and also compromises the quality of life of affected individuals and families.<sup>8</sup> In 2007, the economic burden of dengue in Brazil accounted for 40.9% of the total cost of dengue fever throughout the Americas. The literature suggests that severe climatic changes become an important factor in relation to vector transmission and complications due to the disease.<sup>9</sup>

The anamnesis and physical examination data are primordial for the staging of the cases and orientation of the appropriate therapeutic measures. Dengue fever is a dynamic disease and the patient may progress rapidly to a more severe stage. Adequate management of patients depends on the early recognition of warning signs, continuous monitoring and prompt replacement of water, as warning signs and worsening of the condition usually occur during the remission phase of fever.<sup>10</sup>

In 2016, 13,966 were notified and 4,378 dengue cases were confirmed in the Santa Catarina State. Considering those numbers, 4,007 (92%) were autochthonous, with transmission within the Santa Catarina State, 289 (6%) were imported (transmission from outside the State) and 82 (2%) were not determined.<sup>11</sup> The municipality of Pinhalzinho had the highest number of autochthonous cases (2,453) in the State, with an incidence rate of 13,120.5 cases per 100,000 citizens.<sup>11</sup> This high case index evidences the importance and the need to develop studies in order to understand the legacy of knowledge that professionals acquired over prevention, vector control, and patient handling.

Bearing in mind the complexity of factors involved in the prevention, control, and treatment of dengue in regions where it is endemic, this study had as objectives: a) to identify the measures used to control the dengue vector in the municipality of Pinhalzinho; b) to identify how the patients showing signs and symptoms of dengue fever are being handled; c) to describe the signs and symptoms recognized as dengue warning signs by professionals and health technicians.

## METHODS

It is a cross-sectional, observational and descriptive study that was performed with professionals and health workers from the municipality of Pinhalzinho, located in the western region of the Santa Catarina State (26°50'53 "S; 52°59'31" W), at an altitude of 515 meters. The municipality has an estimated population of 19,511 citizens.<sup>12</sup>

The study describes the measures used to control the *A. aegypti* vector in the municipality and reports the perception of Endemic Diseases Combat Agents (EDCA), Community Health Agents (CHA) and Environmental Surveillance professionals about the measures used to fight the vector in the municipality of Pinhalzinho. Through the health professionals who assisted the patients with dengue fever suspicion, this study has also identified if the warning signs for dengue and the management used during the professional practice were in agreement with those defined by the World Health Organization and the Ministry of Health.

In order to collect data concerning the measures used to fight the vector in the municipality, there were carried out interviews with Endemic Diseases Combat Agents and Community Health Agents who worked in the municipality during the epidemic and who had at least one year of activity in the area. The coordination of the Municipal Dengue Control Program was also interviewed. In order to collect the information, a semi-structured questionnaire was used with questions related to the forms of vector combat.

Aiming to know about the patients' management procedure, it was used an adapted WHO structured questionnaire, with closed questions, which was translated and validated into Portuguese by Correa et al.<sup>13</sup> The WHO instrument has 14 questions with alternatives that should be pointed out by health professionals. The document addresses the following items: characteristics of the participant; experience in dengue care; warning signs for severe dengue presented by patients and patient handling.

A quantitative data analysis was descriptively performed based on the answers' frequency. In order to so, the data was tabulated in an Excel for Windows' software database. This research was approved by the Research Ethics Committee under the Legal Opinion No. 1.663.781.

## RESULTS AND DISCUSSION

In total, 29 EDCA and CHAs have participated of this study, they were mostly women and a considerable percentage (41.3%) with more than four years of experience. **Table 1** shows the sociodemographic characteristics of these workers. All had received training on dengue symptoms and guidelines for vector control when they started working, which were intensified during the epidemic period.

**Table 1** – The sociodemographic characteristics of EDCA and CHA from the municipality of Pinhalzinho, Santa Catarina State, Brazil, 2016.

Sociodemographic data	Number of EDCA and CHA	
	Absolute (n)	Relative (%)
<b>Age</b>		
18 to 30 years old	10	34.4
31 to 40 years old	9	31.0
41 to 50 years old	7	24.1
More than 50 years old	3	10.3
<b>Gender</b>		
Male	5	17.2
Female	24	82.7
<b>Marital status</b>		
Single	8	27.5
Married	16	55.1
Common-law marriage	5	17.2
<b>Education</b>		
High school	22	75.8
College	7	24.1
<b>Time working as EDCA/CHA</b>		
From 1 to 2 years	11	37.9
From 2 years and 1 month to 3 years	3	10.3
From 3 years and 1 month to 4 years	3	10.3
More than 4 years	12	41.3

The joint activities of EDCA and CHA in the municipality have been systematic visits in all neighborhoods, streets, residences, commercial establishments, vacant lots and strategic points, in order to identify possible outbreaks of the vector and guide the population to take the necessary care around their places of residence or business. All EDCA and CHA (n=29), in their home visits, reported having found people with symptoms of dengue during the epidemic period. Most of them tell symptomatic individuals to seek medical service or a Basic Health Unit (BHU) for treatment and care. The signs and symptoms most commonly perceived by EDCA and CHA in-home visits are explained in **Table 2**.

**Table 2** – The signs and symptoms addressed by the EDCA and CHA during home visits of patients with dengue fever suspicion in the municipality of Pinhalzinho, Santa Catarina State, Brazil, 2016.

Signs and symptoms	Number of EDCA and CHA	
	Absolute (n)	Relative (%)
Fever	29	100.0
Headache	28	96.55
Muscle pain	28	96.55
Red spots on the skin	26	89.65
Nausea and vomiting	21	72.41
Diarrhea	14	48.27
Others	8	27.58

EDCA and CHA reported (n=10; 34.48%) that the majority of the population collaborates with the elimination of mosquito breeding sites, but they consider that people take better care in the locations where one of their family members has experienced the disease. On the other hand, they report (n=11; 37.93%) that although there is systematic work in guiding vector control, there is a lack of population regarding the vector control program and the severity of the disease.

Concerning the challenges faced, all the Agents

emphasize the high number of closed or inaccessible residences and also the presence of residues in the streets and vacant lots. Nonetheless, these agents (n=21; 72.41%) reiterate that they perceive improvements in care since the beginning of viral transmission in the municipality and reinforce that it is primordial the creation of stricter control and enforcement laws, as well as, greater adhesion and population participation in vector control of the vector, considering breeding sites such as water tank, swimming pool and vacant lots.

As for the contribution of the population to the control of *A. aegypti*, the agents report that, although a portion of the population collaborate to control the breeding sites, there are still situations in which some breeding sites go unnoticed, even during the epidemic. They also report that among the greatest difficulties are the intersectoral activities that should involve the other sectors of the municipality, sharing responsibilities.

According to the coordination of the Municipal Dengue Control Program (MDCP), the community participation is fundamental in controlling and combating the vector. The MDCP reiterates that it is essential to continue with the awareness campaigns, as well as the effective performance of the EDCA. The MDCP also emphasizes the need for health services to identify and report all suspected cases and to avoid mosquito breeding sites, since prevention is a facilitated task compared to the reversal of the epidemic scenario already in place.

Health professionals (n=8) reported their practices for the welcoming and handling of patients bearing dengue in the municipality. These professionals worked in the four Basic Health Units of Pinhalzinho during 2016 and assisted patients bearing symptoms of dengue (Table 3). The professionals stated that the set of signs and symptoms indicated by the Ministry of Health for the management of dengue was routinely used as indicators of severity in the patients and that they welcomed the attendance of the public health services.

**Table 3** – Sociodemographic characteristics of the health professionals from the Basic Health Units of the municipality of Pinhalzinho who participated in the study (n=8). *Pinhalzinho, Santa Catarina State, Brazil, 2016.*

Professional data	n (%)
<b>Age</b>	
25 to 35 years old	6 (75)
36 to 45 years old	2 (25)
<b>Gender</b>	
Male	3 (37.5)
Female	5 (62.5)
<b>Care level</b>	
Primary care	8 (100)
<b>Main occupation in the health service</b>	
Physician	4 (50)
Nurse	3 (25)
Nurse technician	1 (12.5)

All health professionals (n=8) stated that they had gained experience in the clinical management of dengue patients,

and during the viral circulation, each one assisted more than 50 patients with the disease suspicion. Considering those numbers, seven participants (n=7, 87.5%) worked for less than one year in the health service of the municipality, and one professional (n=1; 12.5%) for more than five years.

Regarding the signs and symptoms of the patients assisted at the BHU, professionals reported that they referred to the hospital of medium complexity, when patients showed warning signs for severe dengue (Table 4).

**Table 4** –The criteria used by the health professionals to refer patients either bearing dengue fever or dengue fever suspicion to the hospital, *Pinhalzinho (n=8), Santa Catarina State, Brazil, 2016.*

Situations to be addressed as severe dengue fever (clinical record)	n (%)
Severe abdominal pain	8 (100)
Persistent vomiting	8 (100)
Bleeding from the nose or gums	7 (87.5)
Any infant with dengue fever suspicion	5 (62.5)
No predetermined criteria based on clinical evaluation	4 (50)
Less than 100,000 platelets	2 (25)
Fever and rash	1 (12.5)

All health care providers use the World Health Organization's (or the Ministry of Health) warning signs for severe dengue to refer a patient to the hospital.

In order to prevent dengue and population control of the vector, preventive measures are fundamental, and this is due to the continuous, intersectoral and timely character of the actions.<sup>14</sup> The EDCA in Brazil, in partnership with the population, act in the mechanical and chemical control of the vector, whose actions are focused on the detection, destruction and correct destination of natural reservoirs or water artifacts that can serve as breeding sites for the *A. aegypti* mosquito.

The CHA agents also have the skills and abilities to act in the control of endemics acting in conjunction with the EDCA, as occurred in the municipality during the period of the epidemic. The Ministry of Health indicates that the CHA can, among other actions, refer the suspected cases of dengue to the BHU; At home visits, inform the residents about the symptoms and risks of dengue, the vector responsible for transmission and prevention measures; Inspecting real estate and surroundings areas to identify possible mosquito breeding sites.<sup>15</sup>

It is important to note that all EDCA and CHA received training on dengue signs and symptoms and guidelines to inform the population about how to search for health services when they find people with any symptoms of the disease. All reported having found, in their visits, symptomatic patients of the disease. There is an important relationship between the work performed by the EDCA and the CHA and the health professionals. In the socio-educational framework, the EDCA and CHA in their visits also act recognizing symptoms of Classical Dengue, such as

fever, headache, and generalized myalgia.

Among the factors that influence dengue vector survival, reproduction, distribution, and density are temperature and rainfall, which have shown a weak association with cases of the disease.<sup>16</sup> The seasonality of the incidence of outbreaks has an intimate relationship and coincidence with the season of summer due to the higher rainfall index and temperature increase during this period. Gonçalves Neto and Rebelo<sup>17</sup> confirm this information, showing that the rains exerted great influence in determining the period of occurrence of the disease. These findings may justify the expansion of the epidemic in the municipality of Pinhalzinho in 2016.

EDCAs and CHA have the role of inspecting and treating risk-generating centers in order to control epidemics, promoting education and raising awareness of the internal and external environments of households.<sup>15,18</sup> Regarding the numerous cases of dengue in the municipality, it seems there is, on the one hand, an effort on the part of the municipality, with the contracting of an EDCA compatible with the MDCP, with training of these workers and, on the other hand, a certain negligence on the part of the population, vis-à-vis the measures of control and combat to the vector. This scenario is described by EDCA, CHA and Environmental Surveillance coordination. The recognition that disease is a public problem and that population is an important part of this process, makes clear the role of education and information in preventing viral transmission.

The main difficulties encountered by EDCAs and CHA were closed or inaccessible residences and the presence of residues in the streets and vacant lots. According to these workers, after the first visit, the majority of the population showed to be more cooperative.

The incorporation of certain habits in the daily life of the population and of the public and private power, appear as initial and important measures. Eliminating potential reservoirs is essential because most breeding sites are inside the residences, in pots of plants, bottles, cans, and others.<sup>19</sup> The undue accumulation of domestic waste and dengue cases have a positive relationship, requiring a change in behavior, a fact that makes the population's collective role in combating the vector essential.<sup>20</sup>

The statements coming from the coordination of the Municipal Dengue Control Program and the Environmental Surveillance confirmed what the EDCA and CHA find in their daily visits: "there is still a lack of awareness and cooperation of the population, especially in the control of breeding sites in the home environment, then facilitating the procreation of the disease vector".

With 2,453 cases of autochthonous dengue confirmed in the first half of 2016,<sup>11</sup> health professionals in the municipality of Pinhalzinho prioritized all care for patients who sought care in health services with suspected illness. Early identification of dengue cases is of vital importance for

timely decision-making and implementation of measures aimed at blocking transmission, and early identification of warning signs and timely treatment of severe dengue are the main strategies to avoid the occurrence of deaths. The epidemiological classification of dengue cases, which is usually performed after clinical outcome, is most often retrospective and depends on clinical and laboratory information available at the end of medical follow-up. These criteria do not allow the early recognition of potentially serious forms, for which immediate treatment is crucial.<sup>21</sup>

Most dengue deaths are preventable and generally depend on the organization of the health services network and the quality of care provided. Hence, the qualification of the professionals involved in the care is paramount, which includes the instrumentalization of these for the recognition of potentially serious patients.<sup>13</sup> It is from this perspective that the professionals of this municipality have organized themselves for care during the period of the epidemic event.

The health professionals who participated in this study work in Primary Care and did an expressive number of visits in an epidemic period, which allowed them to appropriate the symptoms and forms of dengue. They used the warning signs indicated by the Ministry of Health to refer the patient to the hospital. Among the main warning signs for severe dengue, the following stand out: lethargy/agitation, major hemorrhages, persistent vomiting, severe and continuous abdominal pain, increased hematocrit and/or a rapid decrease in platelet count, hypotension and/or fainting.

The hospitalizations performed in the municipality by the health professionals who participated in this study, as well as the understanding of the need to refer for hospitalization, was when the patient suspected of being infected by the dengue virus presented some of the warning signs indicated by the Ministry of Health,<sup>10</sup> which are the following: refusal to eat food and liquids; respiratory compromise; platelets  $<20,000/\text{mm}^3$ , regardless of hemorrhage; impossibility of follow-up or return to the health unit; decompensated comorbidities such as diabetes mellitus, arterial hypertension, heart failure, use of coumarin-like compounds and acute asthmatic events.<sup>10</sup> It is important to note that fever and rash, thrombocytopenia  $<100,000$  platelets, and infants with suspected dengue fever are not warning signs of severe dengue, these have been observed with attention in clinical practice.

The health professional, besides the important role in the management of the patients, is essential in the actions to combat the vector. Following the proper management carried out by these professionals is paramount in the context of controlling an epidemic, as in the case of Pinhalzinho. Intersectoriality is another relevant factor to consider, the actions of combating the vector associated to the work of health professionals, together with other areas of action of the municipality, contribute to better control

effectiveness of the disease.

## CONCLUSIONS

This study was able to demonstrate that it is necessary to continue improving the organization of the health service response to the disease. Health services, especially Environmental, Epidemiological and Sanitary Surveillances, must be alert to the trends of this disease in order to quickly detect changes in its profile and guide control actions.

Moreover, the Intersectoriality between surveillance and other public sectors, such as education, sanitation, public cleaning, culture, the press, among others, must build and implement the municipal dengue control plan. Larger investments in methodologies adapted to the local reality are essential to prepare the population about the importance of behavioral changes towards the vector control, and in regards to the environmental management, also to include the broadening of focused actions towards the integrated management of vectors.

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