Original Article

Environmental issues associated with dengue occurrence in a town of Mato Grosso state

Aspectos Socioambientais associados à ocorrência de Dengue em um Município do estado do Mato Grosso

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RESUMO

Justificativa e Objetivos: a dengue apresenta-se como um dos problemas mais significativos do mundo em relação à saúde pública. Sua expansão geodemográfica entre as unidades federadas do Brasil preocupam as autoridades sanitárias e profissionais de saúde. O Brasil é um país de clima tropical, com variações pluviométricas heterogêneas de acordo com cada região, o que pode influenciar direto a prevalência deste agravo em âmbito sistêmico. Considerando o exposto, o objetivo do presente estudo foi analisar a relação dos aspectos socioambientais com os casos de dengue no município de Primavera do Leste/MT entre os anos de 2010 a 2012. **Métodos:** pesquisa quantitativa, de característica descritiva e transversal, realizada a partir de dados secundários obtidos através de Sistemas de Informação de Agravos Notificáveis, Sistema de Informação de Febre Amarela e do Instituto Mato-Grossense do Algodão. **Resultados:** o acúmulo e lixo ao redor dos domicílios foi um ponto relevante detectado no estudo, assim como o predomínio de depósitos artificiais passíveis de remoção/proteção no peri-domicílio que apontou ter valor no índice de infestação do vetor, o que leva a indicar maior influência das condicionantes sociais, que pode estar associado com aspectos de hábitos culturais da população. **Conclusão:** não foi possível associar o aumento ou a redução dos números de casos com os fatores climáticos, já que praticamente não ocorreu variação de temperatura e pluviosidade. O estudo mostrou ser relevante levar em consideração os aspectos culturais da população de cada região, já que as formas de controle da dengue estão intrinsecamente ligadas às variáveis socioambientais.

DESCRITORES: Dengue. Vigilância Epidemiológica. Prevenção Primária.

ABSTRACT
Background and Objectives: Dengue has shown to be one of the most significant public health problems worldwide. Its worldwide expansion among the Brazilian federal units is a matter of concern for health authorities and health professionals. Brazil is a country with a tropical climate, with heterogeneous rainfall that varies according to each region, which can directly influence the prevalence of this disease at a systemic level. Considering the above, the aim of this study was to analyze the association of social and environmental aspects with dengue cases in the city of Primavera do Leste / MT between the years 2010 and 2012. **Methods:** A quantitative, descriptive, and cross-sectional study was carried out, based on secondary data obtained from the Notifiable Diseases Information System, Yellow Fever Information System, and Instituto Mato-Grossense do Algodão. **Results:** the accumulation of trash around the households was an important point detected by the study, as well as the predominance of artificial storage areas subject to removal/protection in peri-domicile area, which showed to be significant for vector infestation rate, indicating greater influence of social status, which may be associated with aspects of the population's cultural habits. **Conclusion:** It was not possible to associate the increase or decrease in the number of dengue cases with climatic factors, as there was virtually no variation in temperature and rainfall. The study showed to be relevant by considering the cultural aspects of the population of each region, as dengue control procedures are intrinsically associated with environmental variables.
KEYWORDS*:* Dengue. Epidemiological Surveillance. Primary prevention.

INTRODUCTION

Currently, dengue is the most important zoonosis that affects humans, constituting a serious public health problem, especially in tropical countries such as Brazil, where environmental conditions favor the development and proliferation of the main vector of the disease, the *Aedes aegypti* mosquito.[1]

Dengue is a major public health concern in the tropical and subtropical regions of the world. The World Health Organization (WHO) estimates that 50-100,000,000 dengue infection cases occur each year and that almost half of the world's population lives in countries where dengue is endemic. Dengue is a global concern, with a steady increase in the number of countries where it can found. Currently, approximately 75% of the world's population exposed to dengue is in the Asia-Pacific region.[2]

Dengue virus infection causes a broad spectrum of clinical disease, ranging from oligosymptomatic forms to severe conditions, of which some can progress to death. In the classical presentation, the first manifestation is fever, usually with high temperatures (39ºC to 40ºC), abrupt onset, associated with headache, adynamia, myalgia, arthralgia, and retroorbital pain. The classic exanthema, present in 50% of the cases, is predominantly of the maculopapular, additive type, affecting the face, trunk, and limbs, and not sparing foot soles and hand palms, but also can present as other forms with or without pruritus, frequently when the fever disappears.[3]

Social and environmental conditions such as precarious sanitation, uncontrolled urbanization, exacerbated trash production, garbage accumulation in the peri-domicile area, large population displacement, uninterested population, tropical climate, intense rainfall, and high temperatures can contribute to the prevalence of dengue in the national territory. [4]

Considering the prevalence of this disease in the national scenario and its implications for the health system and society, the present study undertakes a relevant epidemiological character, as its aim was to analyze the socioenvironmental aspects associated to the occurrence of dengue in the municipality of Primavera do Leste between the years 2010 and 2012. It is important to emphasize that the information obtained in this study can be used as subsidy for the health area managers, technical teams and professionals regarding the behavior of dengue at the local level.

METHODS

This research was carried out in the municipality of Primavera do Leste, MT, located in the southeast region of the state of Mato Grosso, Brazil, 230 km from the capital city of Cuiabá, with an estimated population of 52,066 inhabitants.[5]

An epidemiological, quantitative, descriptive, and cross-sectional study was performed based on secondary data from the Notifiable Diseases Information System (SINAN). The climatic conditions of rainfall, mean temperature, vector infestation index, and types of storage/breeding sites were evaluated to establish possible associations with the number of dengue cases between the years 2010 and 2012.

The vector infestation indexes, predominant trash sites and climatic data were obtained respectively from the Yellow Fever and Dengue Information System (SISFAD) and Instituto Mato-Grossense do Algodão (IMAMT). The rainfall and temperature data, obtained from Instituto Mato-Grossense do Algodão (IMAMT), were statistically processed through an annual average, whereas visualizations and analysis were performed through charts.

Regarding the vector breeding sites, these are classified in groups of five, allowing us to obtain information on the epidemiological importance and the extension of vector control actions. Group A is related to the method of water storage for the population, such as cisterns, water collection systems, water tanks and barrels. Group B is related to mobile storage sites, such as dishes, bottles, water catchment system, construction storage sites and drinking fountains in general.

Group C refers to fixed storage sites, such as tire shops, water reservoirs under

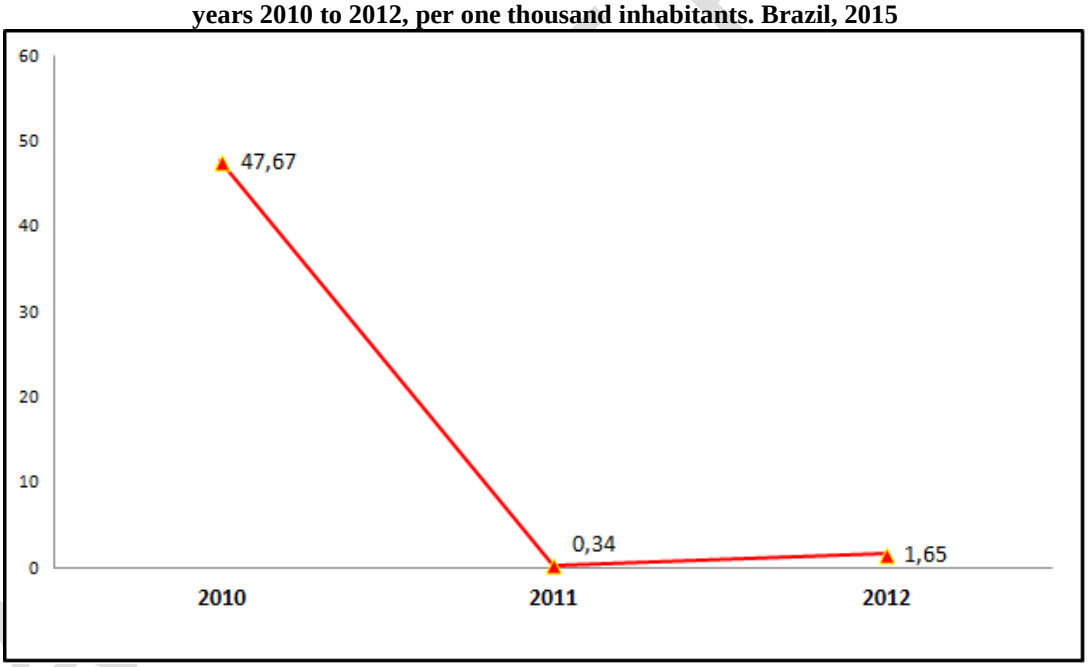
construction, gutters, concrete slabs, glass shards on walls, disused toilet bowls, and untreated pools. Group D are those that can be removed, such as old tires, yard scrap (railroads, harbors), plastic containers, bottles, cans, debris, and scrap. Group E are the natural ones, such as animal remains (carcasses), leaf axils, orifices in trees and rocks. [6]

The collected information was tabulated using the Excel® software, version 2007. Because it is a study with secondary data and with no impact on third parties, it was not necessary to send it to the Ethics Committee for approval.

RESULTS

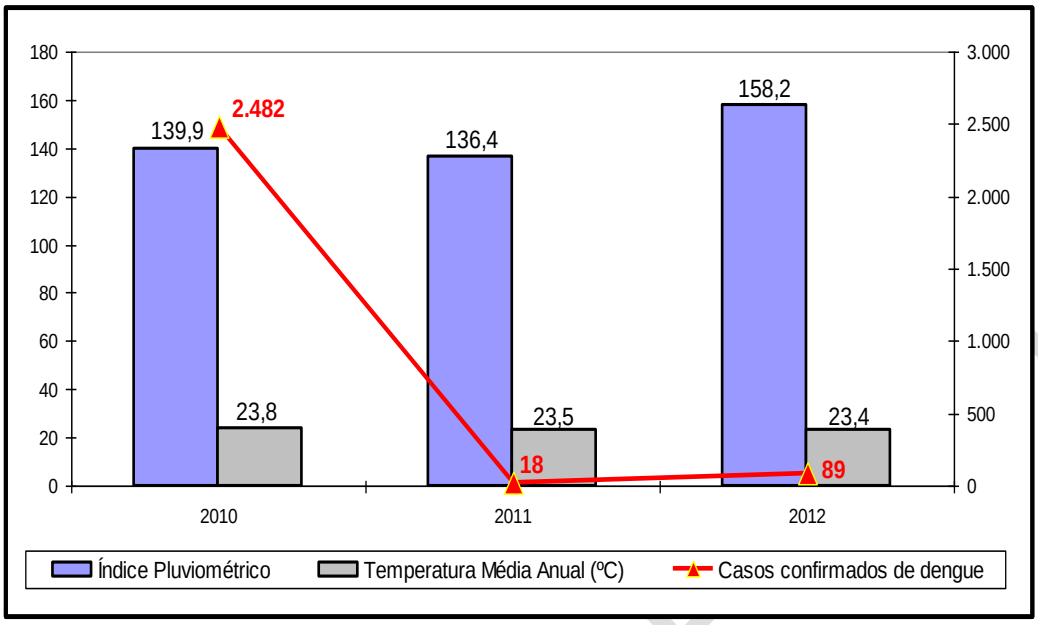
Between 2010 and 2012, 2.589 cases of dengue fever were reported in the municipality of Primavera do Leste, with an incidence rate of 47.67/1.000 inhabitants in 2010 (Figure 1).

Figure 1 - Incidence rate of dengue fever in the municipality of Primavera do Leste – MT, between the years 2010 to 2012, per one thousand inhabitants. Brazil, 2015



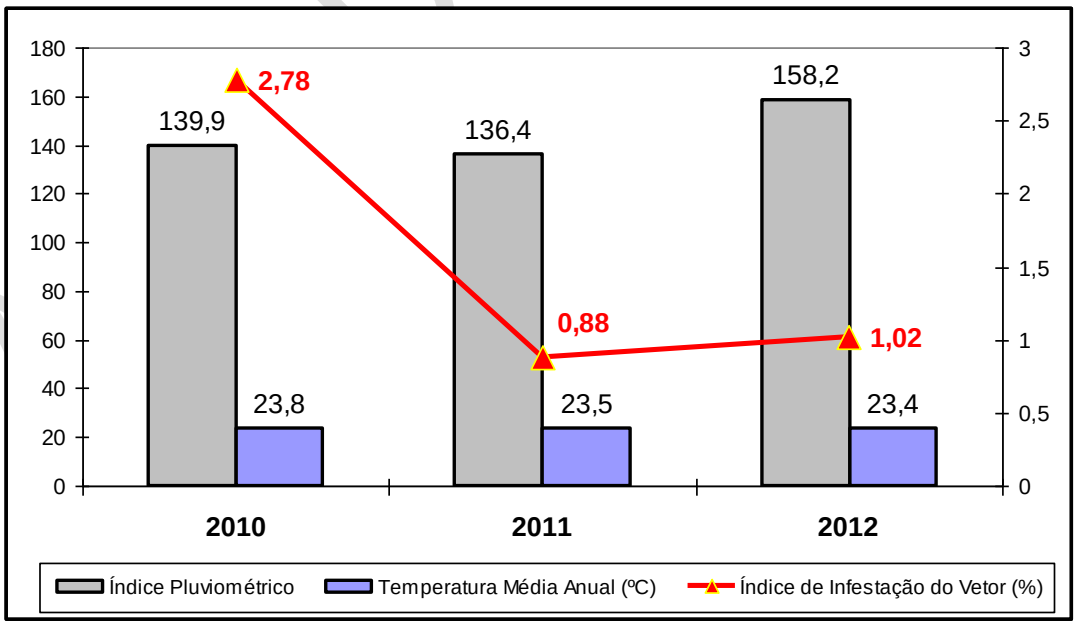
Regarding the occurrence of dengue cases in relation to climatic variations, it was possible to observe that the mean annual temperature variation in the studied periods was around 23ºC to 24ºC, being slightly higher in 2010 (23.8ºC). The rainfall variable did not show a significant difference, ranging from 136.4mm to 158.2mm. Temperature and rainfall showed no significance to be considered as conditioning factors in relation to the number of dengue cases (Figure 2).

Figure 2 – Description of the number of dengue cases according to the rainfall index and annual mean temperatures, between the years 2010 and 2012, in Primavera do Leste - MT. Brazil, 2015.



Regarding the Vector Infestation Index, the year 2010 showed data that were above the epidemiological standards recommended by the Ministry of Health (2.78%), showing a reduction (0.88%) in the year 2011 (Figure 3).

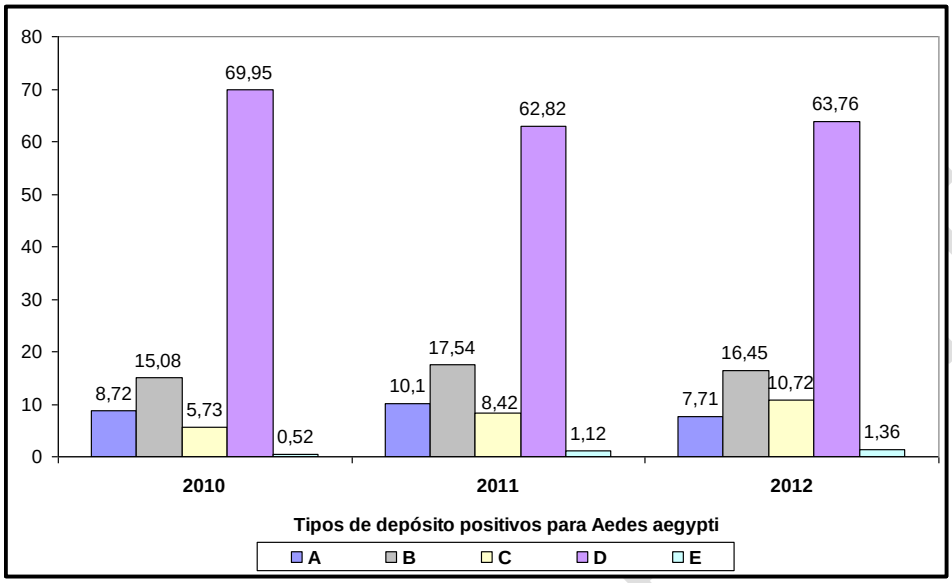
Figure 3 – Vector infestation index between the years 2010 and 2012, in relation to the rainfall index and mean annual temperature, Primavera do Leste/MT, Brazil, 2015.



This study showed that the breeding places classified as Group D, which are

disposable containers such as plastic containers, cans, junk, metal scrap, as well as such as old tires, were the most common.

Figure 4 – List of storage sites positive for the presence of *Aedes aegypti* in the municipality of Primavera do Leste/MT, between the years of 2010 and 2012. Brazil, 2015.



DISCUSSION

A study was developed in the city of Belo Horizonte on the dengue distribution pattern, which verified that between 2001 and 2010, monthly dengue incidence rates showed a statistical significance in relation to precipitation (r = 0.36, P = 0.00006) and the minimum monthly temperature (r = 0.29, P = 0.001). It was also observed that the outbreaks of dengue occurred during the months of January to May, a period of greater precipitation and humidity.[7]

The current situation of dengue in Brazil is a matter of concern and reflects a complex context, which comprises actions by the public authority and society in general, and it is necessary to consider the population's contribution as being effective and permanent, due to the complexity of the vector biology and its ability to adapt to the environment.[8]

The climatic variables of rainfall and temperature are conditioning factors for case variation and influence the dynamics of vector diseases. For dengue and other vector diseases, the climate is rarely the main determinant of its prevalence or distribution.[9]

Studies have associated the vector index and the broad existence of containers in open areas as determinant factors for the increase of the mosquito population. Similarly, when the indices are lower, the chances of it being associated to better population adherence regarding the non-accumulation of containers in properties are higher, contributing to the reduction in the vector infestation index.[10]

Studies on the epidemiological behavior of dengue in the state of Tocantins did not find a significant correlation between the mean rainfall and the incidence coefficient, nor there was a significant correlation between the temperature and the incidence coefficient in both rainy and dry seasons. However, the incidence of the disease was higher in the rainy season.[6]

A study carried out in the municipality of Santa Bárbara do Oeste, state of São Paulo, showed that in 2010 the circulation of two disease serotypes, DEN-1 and DEN-2, were detected. This fact culminated in the largest dengue epidemic in the city, totaling 1,172 cases, of which 1,133 were indigenous and 39 were imported, with an incidence of 6,506 cases per 1,000 inhabitants. [11]

The best way to control the increase in dengue cases is by eliminating the mosquito breeding sites through campaigns to eradicate breeding sites and to raise the population awareness in affected and at-risk areas, as there is no vaccine or specific drug against the disease to date. [12]

A study carried out on geospatial vulnerability based on thermopluviometric variables in the municipality of João Pessoa, state of Paraíba, Brazil, between the years 2007 and 2011 showed that the positive influence of high temperatures on the vector life was not demonstrated due to the high infestation to *Aedes aegypti*, with monthly averages in the city.[13] Studies carried out in the municipality of São José do Rio Preto showed that rainfall and temperature were not significant, a fact that did not allow the authors to affirm that the vector infestation index was associated with climatic conditions, but to the number of storage sites distributed in peridomiciliary area.[4]

The municipality of Coari, state of Amazonas, Brazil, showed that the most affected inhabitants were those living in neighborhoods located near streams, lakes and those undergoing the process of recent and disorderly housing.[12] Analysis of dengue occurrence and meteorological variations in Brazil showed that meteorological factors such as temperature, relative air humidity and rainfall mentioned in several studies influenced the vector dynamics, as well as the peaks of dengue epidemics in Brazil, regardless of the climatic compartment. The occurrence of the disease is associated with the increase in rainfall indexes and temperature variations, especially in the first semester of each year.[14]

Data obtained from studies show that of variables related to the social aspect, 97.7% of the municipalities have access to the trash collection service. However, the accumulation of garbage around the households, with the presence of exposed artificial containers favors the

cultural habit of the population, who became accustomed to hoard these types of materials, even though trash is regularly collected. [5]

It should be emphasized that the vector has specific characteristics, among which is the preference for indoor and peridomiciliary environments, where it finds food and the possibility of artificial breeding places, especially those located in open areas. In a study carried out in the state of São Paulo, it was demonstrated that 90% of the recipients containing vector foci were artificial containers found in the peridomiciliary area. [15] Similarly, it is verified that the investigations carried out in Primavera do Leste also showed similar results, with a predominance of the same containers. [10]

Knowledge of the geographic distribution of dengue is essential to understand its contribution to global morbidity and mortality burdens, to determine the resources available for dengue control and to evaluate the impact of these activities at the international level. Moreover, unapparent infection estimates and distributions are a fundamental requirement for assessing clinical surveillance, demands, and future strategies. [14]

Currently, there is no alternative to vector control aiming to reduce or prevent dengue virus transmission. Most endemic countries have a component of dengue vector control and prevention programs, but their accomplishment by public health professionals is often inadequate, ineffective, or both.[17]

Studies have shown that the likelihood of having severe dengue fever was 5.2 times higher in families that had at least three large capacity reservoirs that were uncovered or inadequately sealed (water tanks, water wells, barrels, cement tanks, cisterns, and swimming pools), which are considered potential breeding sites with higher productivity for the winged *Aedes aegypti* forms ($p = 0.01$).[18]

Co-responsibility for vector control actions, social mobilization, use of technological tools to monitor transmission risk areas and the training of professionals involved in patient care are fundamental strategies aimed at minimizing the risks of epidemics and of life-threatening disease dissemination that affects the population, regarding dengue infections.[11]

The incorporation of dengue control activities should be an option considered by the administrators, so that it can directly contribute to the integration of programs, strengthening the integrality of primary health actions, the fundamental principle of public health care.[19]

This study allowed us to observe that dengue continues to be a matter of concern for health authorities in the national scenario. It is a disease with annual seasonal variations that can directly compromise the population's quality of life and health. It is understood that new

studies will be performed in the area, aiming at improving the monitoring process of the disease in Brazil.

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