ARTIGO ORIGINAL

PANORAMA OF CHIKUNGUNYA'S INCIDENCE BETWEEN 2014 AND 2017: A COMPARATIVE BETWEEN TOCANTINS AND BRAZIL

PANORAMA DA INCIDÊNCIA DE CHIKUNGUNYA ENTRE 2014 E 2017: UM COMPARATIVO ENTRE TOCANTINS E BRASIL

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ABSTRACT

Introduction: Chikungunya is an RNA virus of the genus Alphavirus, transmitted by Aedes ssp. Since 2005, few serious clinical cases and deaths had been associated with virus infection. Severe conditions became known after viral circulation in extensive epidemics. In Brazil, autochthonous transmission was detected only from 2014, whereas in Tocantins only from 2015. This study aims to evaluate and compare the incidence rates (IR) of Chikungunya from 2014 to 2017 of Tocantins and Brazil. Material and methods: this is a transversal, retrospective and descriptive evaluation, based on data provided by the Ministry of Health via the National System of Notifiable Diseases. IR were analyzed from 2014 to 2017 of Tocantins and Brazil. Results: Chikungunya's IR in Tocantins went from 0 in 2014 to 209.9 in 2017, with an increasing trend in the last three years. In Brazil, IR went from 0.03 in 2014 to 127 in 2016 and fell to 85.8 in 2017. Comparing IR from Tocantins and Brazil in 2017, the state's IR exceeded national by 244,63%. Discussion: The inclusion of Chikungunya among the differential diagnoses of arboviruses makes the national surveillance system to be subjected to difficulties inherent in epidemics. Underreporting and divergence in diagnostic criteria equally subject the number of possible cases. However, the fact that the growing IR in Tocantins does not follow the national reduction trend in the year 2017 may indicate other influential factors. Environmental conditions, coinfection, availability of agile diagnostic tests in health services and efficacy of preventive measures could justify such dissonance. Conclusion: The current situation of Chikungunya requires a more accurate follow-up, and the identification of the divergence in IR between Tocantins and Brazil can serve as a subsidy for new studies.

Keywords: Arbovirus Infections; Chikungunya virus; Epidemiology; Health Incidence; Information Systems.

RESUMO

Introdução: O Chikungunya vírus é um RNA vírus do gênero Alphavirus, transmitido por vetores Aedes ssp. A partir de 2005, poucos casos clínicos graves e óbitos haviam sido associados a infecção pelo vírus. Quadros graves tornaram-se conhecidos após circulação viral em extensas epidemias. No Brasil, detectou-se transmissão autóctone apenas em 2014 e no Tocantins a partir de 2015. Este trabalho objetiva avaliar e comparar as taxas de incidência (TI) da Chikungunya de 2014 a 2017 do Tocantins e do Brasil. Material e métodos: trata-se de uma avaliação transversal, retrospectiva e descritiva, baseada nos dados fornecidos pelo Ministério da Saúde via Sistema Nacional de Agravos Notificáveis. Foram analisadas as TI de 2014 a 2017 do Tocantins e do Brasil. Resultados: A TI da Chikungunya no Tocantins partiu de 0 em 2014 para 209,9 em 2017, com tendência nos últimos três anos sempre crescente. Já no Brasil, a TI saiu de 0,03 em 2014, atingindo a máxima de 127 em 2016 e queda para 85,8 em 2017. Comparando as TI do Tocantins e Brasil, em 2017, a do estado superou a nacional em 244,63%. Discussão: A inclusão da Chikungunya entre os diagnósticos diferenciais de arboviroses faz com que o sistema de vigilância nacional seja então submetido a dificuldades inerentes às epidemias. A subnotificação e a divergência nos critérios diagnósticos sujeitam por igual os números de casos possíveis. Todavia, o fato da TI crescente no Tocantins não acompanhar a tendência nacional de redução no ano de 2017 pode indicar outros fatores influentes. Condições ambientais, coinfecção, disponibilidade de exames diagnósticos ágeis nos serviços de saúde e eficácia das medidas preventivas poderiam justificar tal dissonância. Conclusão: A situação atual da Chikungunya requer um seguimento mais apurado, e a identificação da divergência na TI entre Tocantins e Brasil pode servir de subsídio para novos estudos.

Palavras-chave: Epidemiologia; Incidência; Infecções por Arbovírus; Sistemas de Informação em Saúde; Vírus Chikungunya.

ACESSO LIVRE

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INTRODUCTION

Chikungunya (CHIKV) is an RNA virus of the *Togaviridae* family of the genus *Alphavirus*, first described in 1950 in the region that today corresponds to Tanzania, during an outbreak originally attributed to the Dengue virus[1]. The name Chikungunya means "one who bows" in the Makonde language, spoken in various parts of East Africa, the reason for the antalgic position that patients acquired during the disease period[2].

After the first reports, two distinct transmission patterns were described: one wild and periurban in Africa (*Aedes ssp*) and another urban in Asia (*A. aegypti*)[1]. Besides, three different genotypes were reported circulating in regions of the planet: the ECSA genotype, initially found in Central / South / East Africa; the WA, in West Africa; and Asia[3]. Until then, few serious clinical cases and no deaths had been associated with CHIKV infections[1].

Since 2005, small mutations in the E1 protein of the viral envelope in the ECSA variant allowed better adaptation of the agent to another cosmopolitan vector (*Aedes albopictus*)[4]. This fact contributed to a great dissemination of the disease to the Indian Ocean and later to Asia and Europe. Also in 2005, CHIKV arrived in the Reunion Islands after an outbreak in Kenya[5]. In this epidemic, which reached about 40% of the population, many serious cases were documented and laboratory confirmed with lethality estimated in 1/1,000 cases[6].

Chikungunya is characterized by fever associated with intense and debilitating joint pain, headache, myalgia, and by polyarthritis and symmetric polyarthralgia (mainly of them in wrists, ankles and elbows). This clinical condition, in general, improves after 10 days, however, the joint involvement can last for months, thus distinguishing itself from Dengue[7]. The proportion of chronic cases varied in different epidemics in France, South Africa and the islands of the Indian Ocean, from 4 to 63%[6].

Although severe conditions are uncommon and there are no major hemorrhagic shocks such as Dengue, there are some life threatening situations specially for infants and elderly, such as neurological manifestations (encephalitis, meningoencephalitis, myelitis, Guillain-Barré syndrome), cutaneous bullous and myocarditis[5].

Chikungunya presents characteristics that amplify the spread of the disease and increase the possibility of large and explosive epidemics[8]. Among these characteristics are the large proportion of symptomatic cases (> 90%), short incubation period in humans (from two to seven days) and viremia period of two days before and ten days after fever[7]. Viral replication in *Aedes albopictus* mosquito, in addition to *A. aegypti*, increases geographical extension of regions with viral circulation potential[8].

In Brazil, autochthonous transmission of Chikungunya fever occurred initially in 2014, when 3,657 suspected cases were reported in eight cities in different states of the North, Northeast and Central West regions[9,10]. Once the sustained transmission of CHIKV in a certain area has been established with laboratory confirmation of the first cases, Ministry of Health of Brazil recommends that further cases should be confirmed by clinical-epidemiological criteria[10].

The diseases of the dengue-like syndrome are a great challenge due to the non-specificity of the prodromal period and the difficulty of obtaining the serological diagnosis, facts that demand a greater technical capacity of the professional to recognize early clinical criteria that approach the definitive diagnosis. In this sense, the occurrence of simultaneous epidemics makes difficult the correct diagnosis and clinical management due to the peculiarities of Dengue fever and Chikungunya fever[11].

Concerning Tocantins, which is a young and large geographic state, insertion of a new agent constitutes a new obstacle to the local health system, considering that the state has few qualified medical centers to face crisis situation and epidemic emergency. It is responsibility of the scientific community, associated with health services, to monitor the epidemiological situation, transmission patterns in Brazil, impact of the disease and mainly to contribute with the proposal of measures to face this large emerging challenge.

As a result, the objective of this study was to analyze the incidence coefficients of CHIKV infection in Tocantins and in Brazil, taking the temporal cut between 2014 and 2017, and comparing them year by year, associating related factors.

MATERIALS AND METHODS

This study was developed in a cross-sectional, retrospective and descriptive manner, based on data from the Brazilian Ministry of Health, included in the National System of Notifiable Injuries and was published through epidemiological bulletins. The incidence data of Chikungunya fever from 2014 to 2017 of Tocantins and Brazil were analyzed, considering up to the 36th epidemiological week (EW) in 2014 and 2015, and up to the 37th EW in 2016 and 2017, with a view to the uniformity and opportuneness of comparisons.

For this study, only the probable cases of Chikungunya were considered, which are all reported cases, excluding those discarded by negative laboratory diagnosis, with timely collection, or diagnosed for other diseases.

The analysis was done by calculating the incidence coefficient, based on the absolute number of cases and the official population (which was made available by the Brazilian Institute of Geography and Statistics) for the federation unit in question, Tocantins, and for the nation. Tocantins is the newest state of the Brazilian republic, having been created by the Federal Constitution of 1988, for that reason, its reality is very particular in relation to the other states of the country.

Once the analyzes were made, the findings were discussed, confronting them with the literature and making inferences that allowed to fill in the gaps that were found, thus pointing to the considerations that were made at the end of this study.

Since it did not involve human beings directly, this study was not forced to pass through the evaluation of a Research Ethics Committee. However, the ethical dictates have been respected, which apply to the situation, within the limits of the Helsinki Declaration.

RESULTS

In 2014, 54 probable cases of Chikungunya were registered in 15 Brazilian states, rising to 23,431 probable

cases in 2015, distributed in all 26 states of the country. In 2016, there were 264,110 probable cases; and 176,901 in 2017 (Table 1). In Tocantins, in 2014 there were no registered cases. In 2015 there were 15 probable cases, rising to 1,230 probable cases in 2016 and 3,218 in 2017 (Table 2).

Table 1: Probable cases and Incidence Rate of Chikungunya in Brazil, from 2014 to 2017.

Year	Probable cases in Brazil	Incidence Rate in Brazil (/100.000 hab)
2014	54	0,03
2015	23.431	11,5
2016	264.110	128,2
2017	176.901	85,8

Table 2: Probable cases and Incidence Rate of Chikungunya in Tocantins, from 2014 to 2017

Year	Probable cases	Incidence Rate in Tocantins (/100.000 hab)
2014	0	0
2015	15	1
2016	1230	80,2
2017	3218	209,9

Regarding the incidence rates, the Tocantins went from 0 in 2014 to 209.9/100,000 inhabitants in 2017, with increasing trend in the three years. In Brazil, the incidence rate went from 0.03/100,000 inhabitants in 2014, reaching a maximum of 128.2/100,000 inhabitants in 2016 and falling to 85.8/100,000 inhabitants in 2017 (Figure 1). Comparing the incidence rates of Tocantins in relation to Brazil, in the last record of 2017, the state surpassed the national by 244.63%.

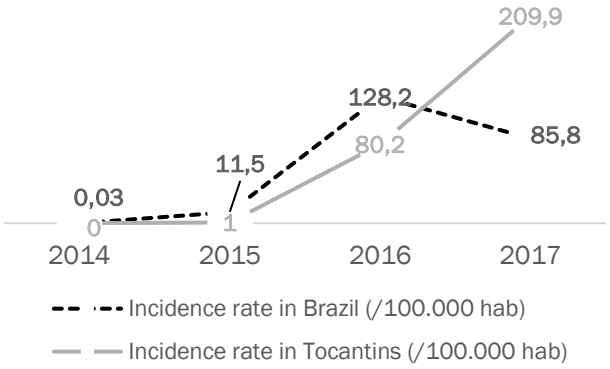

Figure 1: Comparison between incidence rates of Tocantins and Brazil from 2014 to 2017.

DISCUSSION

The inclusion of Chikungunya among the differential clinical diagnoses of the dengue-like syndrome implies an intense dissemination of the disease among health teams throughout Brazil[11]. In addition, co-circulation of Dengue, Chikungunya and Zika infection in Brazil makes clinical management difficult due to similarities, has implications concerning transmission in elderly, pregnant women and children, and has a limited laboratory back-up, although its impact is not well known[9].

The introduction of any arbovirus in an indene area or in areas with the presence of the vector should never be neglected[9], a fact that was confirmed by the rapid expansion of the cases throughout the national territory since the insertion of CHIKV in the country in 2014.

In doing so, the expansion of the areas of CHIKV infection and other arboviruses in Brazil is associated with urbanization, without the proper sanitation infrastructure, which is a mark of the developing economies, and with the economic globalization[12]. These factors contribute not only to the active dispersal of the mosquito, but also to dissemination of the serotypes previously circumscribed to certain geographic areas, a fact corroborated by the intense migratory flow[13]. This reflection of the contemporary and globalized world has increasingly brought CHIKV to areas previously indenes or even importing serotypes previously present only in other regions[13].

Literature also mentions that the incidence fluctuates within the months of the year according to climatic factors, so-called seasonal increase of rates. It is associated to the temperature increase, rainfall and humidity of the air: conditions that favor the increase in the number of available breeding places, the survival of the vector and its density, which is, as far as we know, the greatest determinant for the growth of the coefficients of incidence around the world, especially in the humid tropics[14,15].

The spread of the disease throughout Latin America was enough to establish an emergency situation by the World Health Organization (WHO) two years after the onset of the outbreak on the global stage. At this juncture, Brazil stands out as the country with the highest number of cases registered up to 2016 comparing it to Latin American countries[9,16].

However, countries such as Bolivia, Honduras, and Aruba surpassed Brazil in terms of incidence of the disease, besides Colombia having excelled in presenting the highest rate of lethality[16]. Interestingly, until then the Ministry of Health of Colombia did not accept CHIKV and ZIKV as causes of death, although published studies by Colombian researchers confirmed deaths due to ZIKV[17,18].

Still on the global stage, Caribbean countries, where the outbreak of CHIKV infection in the Americas started in the beginning of the year 2017, were characterized by high incidence rates for the disease, especially Aruba, which in epidemiological week 1 presented a rate of incidence of 821.93/100,000 inhabitants[16].

The perplexity regarding the dissemination of the ZIKV and the CHIKV and its impact in Brazil culminated in the establishment of an emergency situation in public health by the Brazilian Ministry of Health[9]. The significant decline in the number of probable cases verified in 2017 in Brazil could be attributed to the consequent resources movement and articulations between states and cities. The execution of the arbovirus control policy is carried out with treasury resources of each state and through intergovernmental transfers of resources[19].

Mosquitos of the genus *Aedes spp* are the main vectors of Dengue, Zika and Chikungunya, which means that the strategies of prevention of these diseases and vector control will impact on the three arboviruses, optimizing

resources and efforts[20,21]. Therefore, it would be possible to suppose that the diligences adopted as a response of the Brazilian government to the increased prevalence of microcephaly caused by ZIKV had repercussions on the national reduction in the incidence of Chikungunya observed by the study. However, for some authors, the actions developed in the cities have not been shown to be effective in reducing *Aedes* infestation in most of the country[20].

It is known that there may be some restrictions related to the quality of the information available to carry out risk mapping for arboviruses[20]. Although the dengue surveillance system in Brazil was shown to be consistent and opportune for case reporting, difficulties for the differential diagnosis of dengue-like syndromes were imposed after the introduction of the new viruses, which may interfere the quality of the information provided by the Ministry of Health[20]. In the absence of the serological diagnosis, which is the definitive one, the professional's diagnostic impression, based on well-defined clinical criteria and correctly validated by the medical literature, is essential for correct notification of the complaint, thus producing reliable indicators, subsidizing observation to the point of guiding public policies[22].

Underreporting and divergence in available clinical and laboratorial diagnostic criteria on a large scale subject the numbers of probable cases to equivocation. The fact that the growing incidence rate in Tocantins does not follow the national reduction trend in the year 2017 may indicate other influential factors.

Environmental conditions influence as the tropical climate with two well-defined seasons - a drought and a rainy season -, associated with the population growth of Brazil's newest state, favor the formation of artificial oviposition sites, such as disposal materials that can serve as reservoir for standing water[23]. However, this factor alone is not enough to explain the dissonance of the results between Tocantins and Brazil.

Concerning the change in the incidence in Tocantins due to the cocirculation of arboviruses that compete for the same vector in the state, such as Chikungunya, Zika and Dengue, there are no studies that show the relation of this cocirculation with the increased incidence of the disease. The risk, in this case, is associated with a co-infection that can be serious, as described in cases in the state of Pernambuco[24].

Ineffectiveness of preventive measures in the state is a condition to be considered. There is a need for weekly efforts to clean the water reservoirs, also associated with measures of individual protection against stings in the early morning and late afternoon (habit not very verified in the population behavior), since the vector makes the eggs deposition in any proximity to the reservoir, having an extremely fast life cycle[25].

In this perspective, the recent observation of the epidemiological phenomenon and the lack of analyzes aimed at elucidating the dissonance between the incidence rates considered in the present study preclude the realization of more precise inferences[9].

Finally, efforts to develop agile and sensitive diagnostic tests, specific immunobiological and antiviral drugs are essential9. Laboratory tests that allow early diagnosis, even in the prodromal period, are of great value with a view to secondary prevention. As a result, it would minimize the risks of complications and contribute to a reduction of the morbid process, sparing both human and monetary resources for Brazil's already desolated health care system. On the other hand, the launch of drugs that are effective in eradicating the infection once it is installed is a great search niche, since such active principles would play a decisive role in the natural history of the disease, treating infection and preventing complications, not only adopting palliative efforts during the period of CHIKV infection.

CONCLUSION

Chikungunya's importance runs through many aspects, from the epidemic issue to the evidence of severe illness. Besides the arthralgia followed by fever, nausea and vomiting, many patients also develop subacute forms of the disease, with prolonged symptomatology for several weeks, and others, the chronic form, with arthritis and severe arthritis, which arise and cause pain and limitations in the patients for many years[11].

Regarding management, coping with emerging arboviruses requires broad-spectrum policies and interventions, involving various society's sectors, not only health[9]. This way, epidemiological research should be part of national public health surveillance routines and concerns to predict new emergencies[9]. Joint actions in research and the fight against vectors can impact on the spread of emerging viruses[9].

The combination of more efficient vector control, which impacts the transmission force of the disease, and the vaccination of large population groups, which reduces the proportion of susceptible individuals, seems to be a promising strategy. However, realistically, the lack of an effective and cost-effective vaccine against CHIKV and the unavailability of specific treatment and immunobiological still affirm the role of the fight against *Aedes aegypti* as a central strategy for the containment of arboviruses. Nevertheless, vector control will only succeed if it can incorporate new technologies and tools that can, jointly with those already in force, achieve more satisfactory results, which are proven to reduce disease burden and not only improve entomological indicators.

Chikungunya's current situation requires more accurate follow-up. The Tocantins conditions that allowed the virus to spread must be intervened in order to interrupt its rapid spread and the consequent disease morbidity. Thus, the identification of divergence in the incidence rates of 2017 between Tocantins and Brazil may serve as a subsidy for new studies that follow, perhaps for a longer time, the panorama of the disease.

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