

## Communication

### Seroprevalence analysis by rapid test and ELISA of Zika virus infection in a prison from Mato Grosso State

*Análise da soroprevalência por teste rápido e ELISA de infecção por zika vírus em unidade prisional de Mato Grosso*

*Análisis de seroprevalencia por teste rápida y ELISA de infección por el virus del Zika en una unidad penitenciaria en Mato Grosso*

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#### RESUMO

A emergência do Zika vírus no Brasil entre os anos de 2015 e 2016, com graves morbidades relacionadas, suscitou a necessidade da disponibilidade de teste diagnóstico de qualidade. Neste contexto, buscou-se analisar a soroprevalência da infecção por Zika em uma unidade prisional feminina do estado de Mato Grosso através do teste rápido (Bahiafarma) e do Ensaio Imunossorvente por Ligação Enzimática de Captura de Anticorpos para Zika. Trata-se de um estudo transversal, com abordagem quantitativa, pautado em dados coletados em 2018, em que se coletou sangue periférico e procedeu-se análise com duas estratégias diagnósticas: o teste rápido e o Ensaio Imunossorvente por Ligação Enzimática de Captura de Anticorpos para Zika. Em ambos os testes detectou-se sororreatividade para Zika, com excelentes concordâncias, ou seja, foi calculado o coeficiente Kappa e foram obtidos os valores de 1 para IgM e 0,86 para IgG. Além dos achados laboratoriais, foram relatados fatores de risco para a infecção, decorrentes das características intrínsecas ao ambiente prisional e do modo de vida das participantes. A descrição da soroprevalência dessa arbovirose será importante para direcionar as ações de prevenção e controle a serem implementadas pela vigilância epidemiológica.

**Descritores:** Epidemiologia. Infecção por Zika vírus. Prisões.

## ABSTRACT

The emergence of Zika virus in Brazil between 2015 and 2016, with serious related morbidities, raised the need for the availability of good quality diagnostic tests. In this context, we sought to analyze the seroprevalence of Zika infection in a female prison unit in the State of Mato Grosso using the rapid test (Bahiafarma) and the Zika Antibody Capture Enzyme Immunosorbent Assay. This is a cross-sectional study, with a quantitative approach, based on data collected in 2018, in which peripheral blood was collected and analyzed with two diagnostic strategies: rapid test and Zika Antibody Capture Enzyme Immunosorbent Assay. In both tests, Zika seroreactivity was detected with excellent agreement, that is, Kappa coefficient was calculated and the values of 1 for IgM and 0.86 for IgG were obtained. In addition to laboratory findings, risk factors for infection resulting from the intrinsic characteristics of the prison environment and the lifestyle of the participants were reported. The description of the seroprevalence of this arbovirus will be important to guide prevention and control actions to be implemented by epidemiologic surveillance.

**Keywords:** Epidemiology. Zika Virus Infection. Prisons.

## RESUMEN

La emergencia del virus del Zika en Brasil entre 2015 y 2016, con graves enfermedades relacionadas, planteó la necesidad de contar con pruebas de diagnóstico de calidad. En este contexto, buscamos analizar la seroprevalencia de la infección por el Zika en una unidad penitenciaria femenina en el estado de Mato Grosso a través de la prueba rápida (Bahiafarma) y el Ensayo inmunoenzimático de captura de anticuerpos del Zika. Este es un estudio transversal con un enfoque cuantitativo basado en datos recopilados en 2018, en el que se recolectó y analizó sangre periférica con dos estrategias de diagnóstico: la prueba rápida y el Ensayo inmunoenzimático de captura de anticuerpos del Zika. En ambas las pruebas se detectó seroreactividad del Zika, con excelente concordancia, es decir, se calculó el coeficiente Kappa y se obtuvieron los valores de 1 para IgM y 0.86 para IgG. Además de los hallazgos de laboratorio, se informaron los factores de riesgo de infección resultantes de las características intrínsecas del ambiente de la prisión y el estilo de vida de las participantes. La descripción de la seroprevalencia de este arbovirus será importante para guiar las acciones de prevención y control que se implementarán mediante la vigilancia epidemiológica.

**Palabras Clave:** Epidemiología. Infección por el Virus Zika. Prisiones.

Zika virus (ZIKV) was first identified in humans in 1952. It belongs to the genus *Flavivirus* and its main vectors are *Aedes aegypti* and *Aedes albopictu*.<sup>1</sup> ZIKV infection can cause acute febrile illness, with mild symptoms, however, in 2015, there was scientific evidence of the association between ZIKV and microcephaly in Brazil. This condition caused greater concern and urgency with regard to prevention and control measures.<sup>2-4</sup>

In 2020, 1,667 probable cases of ZIKV infection were registered in the country, with an incidence rate of 0.79 cases/100,000 inhabitants, being Mato Grosso the state with the highest incidence in the Midwest region, reporting 1.72 cases / 100,000

inhabitants.<sup>5</sup> It is noteworthy that the environmental and socioeconomic conditions of Brazil are more favorable to the proliferation of vectors and alteration of the natural cycle of this arbovirus.<sup>6</sup>

This situation can be aggravated in places with a high population density, such as the Brazilian prison system.<sup>7</sup> In addition to environmental issues, individual and collective factors enhance the proliferation of pathogens and vectors, acute conditions and other epidemics, making this population even more vulnerable.<sup>8</sup>

Thus, we sought to analyze the seroprevalence of ZIKV infection in a prison unit in the State of Mato Grosso through a cross-sectional study, with a quantitative approach. All ethical aspects in research with human beings were respected, in accordance with Resolution 466/12 and Resolution 441 of 2011 of the National Health Council, under approval of opinion 1,457,621 / 2016 of the Research Ethics Committee with human beings from the State University of Mato Grosso.

The female prison in the middle north of Mato Grosso, the place of study, has eight cells with capacity for 50 reeducating women.<sup>9</sup> All the reeducating women were included, that is, 57 women on a provisional or convicted basis, those who received *habeas corpus* were excluded.

Data collection was carried out in 2018 by interviews and collection of biological material to perform the rapid test and MAC-ELISA for Zika virus. The interview took place in a private environment, using a semi-structured form containing socioeconomic, epidemiological and clinical variables, with an approximate duration of 30 minutes for each participant. Then, peripheral blood was collected and, after centrifugation, the serum was used and it was fractionated for rapid tests and cryopreserved for further analysis by MAC-ELISA. The rapid tests were carried out using a protocol from the Ministry of Health, starting with guidance on the purpose of the test and welcoming the participant and ending with guidance on the results.

Cryopreserved samples at -80 ° C were transported to the teaching laboratory of the University of Cuiabá (UNIC), where the MAC-ELISA was performed, which followed the protocol of the commercial kit (PRNT) .<sup>10</sup> Data was systematized in spreadsheets by double typing and later compared using Data Compare software. In addition, the database was imported into the Statistical Package for the Social Sciences (SPSS) version 20.0, to then proceed to statistical analysis. Kappa coefficient was calculated to assess the agreement (reliability and precision) between the variables, where

values <0.40 represent low agreement, values between 0.40 and 0.75 represent median agreement and values > 0.75 represent excellent agreement.

The socioeconomic profile presented by the participants showed a higher frequency of the age group 30 to 39 years old (40.35%), self-declared brown (78.95%), without a partner (54.39%), incomplete elementary school (50.88%), born in other Brazilian States (59.65%) and with monthly income between one and two minimum wages (64.91%), (Table 1). The routine experienced by the reeducating women is limited to sunbathing and activities such as crochet, handicrafts, garden maintenance and classes, that are also offered in order to enable the completion of the medium level of study.

**Table 1.** Socioeconomic profile of reeducating women. Tangará da Serra - Mato Grosso, Brazil, 2018.

<b>Variable</b>	<b>N</b>	<b>%</b>
<b>Age group</b>		
<20	4	7.02
20 to 29	22	38.60
30 to 39	23	40.35
40 or older	8	14.04
<b>Skin color</b>		
White	6	10.53
Black	6	10.53
Brown	45	78.95
<b>Marital status</b>		
With a partner	26	45.61
Without a partner	31	54.39
<b>Education</b>		
Illiterate	2	3.51
Incomplete elementary school	29	50.88
Complete elementary school	3	5.6
Incomplete high school	16	28.07
Complete high school	4	7.02
Incomplete higher education	2	3.51
Complete higher education	1	1.75
<b>Place of birth</b>		
Mato Grosso	23	40.35
Other states	34	59.65
<b>Income</b>		
1 to 2 minimum wages	37	64.91
3 to 4 minimum wages	4	7.02
5 to 6 minimum wages	4	7.02
No income	12	21.05

All reeducating women reported having seen the vector within the prison environment, in addition to accentuated exposure to infection because of the unavailability of repellents and mosquito protection screens in the cells.

In the period referring to the 30 days prior to the study, 92.98% of the participants stated that they had fever, itching and rash. Thus, a rapid test was performed for ZIKV to identify IgM (recent) and IgG (late), presenting 3.50% positivity for IgM and 17.54% for IgG, totaling an overall seroprevalence of 21.04%.

In order to guarantee the accuracy and reliability of the results, the analysis was carried out using the MAC-ELISA. The seroreactivity for IgM was 3.50%, identical to the rapid test and lower for IgG (14.03%), with a total of 17.53% in the global analysis. However, it was observed that through statistical analysis of the variables, a Z value was found for IgM (7.55) and IgG (6.61) and Kappa coefficient was calculated, in which the values of 1 for IgM and 0.86 for IgG were obtained, showing excellent agreement between the methods used, according to Table 2.

**Table 2.** Distribution of Zika virus serological results among reeducating women. Tangará da Serra - Mato Grosso, Brazil, 2018

<b>Variable</b>	<b>Quick test</b>	<b>Elisa</b>	<b>Kappa</b>	<b>Z</b>	<b>Prob&gt;Z</b>
IgM reactive	2	2			
IgM not reactive	55	55	1	7.55	0.0000
IgG reactive	10	8			
IgG not reactive	47	49	0.8684	6.61	0.0000

The rapid test and MAC-ELISA showed different seroprevalence, but an excellent agreement between the methods used for both IgM and IgG. These findings differ from the literature, but the agreement may have shown excellent results due to the small number of participants. It is important to note that the association of laboratory tests is the best alternative to assist in the differential diagnosis and clinical management of ZIKV.

Risk factors for infection were also reported, resulting from the characteristics intrinsic to the prison environment and the participants' way of life. Thus, it is necessary to adopt control and prevention measures for health surveillance, making it possible to

improve the quality of life for reeducating women and the population assigned to the prison unit.

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BCG, ACPTT contributed to the conception, design of the article, analysis and writing of the article;

TYH, VFN, VKV, GVAF and RCAM contributed to the planning and design of the article, review and final approval of the article;

All authors approved the final version to be published and are responsible for all aspects of the work, including ensuring its accuracy and integrity.

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