

## Evaluation of triatomines infestation occurrence in home environments in the city of Taua-Ce, 2012

*Avaliação da ocorrência de infestação por triatomíneos em ambientes domiciliares no município de Tauá-Ce, 2012*

*Evaluación de la ocurrencia de infestación por triatomíneos en ambientes domiciliarios en el municipio de Tauá-Ce, 2012*

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### ABSTRACT

**Background and Objectives:** Triatomines are vectors of *Trypanosoma cruzi*, the etiologic agent of Chagas disease, a parasitic disease that affects mammals and humans. The destruction or transformation of natural ecotopes has intensified, resulting in the invasion of triatomines in households, bringing risks to the population. Thus, the objective of the study was to carry out a data survey on triatomine infestation in the countryside of the city of Taua-Ce, in 2012. **Methods:** This is a descriptive/exploratory study of a quantitative nature, where the Secondary data were obtained from the Municipal Health Department (Endemic Nucleus). **Results:** The percentage of infestation in the 15 locations studied was 26.1%, with the most affected locations being: Sítio Central do Incra 50%, Fazenda Brôco 18.2%, Jordão 16.7%, Fazenda Bom Lugar 0%, Fazenda Riacho do Mato 40%, Fazenda Cearauai 37.5%, Sítio Riacho do Mato 30%, Fazenda Cedro 17.4%, Cachoeirinha 27%, Fazenda Várzea do Feijão 24%, Cachoeira do Júlio 41.2%, Fazenda Mutuquinha 9,4%, Sítio Várzea Grande 33.3%, Iparana 9.1% and Cachoeira do Celso 16.7%. **Conclusion:** The study showed that there is a significant rate of triatomine infestation in the home environment, which represents a great risk to the health of the population of Taua. Therefore, a more frequent entomological control is suggested, going beyond the period of campaigns for a better monitoring of the occurrence of these insects in the area.

**Descriptors:** Vector Insects. Infection. Chagas Disease. Entomological surveillance.

### RESUMO

**Justificativa e Objetivos:** Triatomíneos são vetores de *Trypanosoma cruzi*, agente etiológico da doença de Chagas, parasitose que atinge mamíferos e humanos. A destruição ou transformação dos ecótopos naturais tem se intensificado, resultando na invasão de triatomíneos em domicílios trazendo riscos a população. Diante do exposto,

o objetivo do estudo foi realizar um levantamento de dados sobre a infestação de triatomíneos em localidades do interior do município de Tauá-Ce, em 2012. **Métodos:** Trata-se de um estudo descritivo/exploratório de natureza quantitativa, onde os dados secundários foram obtidos junto à Secretaria de Saúde (Núcleo de Endemias) do município. **Resultados:** O percentual de infestação nas 15 localidades estudadas foi de 26,1%, sendo as localidades mais afetadas: Sítio Central do Inca 50%, Fazenda Brôco 18,2%, Jordão 16,7%, Fazenda Bom Lugar 0%, Fazenda Riacho do Mato 40%, Fazenda Cearauai 37,5%, Sítio Riacho do Mato 30%, Fazenda Cedro 17,4%, Cachoeirinha 27%, Fazenda Várzea do Feijão 24%, Cachoeira do Júlio 41,2%, Fazenda Mutuquinha 9,4%, Sítio Várzea Grande 33,3%, Iparana 9,1% e Cachoeira do Celso 16,7%. **Conclusão:** O estudo mostrou que há um expressivo índice de infestação triatomínica em ambiente domiciliar, o que representa um grande risco a saúde da população tauaense. Sendo assim, sugere-se um controle entomológico mais frequente, ultrapassando o período de campanhas para um melhor acompanhamento da ocorrência desses insetos na região.

**Descritores:** Insetos Vetores. Infecção. Doença de Chagas. Vigilância entomológica.

## RESUMEN

**Justificación y Objetivos:** Los triatomíneos son vectores de *Trypanosoma cruzi*, agente etiológico de la enfermedad de Chagas, parasitosis que afecta a mamíferos y humanos. La destrucción o transformación de los ecótopos naturales se ha intensificado, resultando en la invasión de triatomíneos en domicilios trayendo riesgos a la población. Ante lo expuesto, el objetivo del estudio fue realizar un levantamiento de datos sobre la infestación de triatomíneos en localidades del interior del municipio de Tauá-Ce, en 2012. **Métodos:** Se trata de un estudio descriptivo/exploratorio de naturaleza cuantitativa, donde los datos secundarios fueron obtenidos junto a la Secretaría de Salud (Núcleo de Endemias) del municipio. **Resultados:** El porcentaje de infestación en las 15 localidades estudiadas fue de 26,1%, siendo las localidades más afectadas: Sítio Central do Inca 50%, Fazenda Brôco 18,2%, Jordão 16,7%, Fazenda Bom Lugar 0%, Fazenda Riacho do Mato 40%, Fazenda Cearauai 37,5%, Sítio Riacho do Mato 30%, Fazenda Cedro 17,4%, Cachoeirinha 27%, Fazenda Várzea do Feijão 24%, Cachoeira do Júlio 41,2%, Fazenda Mutuquinha 9,4%, Sítio Várzea Grande 33,3%, Iparana 9,1% e Cachoeira do Celso 16,7%. **Conclusión:** El estudio mostró que hay un expresivo índice de infestación triatomínica en ambiente domiciliar, lo que representa un gran riesgo para la salud de la población tauaense. Siendo así, se sugiere un control entomológico más frecuente, superando el período de campañas para un mejor seguimiento de la ocurrencia de esos insectos en la región.

**Palabras clave:** Vectores de insectos. Infección. La enfermedad de Chagas. Vigilancia entomológica.

## INTRODUCTION

A total of 156 species of triatomines, vectors of Chagas disease, are known.<sup>1,2</sup> In Brazil, triatomines are known by the most different names: *bicudo*, *chupa-pinto*, *bicho-de-parede preto*, *finção*, *chupão*, *barbeiro*, *chupança*, *percevejão*, *percevejo-do-sertão*, *procotó*, *baratão*, *piolho-de-piaçava*, *bruxa*, *quiche do sertão*, *prorocotó*, *rondão vuvun*, *cascudo*, *percevejo gaudeiro*, *percevejo francês* and *percevejo grande*.<sup>3,4,5</sup>

The northeast caatinga is a region where there are a large number of these insects. They are insects of the Hemiptera, hematophagous order and the main transmitter of Chagas disease. Triatomines must feed on blood, they inhabit both wild environments and peridomestic and homes.<sup>6</sup> They are found in cracks in the walls, in stables, pigsties, chicken coops, dovecotes, tree hollows and boulders.

The domiciliation process occurs when these insects leave their natural habitat due to destruction or modification and end up migrating to homes where domestic animals are raised, in the peridomestic, with precarious structures providing a source of shelter for the insect. Thus, this process directly influences the occurrence and transmission of *Trypanosoma cruzi*, the etiological agent of Chagas disease.<sup>7,8</sup>

Chagas disease has been known for over 100 years, as it was described by Carlos Chagas in 1909. Even so, it is still considered a neglected disease, which victimizes millions of Brazilians.<sup>6</sup>

Studies on triatomine infestation at home have been conducted, including the assessment of the occurrence in household environments in the city of Aurora, Ceara, between 2012 and 2015;<sup>9</sup> geographic distribution, household infestation and natural infection of triatomines in the state of Piauí, Brazil, 2008;<sup>10</sup> home infestation by triatominae infestans and some epidemiological aspects of American trypanosomiasis in an area of the state of Sao Paulo, Brazil;<sup>11</sup> triatominae infestans in an area under entomological surveillance for Chagas disease, state of Sao Paulo, Brazil;<sup>12</sup> occurrence of triatomines in intra and peridomestic environments in the city of Campos Sales, Ceara,<sup>13</sup> among other studies.

In the state of Ceara, between 2015 and 2019, about 28% (51) of the cities had triatomine infestation greater than 5%. This percentage of triatomine infestation is considered high. What draws attention is the dispersion of these cities throughout the state, showing the wide distribution of triatomines in the state, which in the same period, recorded 557 positive triatomines for *T. cruzi* in an

indoor environment and about 3.4% of natural infection (557/16365), distributed in 66 (36%) of the cities.<sup>14</sup>

In 2013, a total of 1218 cases of CD were cataloged in people over 15 years old in the state of Ceara, and 22 cases (~1.7%) of this record were confirmed in the city of Taua.<sup>6</sup> The city has numerous locations with the presence of triatomines, which justifies the study. There is still insufficient information on the processes of triatomine domiciliation. Therefore, this study aimed to carry out an analysis of the infestation of triatomines in the countryside of Taua-Ce, in 2012.

## METHODS

The survey was carried out in the city of Taua-Ce, in 2020. It is a descriptive/exploratory study of a quantitative nature, where secondary data were obtained from the Health Department (Endemic Nucleus) of the city, having as object of study the occurrence of triatomines in households in the city.

The city of Taua is located in the State of Ceara,

northeast of Brazil, located in the Inhamuns Region. The city is located at a distance of approximately 357 km from the capital Fortaleza, with the geographical coordinates: latitude: 06°00'11"S, longitude: 40°17'34"W, altitude 402.7m, with an area of 4011 km<sup>2</sup>, with a total of 59062 inhabitants. It has a hot, semi-arid tropical climate, with rains from February to April, with open shrubby caatinga vegetation and thorny deciduous forest with an average rainfall of 416.9 mm.<sup>15,16</sup>

Since 1995, the city has been made up of 8 districts, including the district of Taua (Headquarters), Barra Nova, Carrapateiras, Inhamuns, Marrecas, Marruas, Santa Teresa and Trici.<sup>15</sup>

The city borders on the north with Pedra Branca and Independencia, on the south with Parambu and Arneiroz, on the east with Mombasa and Pedra Branca and on the west with Quiterianopolis and Parambu.<sup>16</sup> (Figure 1)

Secondary data were obtained in January 2020 from the Health Department (Endemic Nucleus). The endemics nucleus is responsible for the surveillance of triatomines of the Chagas Disease Control Program (CDCPh).

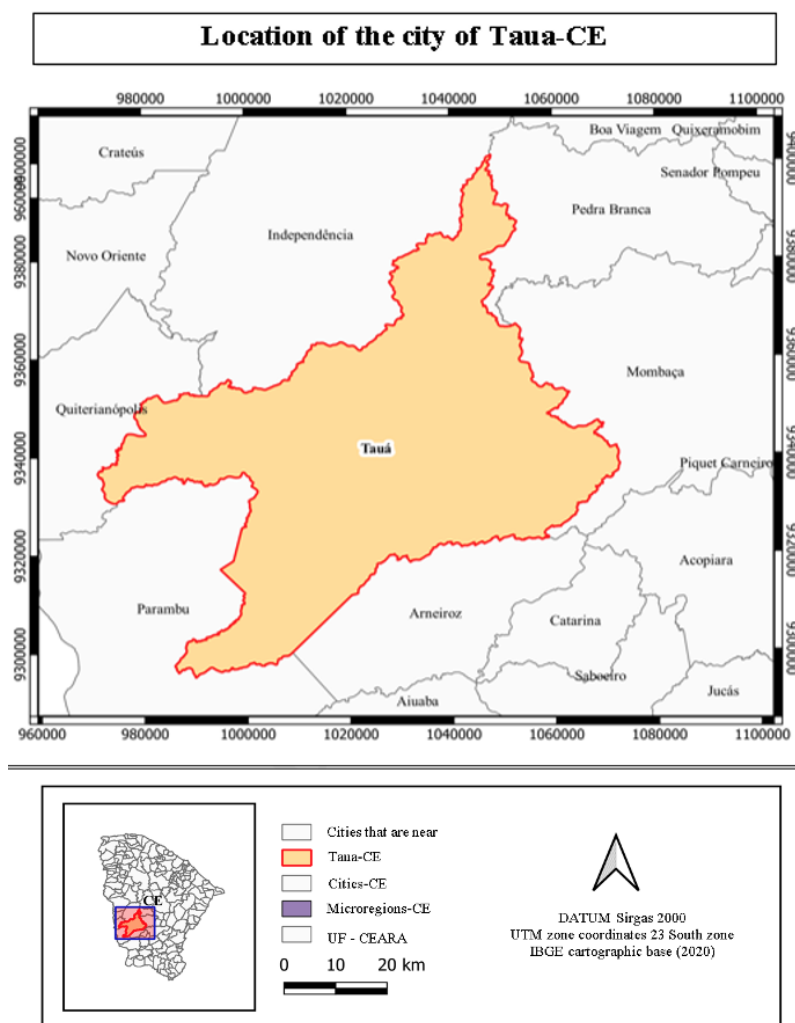


Figure 1. Geographical catalog of the location of the city of Taua-CE.

As an inclusion criterion in the study, data collected from 06/05/2012 to 09/26/2012 in fifteen areas of the countryside of the city were selected and, as an exclusion criterion, the houses in which there was nobody at the time of the visit of the Endemic Combat Agents (ECAs).

The triatomines are captured in visits programmed during the PCDCh, by the ECAs of the center of endemic diseases of the city. A field visit was carried out along with the ECAs to capture the insects (triatomines).

The captured insects are placed in a container (five insects in each jar), with a label identifying the type of indoor environment (inside the house) or peridomestic environment (yard) and later taken to the Entomology Laboratory of Tauá (LEM), where insect identification and parasitological analysis are carried out.<sup>17</sup>

The procedures for capturing and conserving live specimens follow the norms of the Manual of technical norms of the Chagas disease control campaign.<sup>17</sup>

In order to carry out intra and peridomestic capture, the following field materials were needed: bag, flashlight, large tweezers, batteries, containers to store the samples, GPS device, gloves, labels, manual sprayer, dislodging product for triatomines and a field sheet according to the Manual of technical standards.<sup>17,18</sup>

Data were analyzed by descriptive statistical techniques using Excel Office 2013® software and presented in the form of absolute numbers, relative frequency (infestation index) and average percentage.

The number of houses in the localities ( $N_1$ ), the number of inhabitants ( $N_2$ ), the number of houses surveyed ( $N_3$ ), the number of positive houses ( $N_4$ ), the number of pack-loads ( $N_5$ ) containing Alfacypermethrin (Alfatek Insecticide 200 SC) used in spraying to control the insect.

The relative frequency (%) was calculated by the following formula:  $Fr = \left(\frac{Fi}{n}\right) \times 100$ , where (Fr) is the relative frequency; (Fi) the Absolute Frequency and (n) represents

the amount of data. The average percentage  $M_e(\%)$  was calculated by the formula:  $M_e(\%) = \frac{L_1 + L_2 + L_3 + \dots + L_{15}}{NL}$ , where the variable  $L_1, L_2, L_3, \dots, L_{15}$  represents the percentage of locations and NL the number of locations. The number of houses not surveyed, that is, that had no inhabitants during the PCDCh campaign, was calculated using the formula:  $NCNP = N_1 - N_3$ , where  $N_1$  is the number of houses in the localities and  $N_3$  is the number of houses surveyed.

This study complies with the ethical principles of Resolution 466/12 of the National Health Council. The data used in this study do not address nominal data of the residents or any other that establish their identification. Thus, submission to the Research Ethics Committee (REC) was not necessary, according to Resolution No. 510 of the National Health Council, of April 7, 2016.<sup>19</sup>

## RESULTS

Figure 2 shows the triatomine infestation rate in the locations: Sítio Central do Ingra 50%, Fazenda Brôco 18.2%, Jordão 16.7%, Fazenda Bom Lugar 0%, Fazenda Riacho do Mato 40%, Fazenda Cearauai 37, 5%, Sítio Riacho do Mato 30%, Fazenda Cedro 17.4%, Cachoeirinha 27%, Fazenda Várzea do Feijão 24%, Cachoeira do Júlio 41.2%, Fazenda Mutuquinha 9.4%, Sítio Várzea Grande 33.3%, Iparana 9.1% and Cachoeira do Celso 16.7%. The average percentage of triatomine infestation was  $\approx 24.7\%$ .

In the analyzed period, a total of 15 locations with 732 residents were surveyed. Of these, only one home was not found to have triatomines. Of the 386 houses visited, 333 (86.3%) were evaluated, with 87 (26.1%) houses being positive for triatomines and 53 (13.7%) houses were not surveyed, as there was nobody in the house in the moment of the PCDCh campaign. (Table 1).

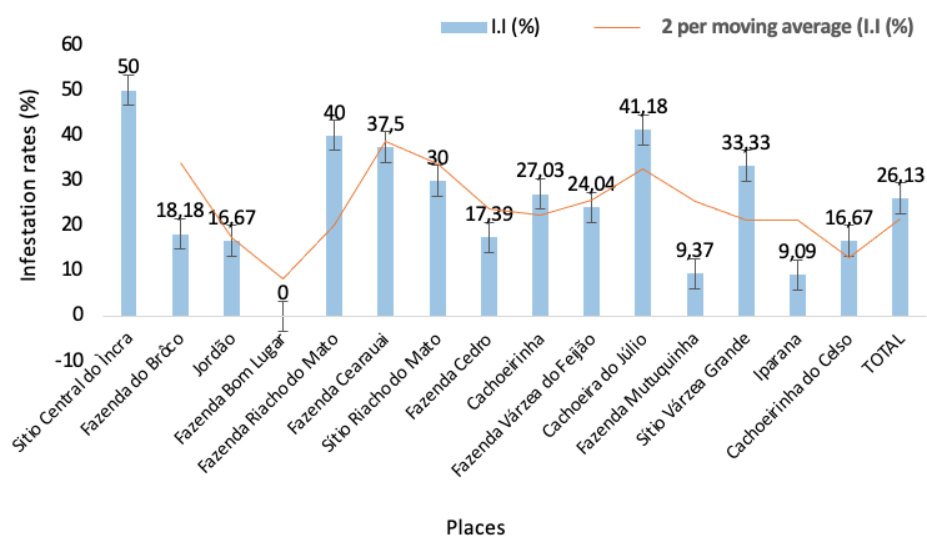


Figure 2. Triatomine infestation rates in the countryside of Tauá-CE, 2012.

**Table 1.** Occurrence of Triatomines in a home environment in Tauá, CE.

PLACES	N <sub>1</sub>	N <sub>2</sub>	N <sub>3</sub>	N <sub>4</sub>	N <sub>5</sub>
Sítio Central do Incra	33	46	18	9	7
Fazenda do Brôco	22	36	22	4	9
Jordão	6	5	6	1	3
Fazenda Bom Lugar	7	15	3	0	0
Fazenda Riacho do Mato	16	26	15	6	14
Fazenda Cearauai	8	9	8	3	8
Sítio Riacho do Mato	10	20	10	3	7
Fazenda Cedro	30	40	23	4	11
Cachoeirinha	38	92	37	10	19
Fazenda Várzea do Feijão	105	252	104	25	58
Cachoeira do Júlio	18	25	17	7	18
Fazenda Mutuquinha	35	79	32	3	7
Sítio Várzea Grande	8	5	3	1	3
Iparana	11	26	11	1	3
Cachoeirinha do Celso	6	10	6	1	3
TOTAL	386	732	333	87	170

Legend: N<sub>1</sub>= number of houses in the place; N<sub>2</sub>= number of inhabitants in the places; N<sub>3</sub>= number of houses surveyed; N<sub>4</sub>= Number of positive houses; N<sub>5</sub>= pack-loads containing *Alfacypermethrin* (Alfatek Insecticide 200 SC) used in spraying for insect control.

A total of 21 triatomines (*Triatoma infestans*) were captured during the field research carried out along with the ECAs and sent to the LEM for identification and parasitological analysis of the insects. Spraying was performed in all homes where the insects were found using the alpha-cypermethrin-based insecticide (ALFATEK 200 SC).

## DISCUSSION

The triatomine infestation rate analyzed in this study was 26.1%. The value is compatible with that found by Candido and Collaborators in Campos Sales (CE), which was 20.4%. However, it differs greatly from the results found by Pinto and Collaborators in Aurora (CE), which was 80.97%.<sup>13-9</sup> Therefore, despite the low infestation rate found in Tauá (CE), it can be observed in this work that there are areas of up to 50% infestation in the city, forming colonies of triatomines may occur in households and annexes, indicating considerable rates of infection by *Trypanosoma cruzi*.<sup>18</sup>

The invasion by triatomines inside homes and annexes is worrying, since these insects are potential sources of natural infection. In addition, it expresses the housing conditions that the populations live, in which the domicile of these insects took place.<sup>13,9,18</sup>

It is also believed that this invasion of triatomines in homes is linked to the occurrence and transmission of the parasite, in addition to connecting the wild and domestic cycles of Chagas disease.<sup>8,13, 18,20-22</sup>

It is concluded that there is home colonization by triatomines in the city of Tauá. Therefore, improvements are necessary in the epidemiological surveillance of the city and the adoption of prophylactic measures by the residents, such as: always keeping the house and surroundings clean, as well as the use of mosquito nets,

protection screens on doors and windows, as well as educational work by authorities focused on the prevention of Chagas disease, aiming to raise awareness of the vector of the disease and its main shelters as a way of minimizing the risks to which they are exposed. In addition, a more frequent entomological control is suggested, going beyond the period of the campaigns for a better monitoring of the occurrence of these insects.

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#### AUTHOR CONTRIBUTIONS

**Elivan Custodio Araujo** contributed to the conception, article design, analysis, article writing, article planning and design, review and final approval of the article;

The author approves the final version to be published and is responsible for all aspects of the work, including ensuring its accuracy and integrity.