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SCHOOLCHILDREN'S PROFILE AND CONCEPTIONS ABOUT ARBOVIRUSES WITHIN THE ECOSYSTEM APPROACH TO HEALTH

PERFIL DOS ESCOLARES E CONCEPÇÕES SOBRE AS ARBOVIROSES NA ABORDAGEM ECOSISTÊMICA DA SAÚDE

PERFIL Y CONCEPCIONES DE LOS ESCOLARES SOBRE LOS ARBOVIRUS DENTRO DEL ENFOQUE ECOSISTÉMICO DE LA SALUD

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ABSTRACT

The control and prevention of the Dengue, Zika, and Chikungunya arboviruses transmitted by the *Aedes aegypti* vector is a severe public health problem in Brazil. This study aims to characterize sociodemography and prior knowledge about *Aedes aegypti* and control/prevention strategies of the participants of a study conducted in 2018 with 55 students regularly enrolled in two municipal elementary schools in Fortaleza, Ceará, Brazil. A semi-structured questionnaire with open-ended and closed-ended questions was applied to collect data. Data were organized in tables and analyzed descriptively. The results indicated greater participation of girls (29; 52.7%) aged 10-16 years (43; 79.1%). Students had a general knowledge of arboviruses, and 48 (87.3%) knew the virus transmission mode. We conclude that the students were primarily female and knew about arboviruses and their effects on health.

KEYWORDS: *Aedes aegypti*. Vector control. Arboviruses.

RESUMO

O controle e a prevenção das arboviroses Dengue, Zika e Chikungunya transmitidas pelo vetor *Aedes aegypti* são um grave problema de saúde pública no Brasil. Este estudo tem como objetivo caracterizar a sociodemografia e o conhecimento prévio sobre o *Aedes aegypti* e as estratégias de controle/prevenção dos participantes de um estudo realizado em 2018 com 55 alunos regularmente matriculados em duas escolas municipais de ensino fundamental de Fortaleza, Ceará, Brasil. Para a coleta de dados foi aplicado um questionário semiestruturado com questões abertas e fechadas. Os dados foram organizados em tabelas e analisados descritivamente. Os resultados indicaram maior participação das meninas (29; 52,7%) de 10 a 16 anos (43; 79,1%). Os alunos tinham um conhecimento geral de arboviroses, e 48 (87,3%) conheciam o modo de transmissão do vírus. Conclui-se que os escolares eram primariamente do sexo feminino e conheciam as arboviroses e seus efeitos sobre a saúde.

PALAVRAS-CHAVE: *Aedes aegypti*. Controle vetorial. Arbovírus.

RESUMEN

El control y la prevención de los arbovírus Dengue, Zika y Chikunguña, transmitidos por el vector *Aedes aegypti*, es un grave problema de salud pública en Brasil. El objetivo de este estudio es caracterizar la sociodemografía y los conocimientos previos sobre *Aedes aegypti* y las estrategias de control/prevenção de los participantes de un estudio que se llevó a cabo en 2018 en dos escuelas primarias municipales en Fortaleza, Ceará, Brasil, con 55 estudiantes inscritos regularmente en

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La escuela primaria. Se aplicó un cuestionario semiestructurado, con preguntas abiertas y cerradas en la recolección de datos. Los datos se organizaron en tablas y se analizaron de forma descriptiva. Los resultados indicaron una mayor participación de las niñas (29; 52,7%) y de 10 a 16 años (43; 79,1%). Los estudiantes tenían conocimientos previos generales sobre los arbovirus y 48 (87,3%) también conocían el modo de transmisión de los virus. Se concluye que los estudiantes eran en su mayoría mujeres y conocían los arbovirus y sus efectos en la salud.

PALABRAS CLAVE: *Aedes aegypti*. Control de vectores. Arbovirus.

INTRODUCTION

For decades, the control and prevention of Dengue, Zika, and Chikungunya arboviruses transmitted by the *Aedes aegypti* vector have been a recurring public health problem in Brazil. In 2020, the Ministry of Health's Epidemiological Bulletins pointed to increased arbovirus infections with a predominance of Dengue (DENV), with more than 600,000 probable cases and 221 deaths caused by the disease¹.

The uncontrolled population growth in Fortaleza practically doubled in the last thirty years. Because it is an important tourist center, the city is conducive to the introduction and circulation of new endemic agents and the rapid dispersion of arboviruses. Many factors are associated with the emergence and permanence of the *Aedes aegypti* vector, including disorderly urbanization, the vector-related biological aspects, such as climate, resistance to insecticides, aspects related to public policies, such as waste management and handling, the organization of health services, and vertical vector control programs².

Social inequalities are represented in the differences in health status between population groups and reflected in the characteristics of the social situation in education, the place of residence or work conditions, basic sanitation, ethnicity, and gender. These are common elements in endemic and epidemic contexts. The socio-environmental vulnerability brings to the fore ethical, political, and social issues that confront the community spread of risks and diseases and the coping competencies.

Given the growing need for community-based educational actions involving different segments of the population, this paper aims to present the profile of schoolchildren participating in an ecosystem approach to health study to develop educational, participatory, and sustainable actions and act directly in the daily life of the school environment for the control/prevention of the *Aedes Aegypti* vector and the DENV, CHIKV, and ZIKV arboviruses.

METHODS

This qualitative study with analytical dimensions favors the analysis of the participants' profiles in a dialogue with the adopted theoretical references. Qualitative collective health studies provide an opportunity to discuss the investigated object based on theoretical references, which in this case, we call the ecosystem approach to health to enlighten our research findings.



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This work is an excerpt from the Master's dissertation of the Postgraduate Program in Public Health at the State University of Ceará. The dissertation, in turn, is a participatory excerpt nested in a multicenter research implemented in three countries (Brazil, Colombia, and Mexico) and funded by the International Development Research Center (IDRC-Canada), in which initiatives are engendered based on the principles of ecosystem approaches to combat vector-borne diseases to improve the understanding of health determinants and the population's quality of life through actions that enable sustainable environmental transitions.

The field research was conducted in 2018 in two municipal schools in Fortaleza, Ceará, Brazil. The sample consisted of 55 students regularly enrolled in Elementary School II (6th to 9th grade) in School 1, and Elementary School I (4th and 5th grades) in School 2, in the morning and afternoon shifts. The sample of subjects was selected by convenience based on the age group appropriate for the application of data collection techniques.

For data collection, a semi-structured questionnaire adapted from the following questionnaires was used: © The KIDSCREEN Group, 2004; EC Grant Number: QLG-CT-2000-00751 KIDSCREEN-27. It is divided into two distinct parts: the first on sociodemographic data, self-perceived health, and motivation, with questions about gender (male/female); age (full years); residing with (the father, the mother, parents, or grandparents); type of residence (house/apartment); health perception (excellent, very good, good, regular, poor and very poor); and incentive to perform activities in the school environment (always, often, sometimes, rarely, never). After data collection, the following variables were recategorized by age (≤ 10 years; $\geq 11-16$ years); health perception [positive (excellent, very good, good); and negative (regular, poor, and very poor)]; activity in the school environment [I am stimulated (always, often, sometimes) and I am not stimulated (rarely, never)].

The second questionnaire was about the students' previous knowledge of the *Aedes aegypti* vector and the means of controlling and transmitting arboviruses (DENV, ZIKV, and CHKV). In this one, open-ended questions were used, such as 1) Have you ever heard about Dengue, Chikungunya, and Zika?; 2) Do you know how Dengue, Chikungunya, and Zika are transmitted?; 3) Do you know what we should do to avoid Dengue, Chikungunya, and Zika? and 4) Has anyone in your family ever had Dengue, Chikungunya, or Zika? At the end of the process, the responses were analyzed and categorized. The questions outlined the object so that the constructs arising from the collected contents encompassed the proposed topic for discussion.

When applicable, the results are described as descriptive statistics using simple frequency in absolute and relative terms. Moreover, content analysis was used for qualitative variables. The study was submitted to the Research Ethics Committee of the State University of Ceará (UECE) and is nested in the project "Expanding innovative interventions and active surveillance to prevent and control diseases transmitted by *Aedes aegypti*" under Opinion N° 2248326/CAAE: 70826017.8.0000.5534, issued on August 30, 2017.



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RESULTS AND DISCUSSION

Fifty-five students participated in the study, 30 in School 1 and 25 in School 2, composing the research database. Initially, data regarding gender, age, family context, and type of residence were collected. We observed a prevalence of females (29, 52.7%) in the 11-16 years age group (43, 79.1%). Regarding the degree of kinship, most (29, 52.7%) lived with their parents, and the house was the most common type of residence (48, 87%). Finally, when the perception of health was investigated, most (54, 98.1%) rated it positive, and (39, 79.15%) said they felt encouraged to participate in school activities, as shown in Table 1.

Table 1. Participant characterization regarding the sociodemographic profile, Fortaleza, 2018.

Components	School 1	School 2	%	Total
	<i>f</i>			
Gender				
Female	15	14	52.7	29
Male	15	11	47.3	26
Age group				
≤10 years	-	12	21.8	12
≥11–16 years	30	13	78.2	43
Residing with				
Parents	17	12	52.7	29
Mother	10	10	36	20
Grandparents	3	3	11.3	6
Residence type				
House	27	21	87	48
Apartment	3	4	13	7
In general, you consider your health				
Positive	29	25	98.1	54
Negative	1	-	1.9	1
You feel encouraged to participate in school activities				
I am stimulated	21	18	79.1	39
I am not stimulated	9	7	20.9	16

Source: Authors.

Regarding gender, we observed that girls (29, 52.7%) exceed boys (26, 47.3%), and this predominance was incidental, without any purposeful action to define this sample. Concerning the age group, adolescents prevailed (43, 79.1%) against children (12, 20.9%), mainly due to the greater number of Elementary School II students aged within the 10-16 years age group.

When the components of knowledge about arboviruses (DENV, ZIKV, and CHKV), prevention and transmission models, and history of possible infections among family members were investigated, all were aware of some arbovirus, as shown in Table 2.



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Table 2. Knowledge about arboviruses and vector control, Fortaleza, 2018.

Components	School 1	School 2	%	Total
<i>f</i>				
Where did you hear about Dengue, Chikungunya, and Zika?*				
School	9	21	54.5	30
Community	11	5	29.1	16
Family	12	8	40	22
Media	17	6	41	23
Do you know what we should do to avoid Dengue, Chikungunya, and Zika?				
No	1	25	47.2	26
Yes	29	-	52.8	29
Have you ever had Dengue, Chikungunya or Zika?				
No	21	21	74.5	41
Yes	9	5	25.5	14
How are Dengue, Chikungunya, and Zika transmitted?*				
<i>Aedes aegypti</i> mosquito	23	21	80	44
Still waters	2	2	7.2	4
Has anyone in your family ever had Dengue, Chikungunya, or Zika?*				
No	5	12	31	16
Yes	25	13	69	38
Affected family members *				
Grandparents	8	4	21.8	12
Parents/brothers	12	9	38	21
Uncles/cousins	11	15	47.2	26
Variables	School 1	School 2	%	Total
Do you know how Dengue, Chikungunya, and Zika are transmitted?				
No	3	4	12.7	7
Yes	27	21	87.3	48
Where did you hear about Dengue, Chikungunya, and Zika?*				
School	9	21	54.5	30
Community	11	5	29.1	16
Family	12	8	40	22
Media	17	6	41	23

Source: Authors. *More than one answer was available.

The school was the environment that informed about the subject the most (30, 54.5%). However, only 29 participants (52.8%) knew how DENV, ZIKV, and CHIKV should be addressed to avoid environmental proliferation. Furthermore, when asked about transmission, 44 participants (80%) reported that it occurs through the *Aedes aegypti* mosquito. Thirty-eight participants (69%) confirmed that family members had been affected by some arbovirus, and uncles/cousins had the highest prevalence (26, 47.2%).

In a study from a doctoral thesis, discussions regarding the epidemiological setting reinforce that there is a daily return of a relevant number of children who contracted the virus in schools. We observed that the high prevalence of DENV infection draws attention, mainly considering the population in the 5-15 years age group. Also noteworthy is that many of the transmissions took may



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have occurred outside homes, considering two characteristics of *Aedes aegypti* described in Fortaleza, which are above-average longevity and high vector competence shown in successive epidemics².

Ecosystem approaches to health show the interaction between the ecological and socioeconomic dimensions of specific situations. Their impacts on human health recognize health and quality of life as the result of complex and dynamic interactivity between determining factors and people. We underscore the application of concepts and practices related to social education and care for the environment, listing main elements such as transdisciplinarity, which implies an inclusive viewpoint of ecosystem-related health problems; social participation, which involves different subjects, including the local community; social and gender equity, which includes the equal participation of men and women and different social groups engaged in actions to combat the vector.

We propose actions by several community sectors through activities focused on the elimination of water reservoirs (possible breeding sites) and garbage, including health and environmental education, using socially and culturally adequate health education materials to be developed and used by several groups such as women, students, managers, seniors and new groups of volunteers for environmental health. Several social measures have been applied for selective monitoring and alternatives in controlling *Aedes aegypti* using different action mechanisms, including combinations of techniques³. Therefore, we observe the importance of perceiving and recognizing subjects regarding individual and collective social spaces.

The risks of exposure to *Aedes aegypti* infections leave many questions open for the most diverse action fronts. In this uncertain setting, the population may find an appropriate moment to review its relationship with the environment, the spaces it occupies and transforms, and its lifestyle and health, from an individual, collective and public sphere perspective⁴.

We should consider adopting ecosystem approaches to combat the problem arising from these diseases, generally originating from the individual, about how we view our health and get involved in collective actions. Table 2 shows the second part of the questionnaire, corresponding to the previous knowledge of the study participants about the *Aedes aegypti* vector, the means of control and infection of arboviruses (DENV, ZIKV, and CHIKV), and investigates the history of possible infections among the family members of the respondents.

We found that all 55 (100%) students who completed the questionnaire had already heard about DENV, CHIKV, and ZIKV. However, some students responded with more than one option about where and from whom they heard about it, with school and television prevailing in the former and teachers and mothers in the latter. Noteworthy is that the most significant number of students who mentioned the school were the participants of School².

The present study showed the profile and knowledge of schoolchildren about arboviruses (DENV, ZIKV, and CHIKV). The findings identified that most respondents were female adolescents



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living with their parents in a house. Also, the perception of health was positive, and they were motivated to perform activities on this topic in the school environment.

DENV remains one of the leading Brazilian public health issues due to the disease's viral load and the considerable potential to develop to death. Surveillance must act intensively, especially during low transmission, to maintain awareness of the disease and early detection of changes in the pattern to intervene in a timely manner³.

The ecosystem approach is associated with several mechanical vector control methods and other available tools for identifying priority intervention areas⁵ and is a way of combatting the vector grounded on information to the population via education and health promotion actions. We should underscore the crucial role of Primary Health Care (PHC) as an integrating strategy for these services through the work of health professionals, especially Endemic Control Agents. Evidence shows that PHC can respond to 85% of health needs, acting in preventive, curative, rehabilitative, and health promotion services. It integrates care and addresses the population's life context, influencing the resolution of health problems⁶.

The recognition of diversity proposes different visions of the world that facilitate collective construction, especially the autonomy of subjects in their community. The responsibilities of actions for preventing and controlling the DENV, CHIKV, and ZIKV arboviruses require paying attention and responding to environmental conditions that affect the reproduction and life cycles of the transmitting vector, the *Aedes aegypti* mosquito, and the exposure to the virus and its transmission. It is essential to eliminate all potential foci to prevent its proliferation and emphasize that water treatment does not replace the need to remove and protect against potential breeding sites.

In this sense, there is a need to face economic and social development contradictions to relieve poverty and improve human life. One of the aspects to be addressed is the necessary changes in how people interact with ecosystems to achieve better health and sustainable development from an ecological, social, and economic perspective.

Given the growing need for community-based educational actions that involve different segments of the population, this paper aims to present the profile of schoolchildren participating in a study with an ecosystem approach to health to contribute to the development of educational, participatory, and sustainable actions to act directly in the daily life of the school environment for the control/prevention of vector *Aedes Aegypti* and the DENV, CHIKV and ZIKV arboviruses.

Group representativeness in social and individual behavior follows internalized cultural models. Parameters such as gender and age group comprise segments of representativeness on the complexity of social reality. In this aspect, understanding the cultural models and the particularity of their determinations³ is significant, not the sum of the elements.

In a study from a doctoral thesis, discussions regarding the epidemiological setting reinforce that there is a daily return of a relevant number of children who contracted the virus in schools. A high prevalence of DENV infection was observed, mainly leading to considering people in the 5-15 years



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age group. It is also worth mentioning the possibility that many of the transmissions occurred outside the homes, considering two characteristics of *Aedes aegypti* described in Fortaleza, which are the above-average longevity and a high vector competence shown in successive epidemics².

Therefore, we underscore initiatives that aim to promote vector control through activities conducted in schools. Children and adolescents discuss learning among themselves in the school environment, take the information home, and are active watchdogs in the control of *Aedes aegypti* breeding sites. One of the crucial lessons learned about the epidemics of diseases caused by this vector has been the constant need for surveillance and collective mobilization.

The central axis of the ecosystem approach to health practice gathers methodological pluralism, social participation, mapping, and analysis of the socio-environmental and health situation of the territory under study, the stakeholders' proposed intervention strategies in the problems identified, supported in social and collaborative learning between experts/researchers and local social stakeholders³ as founding principles.

Several social measures have been applied for selective monitoring and alternatives in the control of *Aedes aegypti* using different action mechanisms, including considering combined techniques⁴. Therefore, we observed the importance of the subjects' perception and recognition vis-à-vis individual and collective social spaces.

Some of the responsibilities of the Unified Health System in fighting Dengue are coordinating vector control actions, epidemiological surveillance, and care for people affected by the disease. The National Dengue Control Program for this challenge, designed in 2002, develops permanent programs by implementing information campaigns and mobilizing people. Strengthening surveillance actions increases the ability to predict and detect outbreaks of diseases caused by *Aedes aegypti* early. Vector control will depend on the broad participation of several public policies and society⁵.

Ecosystem approaches to health stand out for the application of concepts and practices related to social education and care for the environment, listing main elements such as transdisciplinarity, which implies an inclusive viewpoint of ecosystem-related health problems; social participation, which involves different subjects, including the local community; social and gender equity, which includes the equal participation of men and women and different social groups in the involvement with actions to combat the vector. We propose actions by several sectors of the community through activities focused on the elimination of water reservoirs (possible breeding sites) and garbage, including health and environmental education, using appropriate health education materials socially and culturally developed and used by several groups such as women, students, managers, older adults, and new groups of volunteers for environmental health⁶.

We observed that the risks of exposure to *Aedes aegypti* infections leave many questions open for the most diverse action fronts. In this uncertain setting, people may find an appropriate moment to review their relationship with the environment, the spaces they occupy and transform, besides their lifestyle and health, whether from an individual, group, or public sphere perspective.



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We noted that the diseases transmitted by the *Aedes aegypti* vector are understood within the social fabric, interposed regarding the existing dynamic relationships between individuals and groups. However, vector control actions will depend on the engagement and broad participation of several segments⁷.

Research alludes to the complexity of social contexts in ecosystem approaches. It reiterates that an intersectoral behavior combining environmental management with social mobilization⁸ is necessary to control diseases transmitted by vectors such as *Aedes aegypti*. In this context, school health as a public policy and a guarantee of the quality of life requires coordination and intersectoral planning based on the definition of interdisciplinary initiatives selected through a local diagnosis of reality, identifying real problems and possible solutions⁹.

Individual and collective surveillance and social participation actions are essential to rethink vector control strategies. Combat policies must be integrated and should overcome territorial limits. It is imperative to take ownership of knowledge to formulate innovative tools adapted to reality.

CONSIDERATIONS

We conclude to affirm that the study participants were primarily female students. We observed that the school environment is conducive to performing studies that favor integrating several pieces of knowledge and local stakeholders. The relationships between health, environment, and society are correlated with sociocultural and environmental reality. Thus, we highlight initiatives that aim to promote vector control through school activities. Children and adolescents discuss learning among themselves in the school environment, take the information home, and are active watchdogs in controlling *Aedes aegypti* breeding sites. One of the crucial lessons learned about the epidemics of diseases caused by this vector has been the constant need for surveillance and community mobilization.

Most participants presented knowledge about arboviruses and their vector and control and prevention actions in the school environment. We identified the apprehended knowledge focusing on the best care of the environment and social interaction spaces, such as school and the home. By characterizing the sociodemographic profile and previous knowledge of the participants, the study shows that the school environment is fertile ground for developing robust control and prevention actions, which consider technical knowledge and local knowledge, the territory, and permanent dialogue as a challenge to be overcome by managers and formulators of sustainable public health policies and by society as a whole.

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