

Short Communication

Blackfly control from a health education perspective: the individual, the organization, and sustainability of the process

Érika Silva do Nascimento-Carvalho^{[1],[2]} and Marilza Maia-Herzog^[1]

[1]. Laboratório de Simulídeos e Oncocercose, Instituto Oswaldo Cruz, Fundação Oswaldo Cruz, Rio de Janeiro, RJ, Brasil.

[2]. Programa de Pós-Graduação *Stricto Sensu* em Biodiversidade e Saúde, Instituto Oswaldo Cruz, Fundação Oswaldo Cruz, Rio de Janeiro, RJ, Brasil.

Abstract

Introduction: This study analyzed blackfly awareness and perceptions of health education practices for blackfly control among vulnerable populations in Brazil. **Methods:** An exploratory descriptive quantitative research analysis was performed to investigate and analyze the awareness of and potential participation in blackfly control measures by vulnerable populations. **Results:** Countryside resident participants (n = 24/38; 63.2% of the total sample) reported that blackflies were an obstacle to the performance of their work activities. **Conclusions:** Blackflies are a public health problem, and actions for blackfly control have been carried out without social participation or educational health practices that involve proper community knowledge.

Keywords: Entomological surveillance. Insect control. Health education.

Blackflies are a public health problem and their presence is remarkable in riverine and rural populations. They are diurnal insects with extremely voracious habits that require blood as food, often attacking in swarms, and their painful bites can cause severe immune reactions, intense itching, irritation, and fever. Some species are vectors for onchocerciasis (*Simulium guianense*, *Simulium incrustatum*, *Simulium oyapockense*, and *Simulium exiguum*) and mansonelliasis (*Simulium amazonicum*, *Simulium oyapockense*, and *Simulium argentiscutum*). Their food requirements make these insects important not only with regard to parasite transmission to humans and other animals, but because of potential impacts on regional and country-level economies¹.

In addition, the blackfly inhabits a wide geographic distribution, reproduce quickly, and colonizes several lotic aquatic environments. Adult blackfly control is challenging, mainly due to their dispersing characteristic in the wild. Therefore, control is often conducted on immature blackflies since larvae stay concentrated in waterway locations, making them easier to target. In Brazil, at different times in the history of the State of Rio Grande do Sul (RS), human populations living in rural areas have suffered significantly from blackfly attacks that resulted in serious health problems, with a record rate of

medical care incidents due to insect bites (174.2 per 10,000 inhabitants) reported in 1983 in Nova Petrópolis². Thus, the RS government published a law - Decree N° 31.211/1983, changing the Promotion Regulation, Protection, and Recovery of Public Health Act, approved by Decree N° 23.430/1974, to include item III – Blackflies in article 47. This addendum considers blackfly proliferations as annoyances to be controlled, in addition to ensuring the development of a Blackfly Control Program. In this regard, it is essential to give necessary legislative capacity to perform the efficient management of human health, a power given to the RS Department of Environmental Health.

However, actions regarding blackfly control have been carried out without social participation or the implementation of educational health practices that involve the knowledge of the bionomics of this insect, hindering the effectiveness of blackfly control practices. Health education comprises a set of knowledge and practices for disease prevention and health promotion. The present study is part of a proposal regarding actions aimed at modifying behaviors that increase health risks through guidance to the appropriate use of services provided by the Brazilian Health System [*Sistema Único de Saúde (SUS)*]^{3,4}. Educational health practices are conducted based on the implementation of Law N° 8.142/1990, which provides for community participation in its article 194 VII.

This study are supported by health education assumptions, which mobilize the creation and development of practices with the aims of modifying risky health behaviors through individual empowerment and applying an educational and dialogic model to include intervention and participatory models that consider

Corresponding author: Msc. Érika Silva do Nascimento Carvalho.

e-mail: erikar.ioc@gmail.com

Received 29 June 2016

Accepted 24 March 2017

a holistic approach to knowledge gains^{5,6}. Therefore, the aim of this study was to analyze the perceptions of vulnerable populations towards health education practices for blackfly control.

This exploratory study is both quantitative and descriptive, thus appropriate for investigating and analyzing the perceptions of vulnerable populations towards participation in blackfly control actions based on environmental health education projects. In addition, it is based on a dialectical view of reality to take into account the close relationship between the social and natural world, consciousness and material support, and understanding humans in their historical journey⁷.

This research study was conducted in the municipality of Joinville, located in the State of Santa Catarina (26°18'14"S 48°50'45"W), in the Atlantic Forest biome. This municipality has implemented a blackfly control program in the countryside for more than a decade. This pioneer study was conducted with 38 technical professionals, government institution managers (*Fundação Municipal do Meio Ambiente, Secretaria do Meio Ambiente, Fundação Municipal de Desenvolvimento Rural 25 de Julho*), technicians, workers, and countryside residents (**Table 1**).

Data were collected in 2014 from research questionnaires (**Figure 1**), comprising a dialogued process with subjects who answered questions related to blackflies and spoke freely about the influence of the blackfly control program. At the end of the interview, a presentation was made regarding the importance of blackfly control for the economy and health sectors; respondents showed an openness to answer questions and debate. Data analysis was performed on the research questionnaire records using a Chi-square test to analyze respondent awareness of the presence of blackflies. Questions were asked regarding the harmfulness of the blackfly insect; if blackflies disturbed or interfered with working conditions, study, or leisure; and if blackflies affected the quality of life of vulnerable populations, such as residents and workers. In addition, questions on blackfly control measures implemented in the municipality were also asked (e.g., perceptions of the physical and social environments and development and social relevance of the blackfly control program).

Countryside resident participants (n = 24/38; 63.2% of the total sample) reported the presence of blackflies and indicated they were an obstacle to the performance of their work activities, unlike urban area inhabitants. All respondents showed residual skin stains, especially on the legs, feet, and arms. In general, respondents attacked by blackflies reported being indisposed and showed discomfort due to the bites, including itching and swelling. In the countryside, house doors and windows must be kept closed to prevent blackfly entry; otherwise, they swarm in for stinging attacks. Even the screened doors and windows installed to prevent mosquito and sandfly entry must be kept closed, since blackflies are small enough to pass through these barriers. To avoid entry, the mesh of the screen should be very small.

There was a significant positive correlation between blackfly awareness and being uncomfortable, independent of

sex, age, and rural or urban zone in Joinville (Chi-square = 6.242; p = 0.012). None of the participants were aware that blackflies comprise several vector species for onchocerciasis and mansonelliasis, and that this may trigger pemphigus foliaceus. The implemented blackfly control program did not include social participation in its activities because no health education activities were carried out and no information on pest management with biolarvicide was passed on. This indicates a failure of linking information between the components of the blackfly control program. Ecological and socioeconomic factors related to lack of knowledge and public participation showed a significant correlation (Chi-square = 21.11; p = 0.0001), including lack of awareness that the dumping of *in natura* livestock waste in streams increases the concentration of organic matter, which can serve as nutrients for the proliferation of the blackfly larvae, thus considerably increasing the blackfly population and decreasing the residual effect of the applied biolarvicide.

Overall, results suggest the introduction of the dialogic model of health education in schools and association meetings and the need for community participation in blackfly control activities, since resident and worker participation is essential to foster the success of these programs. This will promote reality-based criticism and reflection, encouraging individuals to make decisions about their own life through the notion of autonomy^{4,8} and encouraging established social participation in the SUS context⁹, as has been done with mosquitoes vectors. It is speculated that earlier education attitudes and health promotion will result in improvements in the currently ineffective blackfly control program in the municipality, since 75.2% of the interviewed individuals agreed that the resident and worker participation is essential to foster the success of the blackfly control program. However, it is essential that these actions be continuous, with diverse content and methodologies that respect regional characteristics. Program effectiveness is evaluated by verifying changes in behavior and self-awareness after encouraging individuals to take steps to minimize the effects of their actions on the environment. The subjects of this research, except for the technical staff and the managers, declared non-participation in blackfly control actions and agreed that there should be valid and important health education activities in their routine, also pointing out that this would increase learning and awareness of both individual and collective *health care* activities, allowing them to build health and citizenship policies, leading to a healthier society^{10,11}. Seeking a mobilization of the population in different social spaces is relevant for planning strategies for blackfly control. It is required that health self-perception be feasible across the society and municipal management segments. In practice, health education is part of the technical activities related to public health in four different environments: the school, workplace, environment, and community. The main concern is not the existence of technical and scientific knowledge, but the political inability to implement rationally planned educational activities^{12,13,14}.

TABLE 1

Overview of the study population evaluated regarding blackfly control in the municipality of Joinville, Santa Catarina, Brazil, 2014.

Characteristic	Number	Percentage
Sex		
male	24	63.2
female	14	36.8
Age group (years)		
20 to 39	12	31.6
40 to 59	13	34.2
≥ 60	13	34.2
Professional category		
field professional	12	31.6
tourism professional	9	23.7
teacher	8	21.0
management	3	7.9
home professional	3	7.9
health professional	2	5.3
seller	1	2.6
Resident in rural zone		
yes	24	63.2
no	14	36.8
Awareness of blackflies		
yes	13	34.2
no, but people show blackfly bite characteristics	25	65.8
Symptoms described		
skin	12	31.6
itching and swelling	9	23.7
no symptoms	7	18.4
inflammation	5	13.1
fever	3	7.9
itching and petechiae	2	5.3
Is there public blackflies control service in this community?		
Yes, and this service is:	27	71.1
great/good	5	18.5
bad	20	74.1
unknown	2	7.5
No	3	7.9
don't know	8	21.0
Best way to improve information on blackfly control (social participation)		
leaflet distribution	7	18.4
conversation	0	0
both	25	65.8
don't know	6	15.8

This research shows the possibility of building a new participatory municipal model of a blackfly control program by adopting guidelines already recommended by the Ministry of Health that propose permanent education as a strategy for the transformation of training practices, care, management, formulation of policies, popular participation, and social control in the health sector. This in turn produces changes in health practices and actions by applying the dialogic model of education, both regionally and institutionally, and involving leaders, workers, students, and SUS users. The target population should play a central role in education policies, thereby becoming empowered and encouraged to exercise autonomy with regard to their health and consciously exercising

popular participation and social control of public policies. This experience, if adopted, will optimize resources and contribute to the improvement of relations between residents, workers, and the technical and management staff of the blackfly control program in Joinville.

Acknowledgments

We offer our deepest thanks to the institutions that provided technical support for the development and implementation of this study.

Conflict of interest

The authors declare that have no conflict of interest.

Project: Development of action strategies applicable to blackfly monitoring and control programs (Insecta: Diptera)

Name of the people that applied the questionnaire: _____.

QUESTIONNAIRE RESEARCH

1. How long time have you lived or worked in this place:
 0-5 years; 5-10 years; 10-20 years; more than 20 years.
2. You only reside in this place; You only work in this place; You live and work in this place.
3. What is your occupation? _____.
4. Do you see/feel the presence of blackflies in this place? Yes; No; Do not know;
 a. I do not know, but people show blackfly bite characteristics .
5. Do the blackflies annoy you by biting? Yes; No; Do not know.
6. Do you know any other place that the blackflies also annoy you by biting? Yes; No; Do not know;
 a. If so, where? _____.
7. Are you allergic to blackfly bites? Yes; No; Do not know.
 a. Have you had any reaction after a blackfly bite? _____.
8. Do you know that blackflies cause disease? Yes; No.
9. Do you know which diseases are caused by blackflies? Yes; No.
 a. If yes, what is the disease? _____.
10. Do you know where the blackfly breeds? Yes; No.
 a. If yes, Grass; Running water/rivers; Standing water/lakes; Others: _____.
11. Do you know that blackfly larvae occur in flowing water/rivers? Yes; No.
12. Do you know that it is the blackfly female that bites you? Yes; No.
13. Is there a public service activity in the community for the control of other mosquitoes?
 Yes; No; Do not know. a. If yes, how many times per year? _____.
14. Is there a public service activity in the community for blackfly control? Yes; No; Do not know.
 a. If yes, how do you see this activity? Great/good; Bad; Unknown. b. Why? _____.
15. Do you think that you could improve blackfly control? Yes; No; Do not know.
16. Do you receive information to know how to conduct blackfly control? Yes; No; Do not know.
 a. If yes, do you take any action to decrease the amount of blackflies on site? Yes; No.
17. Do you think the local population (residents and workers) can help in blackfly control?
 Yes; No; Do not know.
18. What do you think would be the best way to improve information on blackfly control?
 Leaflet distribution *; Conversation; Leaflet distribution and Conversation;
 Do not know. * Poster, Technical Manual, Brochures and Educational Booklet.
19. What do you think about the initiative of this project?
 Great/good; Bad; Do not know.

Name: _____ / Age: _____ years.

Locality: _____, Date: ___/___/___.

Signature s of the people that applied the questionnaire : _____.

FIGURE 1 - Research questionnaire.

Financial support

Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq), Project number 14/2013.

REFERENCES

1. Shelley A, Hernandez L, Maia-Herzog M, Luna Dias A, Garritano P. The Blackflies (Diptera: Simuliidae) of Brazil. ABLA Series. Vol. 6, Sofia: Pensoft Publishers; 2010.
2. Souza MA. Atendimento médico por picadas de simuliídeos, Porto Alegre, Rio Grande do Sul. Bull Saúde. 1984;11:8-11.
3. Stroschein KA, Zocche DAA. Educação permanente nos serviços de saúde: um estudo sobre as experiências realizadas no Brasil. Trab Educ Saúde. 2012;9(3):505-19.
4. Pereira VV, Guimarães DA, Lopes MD, Pereira VV, Rennó HMS, Silva ES. Programa de Educação pelo Trabalho para a Saúde nas Escolas: Percepção dos Pais. Rev Bras Educ Med. 2013;37(4): 549-56.
5. Oliveira HM, Gonçalves MJF. Educação em Saúde: uma experiência transformadora. Rev Bras Enferm. 2004;57(6):761-3.
6. Besen CB, Netto MS, Da Ros MA, Silva FW, Silva CG, Pires MF. A estratégia saúde da família como objeto de educação em saúde. Saúde Soc. 2007;16(1):57-68.
7. Minayo MCS. O desafio do conhecimento: pesquisa qualitativa em saúde. 11th ed. São Paulo: HUCITEC; 2010.
8. Freire P. Pedagogia da autonomia: saberes necessários à prática educativa. 43rd ed. São Paulo: Paz e Terra; 2011.
9. Cezarino MB, Dibo MR, Ianni AMZ, Vicentini ME, Ferraz AA, Chiaravalloti-Neto F. A difícil interface controle de vetores - atenção básica: inserção dos agentes de controle de vetores da dengue junto às equipes de saúde das unidades básicas no município de São José do Rio Preto, SP. Saúde Soc. São Paulo 2014;23(3):1018-32.
10. Viera DR, Machado ML, Cervi RBB, Verdi MIM. Participação, cidadania e políticas públicas: a construção da saúde em espaços de organização popular. Trab Educ Saúde. 2013;11(3):591-609.
11. Candeias NMF, Abujamra AMD, Pereira MTB. Delineamento do papel profissional dos especialistas em educação em saúde: uma proposta técnica. Rev Saude Publica. 1991;25(4):289-98.
12. Candeias NMF. Conceitos de educação e de promoção em saúde: mudanças individuais e mudanças organizacionais. Rev Saude Publica. 1997;31(2):209-13.
13. Santos AS. Educação em saúde: reflexão e aplicabilidade em atenção primária à saúde. Online Braz J Nurs. 2006;5(2):28-35.
14. Trezza MCSF, Santos RM, Santos JM. Trabalhando educação popular em saúde com a arte construída no cotidiano da enfermagem: um relato de experiência. Texto Contexto - Enferm. 2007;16(2):326-34.